BIOLOGICAL ASSESSMENT

for

Activities Affecting Northern Long-Eared Bats

on Southern Region National Forests

U.S. Department of Agriculture
Forest Service
Southern Region

by

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22 December 2014

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1.0 INTRODUCTION

The U.S.D.A. Forest Service in the Southern Region (FS) conducts many types of routine forest management and prescribed fire actions to manage and improve forest conditions for priority wildlife, including many species of forest dependent bats. Disturbance to the northern long-eared bat (*Myotis septentrionalis*) from these activities may occur during times when forests are occupied by these species. In this instance, regulations set forth in Section 7(a)(2) of the Endangered Species Act (ESA) requires federal agencies to determine whether proposed actions are likely to jeopardize species proposed for listing, and if so, to confer with the United States Fish and Wildlife Service (FWS). Jeopardy actions are those reasonably expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.

On October 2, 2013, the FWS issued a proposed rule to list the northern long-eared bat (NLEB) as endangered, with a final listing rule proposed for November 1, 2014 (Endangered Species Act (ESA) (78 FR 61046-61080). The FWS subsequently released "Northern Long Eared Bat Interim Conference and Planning Guidance' (January 6, 2014, hereafter Guidance), providing recommendations for how to avoid take of any individual northern long-eared bat during the summer roosting period when conducting routine forest management. Most recently, due to new information, the FWS determined a final listing rule is anticipated for April 1, 2015.

This programmatic Biological Assessment (BA) discloses the effects of continued implementation of the following fifteen FS-Forest Land and Resource Management Plans (forest plans) and their associated projects: George Washington, Jefferson, Nantahala-Pisgah, Uwharrie, Croatan, Daniel Boone, Land Between the Lakes, Cherokee, Sumter, Chattahoochee-Oconee, National Forests in Alabama, National Forests in Mississippi, Kisatchie, Ouachita, and the Ozark-St. Francis on NLEB. This BA is prepared in accordance with USDA Forest Service (USFS) manual 2671.44 and 2672.42 and regulations set forth in Section 7(a)(2) of the Endangered Species Act. Determinations of effect were made based on best available information.

1.1 AFFECTED AREA AND SCOPE OF ANALYSIS

The planning area is all Southern Region national forests (fifteen) within the range of the NLEB (Figure 1). This area contains approximately 11.5 million acres of potentially suitable habitat on national forest lands, which is less than one percent of the known range of the species (Figure 2).

The primary factor cited in the proposed listing rule responsible for the decline of NLEB populations is white-nose syndrome (WNS), a lethal fungal disease spread while the species inhabits caves and mines during winter hibernation. The NLEB has experienced a sharp decline in the northeastern part of its range, as evidenced by a combination of hibernacula surveys and summer capture trends. Although the disease has not yet spread throughout the species' entire range (WNS is currently found in 25 of 39 States where the NLEB occurs), it continues to spread although the rate of spread may have slowed. Because of shorter hibernation periods and warmer winters, it is not known if WNS will have the same impact to NLEBs in the southeast as it has in the northeast.

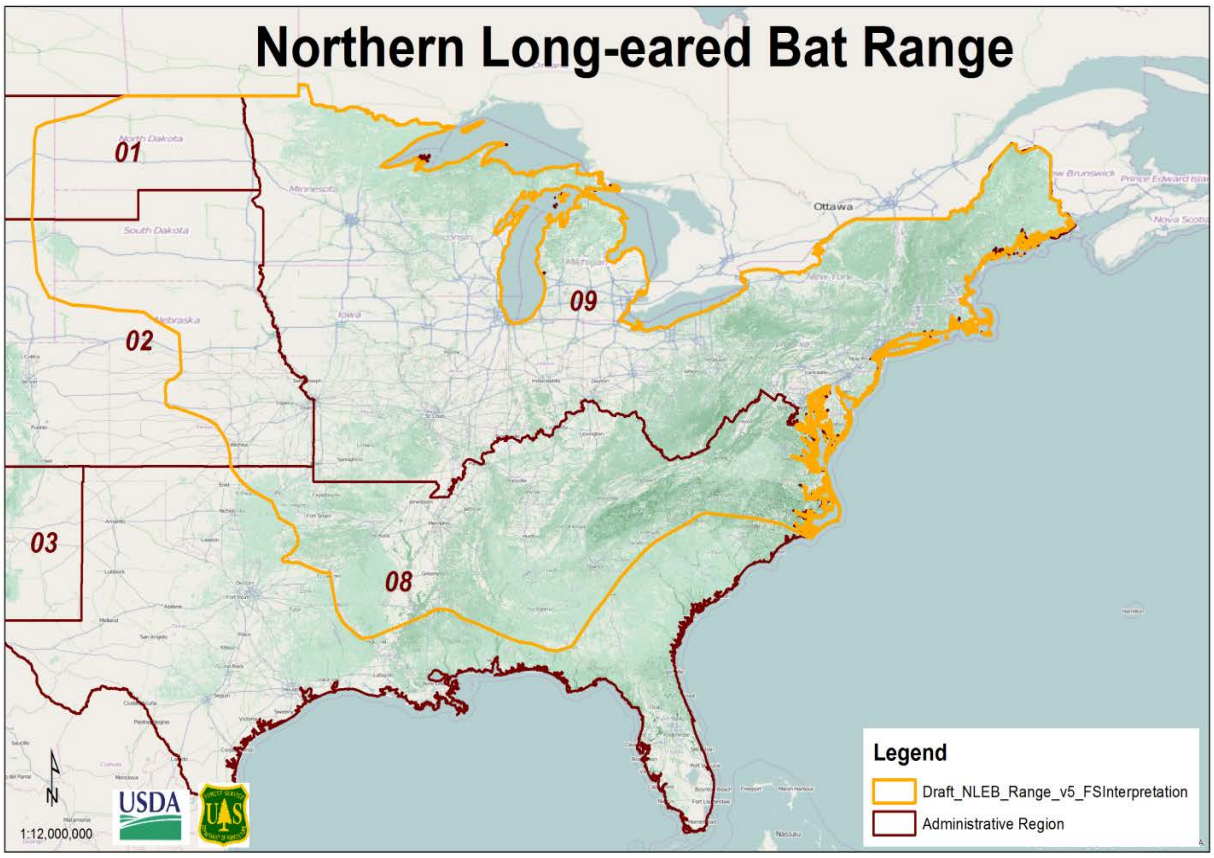

Figure 1: US NLEB range by Forest Service region

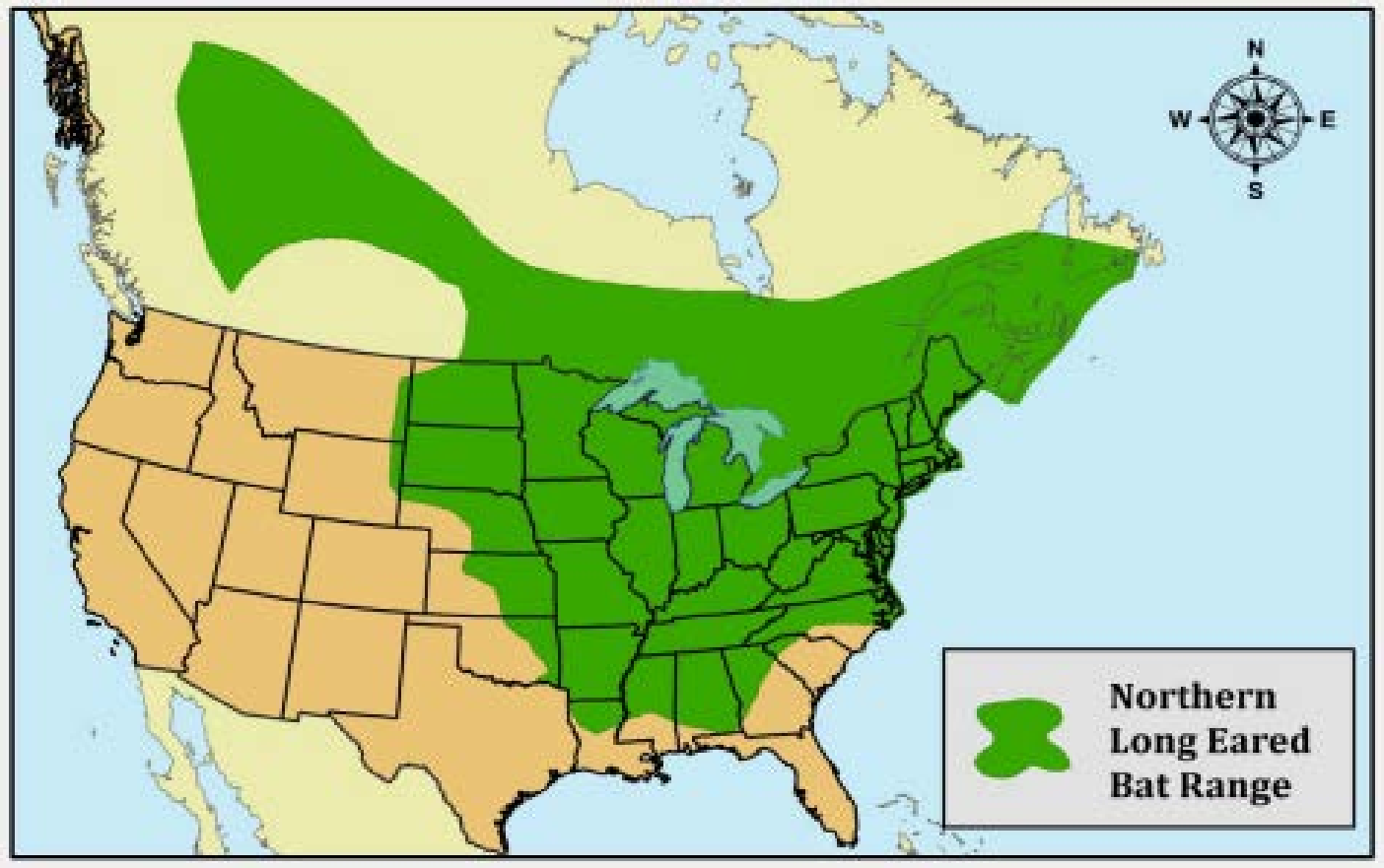

Figure 2: NLEB range

1.2 CONSULTATION HISTORY AND BACKGROUND

October 2, 2013: The FWS announced a 12-month finding on a petition to list the northern long-eared bat as endangered throughout its range. Another determination was that critical habitat for the NLEB was not determinable at that time (USFWS, 2013). The FWS listed several factors that affect the northern long-eared bat; however, they found that no other threat is as severe and immediate to the species persistence as WNS. Predominantly due to the emergence of WNS, the NLEB has experienced a severe and rapid decline in the Northeast, estimated at approximately 99 percent for some hibernacula since the disease was first discovered there in 2007. Summer survey data in the Northeast have also declined for NLEB post-WNS, with rates of decline ranging from 93 to 98 percent. This disease is considered the prevailing threat to the species, as there is currently no known cure. A final ruling was proposed for November 1, 2014.

January 6, 2014: The FWS released the "*Northern Long Eared Bat Interim Conference and Planning Guidance*". This document provided recommendations for how to avoid take of any individual NLEB during the summer roosting period when conducting routine forest management.

June 24, 2014: The FWS announced a six-month extension for making a final determination on listing the NLEB as endangered. With the extension, the Service announced that it would make a final decision on listing the NLEB no later than April 2, 2015. As part of the extension, the Service also reopened a 60-day public comment period and sought input from states, tribes, federal agencies

and other stakeholders about the status of the NLEB and also encouraged interested parties to work with the Service on issues such as forest management and bat conservation.

July 31, 2014: The FS prepared a "*Non-jeopardy Interim Conference Report for the Continued Implementation of Forest Service Southern Region Land and Resource Management Plans and Associated Projects*" report. The document analyzed the effects of the FS routine forest management as outlined in the forest plans for each National Forest. The report served as an interim conference report. The Southern Region NFs within the distribution of the NLEB were assumed to have the species present, so surveys were not deemed necessary at that time. The FWS provided written concurrence to the FS no jeopardy determination on August 27, 2014.

January 12, 2015: The FS transmitted this "*Biological Assessment for Activities Affecting Northern Long-Eared Bats on Southern Region National Forests*" to the FWS. This document assesses Forest Plan activities that would occur after April 1, 2015, for the duration of each Forest Plan, including those during the winter hibernation period and all other times of year. Many forest management activities may directly affect the NLEB while the species is present on FS lands, and indirectly affect the NLEB, through habitat alteration, while the species is absent, either hibernating or in migration to/from hibernacula. This document develops the information necessary at the programmatic level to support effect determinations for all such activities by compiling for each national forest the annual acreage corresponding to Forest Plan objectives for each activity type that may affect the NLEB.

1.3 HABITAT

Summer Habitat: NLEB typically uses mature, intact interior forest for roosting, though younger, managed forests are also used; roost selection is likely adaptable and variable depending on forest characteristics in an area (Broders et al. 2006, Carter and Feldhamer 2005, Ford et al. 2006, Henderson et al. 2008, Lacki and Schwierjohann 2001, Loeb and O'Keefe 2006, Perry and Thill 2007). Roosting site characteristics and tree species vary by geographic location. For example, NLEB were captured frequently in uplands, particularly mid-upper slopes and ridgetops, in northern Ohio and Kentucky (Silvis et al. 2012, Krynak 2010, Schultes 2002), while roost trees in Michigan and southern Illinois were all in wetlands or in bottomland and floodplain habitat (Foster and Kurta 1999, Carter and Feldhamer 2005). Silvis et al. (2012) suggested that while upland positions may increase solar radiation at roost sites, such sites also have the highest natural disturbance frequency and severity; thus, increased snag presence rather than increased solar radiation might be the primary influence on NLEB roost selection. This could also potentially explain higher use of trees in wetlands and floodplains, where high water often results in high snag densities. NLEB differ from Indiana bats (*Myotis sodalis*) in that NLEB often use roost trees with relatively lower levels of solar exposure (i.e., greater canopy cover; Carter and Feldhamer 2005, Ford et al. 2006, Johnson et al. 2009, Lacki and Schwierjohann 2001, Sasse and Pekins 1996, Schultes 2002, Silvis et al. 2012). However, while canopy cover at NLEB roost trees may be relatively high in comparison with Indiana bat roosts, it is generally still lower than the surrounding forest canopy cover.

Similar to the variation in landscape characteristics, many studies suggest that NLEB use a variety of tree species for roosts based largely on the tree species' proportional availability on the local landscape, roosting in the types of trees in an area that offer the necessary structural characteristics (Foster and Kurta 1999, Krynak 2010, Menzel et al. 2002, Sasse and Pekins 1996, Schultes 2002). In studies of relatively mature forested habitat, female NLEB roosts (particularly maternity roosts)

were often in large, taller trees in mid-late decay class, located in localized areas with more open canopy and more abundant snags as compared to other areas (Broders and Forbes 2004, Garroway and Broders 2008, Lacki and Schwierjohann 2001, Sasse and Perkins 1996). In dense deciduous forest subjected to low-intensity timber management in the southern Appalachian Mountains, O'Keefe (2009) found that NLEB preferred oaks (Quercus spp), although they used a variety of hardwood trees. Females tended to select large diameter dead canopy trees with relatively low canopy closure in close proximity to other suitable roosts, while males typically roosted in cavities in live-damaged trees. In studies on the more intensively managed Westvaco Wildlife and Ecosystem Research Forest (WERF) in WV, most maternity roosts were located in snags in or below the canopy, with black locust (Robinia pseudoacacia) used in higher proportion than expected based on their availability; roost locations also were generally in areas with an abundance of other snags (Menzel et al. 2002, Owen et al. 2002). Similar roost tree use was observed on the Fernow Experimental Forest in WV (Johnson et al. 2009). On the Fort Knox military reservation in Kentucky, Silvis et al. (2012) found many females in north-central Kentucky using cavities in suppressed sassafras (Sassafras albidum) snags.

While the NLEB is more flexible than the Indiana bat in its use of roost trees (e.g., species, condition, diameter at breast height (dbh), canopy closure, etc.), published studies and theses/dissertations which provided NLEB roost tree and random tree data (Figure 3; Appendix A) indicate the dbh for roost trees was greater than dbh of random trees in all but two studies, though the difference was not always statistically significant. Both of these studies were located in areas of WV which had undergone recent controlled burns or harvest and where the vast majority of roost trees were snags, primarily black locust. Overall, these data suggest that NLEB will usually choose to roost in larger than average diameter trees in a stand. In more intensively managed landscapes, with fewer suitable large diameter roosts, NLEB appear to select snags of decay-resistant species (e.g., black locust and sassafrass), particularly in areas with an abundance of suitable snags. As such, selective removal of smaller live trees in a densely forested landscape is very unlikely to result in loss of a roost tree, especially when snags are left intact.

Regardless of geographic and topographic location, maternity roost sites must provide warm microclimates that maximize growth rate of the young. O'Keefe (2009) found that mean plot canopy closure for female roosts (43%) was much lower than values reported in previous studies, possibly due to the prevalence of canopy gaps in mixed oak forests in the study area in western North Carolina; Johnson et al. (2009) also frequently found NLEB roosting in trees in canopy gaps. O'Keefe (2009) found that several microhabitat factors were important for roost site selection by reproductive females (roosts were generally large diameter canopy trees with low canopy closure and in close proximity to other suitable roosts), while males were more flexible,

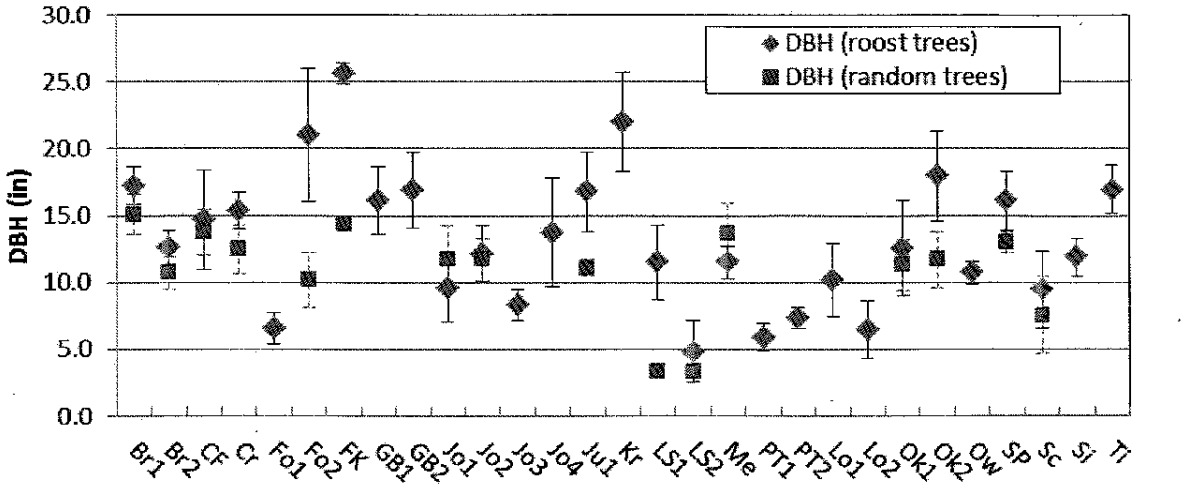

Figure 3. Data from 20 published studies of NLEB roost trees showing mean roost tree size as opposed to random trees in the area; lines represent 2*SE. More than one point may be given for an individual study (e.g., if the publication separated data by sex of the bat or treatment type, such as burned area vs control). Refer to Appendix A for citations and specific data presented in this figure.

typically selecting a cavity in a small diameter live-damaged understory or mid-story roost tree. Male and non-reproductive female summer roost sites also may be in cooler locations, including caves and mines. Maternity colonies have been reported in tree cavities, crevices, under exfoliating bark, in live trees and in bridges as well as buildings and bat boxes (Burke 1999, Foster and Kurta 1999, Menzel et al. 2002, Feldhamer et al. 2003, Henderson and Broders 2008, Krynak 2010).

Like many other tree-roosting bats, NLEB maternity colonies are located in areas with multiple additional suitable roosts available within close proximity, regardless of whether those roosts are located in close proximity to foraging areas. Maternity colonies often are located farther from foraging habitats than are male or non-reproductive female roost trees, likely because stands that support an abundance of potential maternity roosts are not located randomly on the landscape and the availability of such a network of suitable roosts is likely more important to females than proximity to foraging habitat (Broders and Forbes 2004, O'Keefe 2009). Male NLEB generally roost alone and are less selective in terms of roost tree characteristics, such that proximity to foraging sites is more likely to be a more important factor for male roost-site selection. Several recent studies have investigated the fission-fusion social structure of female NLEB roost tree networks, within which individuals switch roosts regularly and subsets of individuals maintain preferred associations on both a short- and long-term basis (Garroway and Broders 2007, Patriquin et al. 2010, Johnson et al. 2012, Silvis et al. 2014). General use of space within roosting networks tends to be similar, with all colonies exhibiting a distinct core roosting area surrounded by other, less frequently used roosts. Simulation results from network analyses of these maternity colonies suggested that NLEB may be robust to the random loss of some of these roosts, which is consistent with the ephemeral nature of snags as a habitat resource (Silvis et al. 2014).

Table 1 shows the number of potential NLEB roost trees available on the landscape by forest. Snags are standing dead trees. Rough cull trees are those with splits, cracks, lightening strikes and other types of defect. Rotten culls are hollow trees. The data does not indicate whether suitable microclimatic conditions for NLEB roosting exists or if snags have any bark remaining. NLEB are

less restrictive in their roost tree requirement compared to Indiana bat. NLEB will also use woodpecker holes in barkless snags as roosts, so snags do not need exfoliating bark to be suitable. There are approximately 704 million potential NLEB roost trees on national forests in the southeast.

National Forest	snags ≥ 5" dbh	rough culls > 3" dbh	rotten culls > 3" dbh	potential roost trees	potential roost trees/acre	snag/ acre
George Washington	17,593,479	77,345,779	2,255,380	97,194,638	91	17
Jefferson	13,019,400	50,515,480	2,119,216	65,654,096	90	18
Nantahala-Pisgah	21,149,917	73,245,497	1,129,474	95,524,888	93	21
Uwharrie	990,727	6,199,020	212,299	7,402,046	80	19
Croatan	3,741,662	11,036,024	143,229	14,920,915	92	23
Daniel Boone	8,053,936	25,181,595	383,301	33,618,832	46	11
Land Between the Lakes	1,524,830	4,919,659	36,790	6,481,279	68	10
Cherokee	16,701,775	33,807,675	103,524	50,612,974	77	25
Sumter	956,682	7,694,044	33,926	8,684,652	110	14
Chattahochee-Oconee	10,391,784	52,511,132	889,867	63,792,783	73	12
Alabama	7,061,667	40,632,712	431,787	48,126,166	64	9
Mississippi	9,788,032	64,189,626	951,718	74,929,376	63	8
Kisatchie	3,945,941	11,444,627	177,308	15,567,876	22	6
Ouachita	14,577,237	56,451,581	1,921,887	72,950,705	40	19
Ozark-St Francis	11,981,969	35,028,923	1,493,460	48,504,352	41	10
Total	141,479,038	550,203,374	12,283,166	703,965,578	64	13

Table 1. Potential roost trees available from Forest Inventory and Analysis Database

There are also 5,005,423 acres (43% of forested acres) of forest classified as unsuitable for timber production. This means they are not subject to sustainable yield management. Unsuitability can be for various reasons including special designation (wilderness, wild and scenic river corridor, research natural area), steepness of slope, lack of access, or highly erosive soils. Being unsuitable for timber production does not mean trees will not be cut. Trees could be cut for insect and disease control or wildlife stand improvement. In general, these stands will get older and likely develop more potential roost trees than areas suitable for timber production.

Winter Habitat: Northern long-eared bats predominantly overwinter in hibernacula that include caves and abandoned mines. Hibernacula used by NLEB are typically large, with large passages and entrances (Raesly and Gates 1987), relatively constant, cooler temperatures (0 to 9 °C; 32 to 48 °F) (Raesly and Gates 1987, Brack 2007), and with high humidity and no air currents (Fitch and Shump 1979, Raesly and Gates 1987). The sites favored by NLEB are often in very high humidity areas, to such a large degree that droplets of water are often observed on their fur (Hitchcock 1949, Barbour and Davis 1969). NLEB are typically found roosting in small crevices or cracks in cave or mine walls or ceilings, often with only the nose and ears visible, thus are easily overlooked during surveys (Griffin 1940, Barbour and Davis 1969, Caire et al. 1979, Van Zyll de Jong 1985, Whitaker and Mumford 2009). Caire et al. (1979,) and Whitaker and Mumford (2009) commonly observed individuals exiting caves with mud and clay on their fur, also suggesting the bats were roosting in tighter recesses of hibernacula. They are also found hanging in the open, although not as frequently as in cracks and crevices (Barbour and Davis 1969, Whitaker and Mumford 2009). In 1968,

Whitaker and Mumford (2009,) observed three northern long-eared bats roosting in the hollow core of stalactites in a small cave in Jennings County, Indiana.

To a lesser extent, NLEB have been found overwintering in other types of habitat that resemble cave or mine hibernacula, including abandoned railroad tunnels, more frequently in the northeast portion of the range. Also, in 1952 three northern long-eared bats were found hibernating near the entrance of a storm sewer in central Minnesota (Goehring 1954,). Kurta and Teramino (1994) found northern long-eared bats hibernating in a hydro-electric dam facility in Michigan. In Massachusetts, northern long-eared bats have been found hibernating in the Sudbury Aqueduct, a structure created in the late 1800s to transfer water, but that is rarely used for this purpose today (French 2012, unpublished data). Griffin (1945) found northern long-eared bats in December in Massachusetts in a dry well, and commented that these bats may regularly hibernate in ‘‘unsuspected retreats’’ in areas where caves or mines are not present.

1.4 PROPOSED ACTION

The proposed action is the continued implementation of the following fifteen FS-Forest Plans and associated projects: George Washington; Jefferson; Nantahala-Pisgah; Uwharrie; Croatan; Daniel Boone; Land Between the Lakes; Cherokee; Sumter; Chattahochee-Oconee; National Forests in Alabama; National Forests in Mississippi; Kisatchie; Ouachita, and the Ozark-St. Francis for activities occurring after April 1, 2015. The NLEB is among the most common of forest bats within the Southern Region and are frequently encountered in surveys within its extensive range throughout most of the Region. For purpose of this analysis, NLEB is assumed present on all national forest within its range in the southeast. This BA incorporates new information and conservation measures for the NLEB for the following activities.

Proposed Actions that Could Affect Northern Long-eared Bats and Habitat
Beginning in FY2015 and continuing for the next 10 years, these Forests have the following annual forest management treatment objectives listed below (Table 2). Thinning for purpose of this BA includes standard timber thinning operations, wildlife stand improvement, timber stand improvement, mechanical fuels reduction, firewood cutting, recreation site maintenance and dropping individual trees in lakes and streams for fish habitat because they all have similar effects of reducing stand density and allowing more sunlight to reach the forest floor. Please see Appendix B for a summary of treatments and specific definitions of each treatment.

1. **Timber Harvest:** Timber harvest may be commercial and offered through a competitive bid process to achieve objectives including ecosystem restoration, threatened, endangered, and sensitive species conservation, stand regeneration for forest health, and wildlife habitat improvement. Some treatments may also be non-commercial, particularly thinning operations. Under timber harvest, treatments could include even-aged or un-even aged regeneration, thinning, wildlife or timber stand improvement, insect and disease control, or mechanical fuel reduction treatments. Table 2 summarizes total projected maximum annual harvests planned for the period beginning FY2015 for each of the southern nationl forests within the range of the NLEB.

Even-aged Management		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	1,770	1,180
Jefferson	942	628
Nantahala-Pisgah	445	1,155
Uwharrie	85	220
Croatan	225	800
Daniel Boone	1,330	1,343
Land Between the Lakes	600	600
Cherokee	800	1,400
Sumter	850	450
Chattahochee-Oconee	310	1,200
Alabama	1,375	3,025
Mississippi	1,009	1,514
Kisatchie	476	1,400
Ouachita	1,840	7,360
Ozark-St Francis	1,083	4,119
Totals (Acres)	**13,140**	**26,394**
% of Total Potential Acres	**0.11%**	**0.23%**

Uneven-aged Management		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	30	20
Jefferson	24	16
Nantahala-Pisgah	167	433
Uwharrie	--	--
Croatan	--	--
Daniel Boone	100	200
Land Between the Lakes	250	250
Cherokee	300	350
Sumter	60	120
Chattahochee-Oconee	600	1,000
Alabama	0	0
Mississippi	2	18
Kisatchie	58	174
Ouachita	2,500	10,000
Ozark-St Francis	21	77
Totals (Acres)	**4,112**	**12,658**
% of Total Potential Acres	**0.04%**	**0.11%**

Thinning		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	1,291	1,115
Jefferson	969	781
Nantahala-Pisgah	445	1,155
Uwharrie	140	360
Croatan	291	1,234
Daniel Boone	7,500	7,500
Land Between the Lakes	300	300
Cherokee	1,781	687
Sumter	100	200
Chattahochee-Oconee	3,455	10,365
Alabama	2,700	5,950
Mississippi	4,476	10,444
Kisatchie	5,481	16,442
Ouachita	11,600	36,570
Ozark-St Francis	7,200	13,100
Totals (Acres)	**47,729**	**106,203**
% of Total Potential Acres	**0.42%**	**0.92%**

Salvage/Sanitation (Routine)		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	0	0
Jefferson	0	0
Nantahala-Pisgah	70	180
Uwharrie	30	70
Croatan	55	195
Daniel Booone	750	750
Land Between the Lakes	350	400
Cherokee	19	6
Sumter	100	100
Chattahochee-Oconee	100	300
Alabama	310	995
Mississippi	100	900
Kisatchie	50	50
Ouachita	1,200	2,800
Ozark-St Francis	509	1,931
Totals (Acres)	**3,643**	**8,677**
% of Total Potential Acres	**0.03%**	**0.08%**

Table 2: National Forests Proposed Total Timber Harvest by Cutting Method, Annually.

The fifteen Forests project an annual treatment on 222,556 acres from the southern range of the NLEB consisting of 68,624 of regeneration and 153,932 acres of thinning. Less than 2% of the fifteen Forests total forested acres (11.5 million acres) are proposed for some type of timber harvest

annually. Planned forest regeneration accounts for 56,304 acres or 0.5% of the total forested acreage annually. This is equivalent to a 200-year rotation. Most of this removal will constitute a temporary loss of potential NLEB summer roost habitat, since new habitat is created as stands regenerate and age.

The critical time period for the NLEB is when young are nonvolant, generally during the first of May through through mid-July. A summary of proposed Forests LRMP forest management activities during this time period are shown below in Table 3.

Summary-All Timber Treatments	Nonvolant Period				
Forests	**EAM**	**UAM**	**Thinning**	**Salv/Sant**	**Totals**
George Washington	1,770	30	1,291	0	**3,091**
Jefferson	942	24	969	0	**1,935**
Nantahala-Pisgah	445	167	445	70	**1,127**
Uwharrie	85	--	140	30	**255**
Croatan	225	--	291	55	**571**
Daniel Boone	1,330	100	7,500	750	**9,680**
Land Between the Lakes	600	250	300	350	**1,500**
Cherokee	800	300	1,781	19	**2,900**
Sumter	850	60	100	100	**1,110**
Chattahochee-Oconee	310	600	3,455	100	**4,465**
Alabama	1,375	0	2,700	310	**4,385**
Mississippi	1,009	2	4,476	100	**5,587**
Kisatchie	476	58	5,481	50	**6,065**
Ouachita	1,840	2,500	11,600	1,200	**17,140**
Ozark-St Francis	1,083	21	7,200	509	**8,813**
Totals (Acres)	**13,140**	**4,112**	**47,729**	**3,643**	**68,624**
% of Total Potential Acres	**0.11%**	**0.04%**	**0.42%**	**0.03%**	**0.60%**

Table 3. Proposed timber treatments by Forest during the nonvolant period, annually.*
*EAM=Even-aged management; UEAM=Uneven-aged management; THIN=Thinning; SAL/SAN=Salvage/Sanitation

Not including prescribed burning, the total amount of acreage across the landscape proposed for forest management during the nonvolant time period is 68,624 acres annually or 0.6% of the total forested acreage across the NLEB's range on Forest Service lands.

2. **Prescribed Burning:** Dormant season prescribed burning generally occurs between October and April. Many of the Forests utilize dormant season prescribed burning to primarily reduce hazardous fuels buildups to reduce the chances of catstrophic wildlfires. Growing season burns generally occur between April 15 and August 15. Growing season prescribed burning is planned for site preparation, control of undesirable species, and restoration of fire-dependent ecosystems. Approximately 1.2 million acres (10%) of combined dormant/growing season prescribed burning could occur annually across the Southern Region's landbase within the NLEB range.

Prescribed burning acreage proposed during the nonvolant timeframe for the NLEB is shown in table 4 below.

Prescribed Burning		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	2,000	18,000
Jefferson	1,500	13,500
Nantahala-Pisgah	1,000	15,000
Uwharrie	700	5,800
Croatan	4,200	25,800
Daniel Boone	3,000	47,000
Land Between the Lakes	4,000	23,000
Cherokee	10,000	21,500
Sumter	NA	5,000
Chattahochee-Oconee	5,000	50,000
Alabama	8,500	99,500
Mississippi	75,372	175,868
Kisatchie	41,250	123,750
Ouachita	25,000	225,000
Ozark-St Francis	25,000	95,000
Totals (Acres)	**206,522**	**943,718**
% of Total Potential Acres	**1.80%**	**8.21%**

Table 4. Total Maximum Acres of Prescribed Burning Proposed for Each Forest by Period, Annually.

3. **Road Construction/Reconstruction/Maintenance:** General road management direction on the Forests are to expand the use of existing corridors (reconstruction) rather than to establish new roadways (construction). For example, of the 6, 451 acres showing in Table 5 for the Nantahala-Pisgah, only 6 acres is new construction. There is no new road construction on the Uwharrie or Croatan national forests, and only 16 acres of new construction at Land Between the Lakes NRA. Both reconstruction and construction can remove trees while generally maintenance of roads do not remove trees unless the tree poses a safety hazard. Generally there are approximately 3 acres per mile for construction and about 0.5 acre per mile of tree removal for reconstruction.

   Numbers in the table below (Table 5) represent total number of any type of road work, to include road construction, maintenance, reconstruction or decommissioning. These figures, for both volant and nonvolant time periods for any type of road work represent less than 0.1% of the total amount of potential habitat for the NLEB.

Road Construction		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	2	2
Jefferson	13	9
Nantahala-Pisgah	1,806	4,645
Uwharrie	69	177
Croatan	178	669
Daniel Boone	258	258
Land Between the Lakes	100	250
Cherokee	5	5
Sumter	NA	NA
Chattahochee-Oconee	30	110
Alabama	12	22
Mississippi	18	55
Kisatchie	361	1,082
Ouachita	44	132
Ozark-St Francis	1,023	2,148
Totals (Acres)	**3,919**	**9,563**
% of Total Potential Acres	**0.03%**	**0.08%**

Table 5. Total amount of proposed road construction for all Forests.

Other activities that have the potential to remove trees, such as trail construction or non-timber land clearing is projected to be 16,188 acres annually (0.1% across all the Forests).

The time period of May 1 through July 15, during the nonvolant period, is the time range of greatest concern for the NLEB. Forest management plans have existing conservation measures in place to aid conservation of the NLEB as well as many other species of bats. Figure 4 shows all activities proposed for all Forests during the nonvolant period for the NLEB.

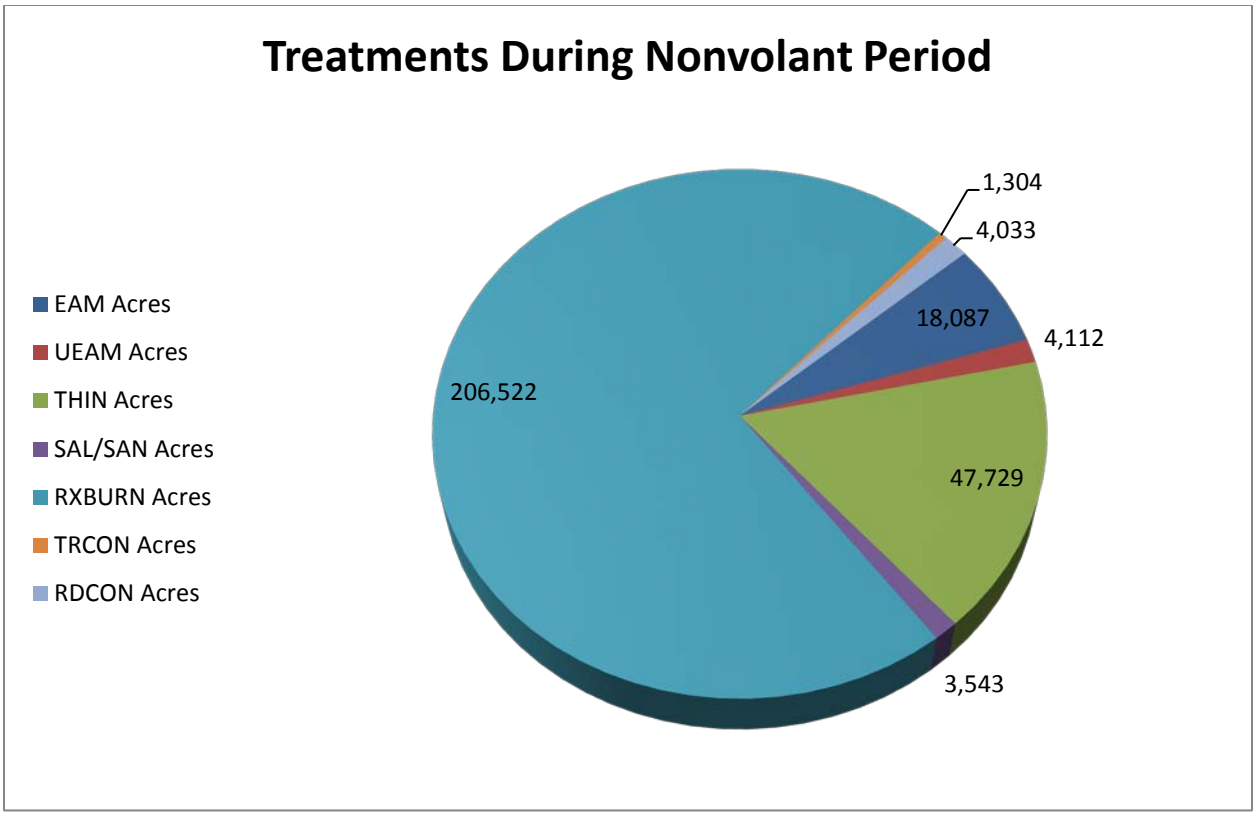

Figure 4: Total acres proposed treatment methods for all Forests during nonvolant period.*
*EAM=Even-aged management; UEAM=Uneven-aged management; THIN=Thinning; SAL/SAN=Salvage/Sanitation; RXBURN=Prescribed Burning; TRCON=Trail Construction; RDCON=Road Construction; CLRNT=Clearing, non-timber.

Table 6 illustrates the total amount of proposed treatment acres for all the Forests during the nonvolant period for the NLEB. These treatements total 283,086 acres (2.5%) out of 11.5 million acres of potential habitat on Forest Service lands.

In Summary, a total of approximately 1.2 million acres (10.4%) of the 11.5 million acres of the Forest Service land base is projected for treatment annually within the range of the NLEB during the all time periods combining all methods of restoration. Of this total, 1,150,240 acres (82%) is prescribed burning.

Summary-All Treatments		
Forests	Tot Acres (Nonvolant Period)	Tot Acres (Volant Period)
George Washington	5,131	20,356
Jefferson	3,480	14,975
Nantahala-Pisgah	4,428	24,420
Uwharrie	1,060	6,758
Croatan	5,002	28,875
Daniel Boone	14,003	58,116
Land Between the Lakes	5,635	25,050
Cherokee	13,001	24,044
Sumter	1,110	5,870
Chattahochee-Oconee	9,507	63,040
Alabama	12,909	109,530
Mississippi	80,980	188,821
Kisatchie	47,755	143,135
Ouachita	42,398	282,446
Ozark-St Francis	36,687	123,944
Totals (Acres)	**283,086**	**1,119,379**
% of Total Potential Acres	**2.46%**	**9.73%**

Table 6. Summary of all treatments annually.

1.5 DESIGN CRITERIA TO BE EMPLOYED

The Forest Plans for each National Forest provide a framework for integrated resource management and guide project-level decision making. Forest Plans step down forest-specific conservation and multiple-use objectives from broader regional and national goals. A Forest Plan does not authorize projects or activities, but projects and activities must contribute to Plan objectives and conform to its standards and guidelines. Standards and guidelines are adopted, among other reasons, to promote the conservation of listed species and to avoid and minimize potential adverse effects of projects implemented under the plan. Forest Plans describe conservation measures employed to avoid or minimize the effects of routine forest management and prescribed fire actions to priority wildlife, including forest dependent bats. A large number of the Forests have incorporated protection measures, standards and guidelines in forest plans, which have helped contribute to the successful increase of the Indiana bat, which has likely benefitted the NLEB as well. Listed below are specific guidelines or protection measures that protect roosting, foraging and hibernacula habitat across these Forests.

Some Forests have employed site specific bat call acoustic and/or bat mist netting surveys, which could pick up the NLEB. However, due to lack of manpower and funding, project level surveys are

not feasible. All of the Forests have acoustic monitoring transects. The data files can be stored until a sufficient bat call identification program is recommended by the FWS. Some of the Forests also have grid sampling acoustic surveys or fixed point acoustic monitoring point areas. All forests will implement the North American Bat Monitoring Protocol developed by the U.S. Geological Survey, U.S. Forest Service, and other federal and state partners. This is a continent-wide, grid-based survey composed of both fixed plot and driving acoustic transects, to monitor trends in bat activity across all ownerships.

Cliffline, Cave, and Mine Habitats

- Mature forest cover is maintained within 100 feet slope distance from the top of cliffs and 200 feet slope distance from the base.. Activities in this zone are limited to those needed to ensure public safety or to maintain and improve habitat for federally listed species or other species whose viability is at risk.
- In May 2009, the FS issued a closure order for all caves and abandoned mines in all Southern Region National Forests except El Yunque NF in Puerto Rico and Blanchard Springs Caverns in Arkansas to proactively slow the spread of *Pseudogymnoascus destructans*, the fungal agent that causes WNS. The closure order had been renewed on an annual basis. On June 2, 2014, the FS Southern Region put in place a 5-year closure to minimize potential human spread of *Pseudogymnoascus destructans* and protect bats.
- As caves are discovered, catalog, inventory, and classify them according to the Cave Resources Protection Act (CRPA) guidelines and determine significance using established protocols. Management direction of cave resources will be made following the CRPA guidelines and will allow for input from interested outside agencies and the public. Known or suspected threatened or endangered species occupancy and/or use is adequate to define a cave or mine as significant.
- A minimum 200' buffer is established around all caves and mines used by bats to protect microclimatic conditions and roost trees. Any management within this zone will be to enhance cave and mine resources.
- Campfires are prohibited within 200 feet from the entrance to caves, mines, and rock shelters used by TES species.
- Prescribed burn plans for areas containing caves or for areas near significant caves or mines identify these sites as smoke sensitive targets.
- Restrict access to caves where disturbance or vandalism of important resources may occur.
- The use of caves for disposal sites or the alteration of cave entrances is prohibited except for the construction of cave gates or similar structures to ensure closure.
- All known TES bat species hibernacula should be evaluated for gates. If additional hibernacula are found, the caves should be evaluated for gating to protect TES bats during the critical hibernation period.

Roosting and Foraging Habitat

Unlike clifflines, caves, and mines which are very similar across the southern region, NLEB roosting and foraging habitat varies across the many ecosystems in the southeast. This results in similar, but not exactly the same design criteria. The design criteria below are consistent across all southern national forests in the range of the NLEB. Design criteria for individual forests can be found in Appendix C.

- In commercial and non-commercial vegetation management activities, snags are not intentionally felled except where public or worker safety concerns exist or where catastrophic events such as weather, wildfire, or disease/insect outbreaks in a stand constitute a threat to the health of the surrounding forest. Some snags may be inadvertently knocked down during vegetation management actions. Where snags are cut because of catastrophic events, a minimum of two of the largest snags are left per acre.
- Den trees are retained where practicable. For example, it may not be desirable to retain den trees in developed recreation sites which could result in increased human interactions with raccoons.
- Create upland water sources as needed.
- Riparian buffers of varying widths are placed on ephemeral, intermittent, and perennial streams depending on stream size and slope of adjacent lands.
- In two-aged shelterwood regeneration areas, leave trees are retained indefinitely. Leave tree basal area varies depending on species and harvest unit size.
- Invasive species are controlled.
- Before old buildings, wells, cisterns, and other man-made structures are structurally modified or demolished, they will be surveyed for bats. If significant bat roosting is found, these structures will be maintained or alternative roosts suitable for the species and colony size will be provided prior to adverse modification or destruction.

2.0 HABITAT RELATIONSHIPS, EFFECTS ANALYSIS, AND DETERMINATIONS OF EFFECTS

Direct, Indirect and Cumulative Effects

The most significant rangewide threat to the NLEB and primary reason for the proposed listing by the FWS is white-nose syndrome, a lethal fungal disease spread while the species inhabits caves and mines during winter hibernation. Although WNS is the primary cause for significant population declines, the activities detailed below may affect NLEB, primarily through disturbance, although direct mortality cannot be ruled out. The Guidance document states, "Although many types of timber management, when properly designed, will not impact (or may improve) NLEB habitat, some types of timber management (clear-cutting) can reduce the viability of NLEB populations if key areas of a home range are removed." The Southern Region rarely uses clear-cutting and it is usually associated with ecosystem restoration.

Standards and guidelines are adopted, among other reasons, to promote the conservation of listed species and to avoid and minimize potential adverse effects of projects implemented under the plan. Forest Plans describe conservation measures employed to avoid or minimize the effects of routine forest management and prescribed fire actions to priority wildlife, including forest dependent bats. White-nose syndrome has not been linked to active forest management activities.

White-nose syndrome is a fungal disease known to cause high mortality in bats that hibernate in caves and mines. The fungus causing the disease thrives in low temperatures and high humidity– conditions commonly found in caves and mines where NLEB hibernate. Northern long-eared bats predominantly overwinter in hibernacula that include caves and abandoned mines. Hibernacula used by NLEB are typically large, with large passages and entrances, relatively constant, cooler temperatures, and with high humidity and little to no air currents.

Cave-dwelling bats are vulnerable to human disturbance while hibernating. Bats use up their energy stores when aroused and may not survive the winter. Properly installed gates on caves and abandoned underground mines are effective at restricting human access while allowing use by bats.

Northern long-eared bats typically occupy their summer habitat from mid-May through mid-August each year. The species may arrive or leave some time before or after this period (in the Southeast Region the range of dates are from mid-March to late November to include spring staging and fall swarming). Whereas some activities (e.g., highway and commercial development, surface mining, and wind facility construction) permanently remove habitat, timber harvest and forest management may remove or alter (i.e., improve or degrade) summer roosting and foraging habitat, but the effect is not permanent.

Suitable summer habitat for NLEB consists of a wide variety of forested/wooded habitats where they roost, forage, and travel, and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. This includes forests and woodlots containing potential roosts. During summer, NLEB roost singly or in colonies in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically ≥3 inches diameter at breast height). Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on presence of cavities or crevices or presence of peeling bark. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1000 feet of other forested/wooded habitat. Northern long-eared bats emerge at dusk and use upland and lowland forested habitats and tree-lined corridors to forage, feeding on insects, which they catch while in flight using echolocation. This species also feeds by gleaning insects from vegetation and water surfaces.

Northern long-eared bat maternity habitat is defined as suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females. Northern long-eared bat home ranges, consisting of maternity, foraging, roosting, and commuting habitat, typically occur within three miles of a documented capture record or a positive identification of NLEB from properly deployed acoustic devices, or within 1.5 miles of a documented roost tree.

Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1000 feet from the next nearest suitable roost tree within a woodlot, or wooded fencerow.

Forest Management

Vegetation management is used to ensure forested habitats remain suitable for a variety of wildlife species, including bats. Forest vegetation management can positively or negatively affect bat habitats at multiple spatial scales and during all facets of bat life history, from foraging habitat to maternity and day roosts to hibernacula and fall swarming and spring staging habitat. Many of the sensitive bat species in eastern North America are tree-roosting bats, for which vegetation management can play a key role in providing and/or enhancing day roost and maternity roosting habitat. While specific roost tree and landscape characteristics vary across and within bat species depending on geographic location and habitat availability, a few characteristics are common across most maternity colony habitats. For example, tree roost-switching is common and the availability of a network of multiple suitable roost trees in relatively close proximity is considered an important characteristic in selection of roost trees by reproductive females (O'Keefe 2009, Patriquin et al.

2010, Johnson et al. 2012, Silvis et al. 2014). Forest management can often enhance areas that may not be used currently for maternity colonies by providing networks of such trees. Vegetation management in the vicinity of hibernacula may also be important in the provision and conservation of fall swarming and spring staging habitat. Conservation of forest cover and/or management of areas in the vicinity of hibernacula to provide additional snags can increase suitable roost habitat for tree-roosting bat species during swarming.

Bat activity and foraging may be greatly influenced by forest clutter. Studies throughout North America suggest that most bats avoid highly cluttered areas and prefer to forage and travel in areas with less clutter (Brigham and et al. 1997a, Erickson and West 2003, Hayes and Loeb 2007, Humes et al.1999). Bats are often more active in early and late-seral stages which are usually less cluttered than in intermediate forest stages (Burford and Lacki 1995a, Erickson and West 2003, Humes et al. 1999, Loeb and O'Keefe 2006, Menzel et al. 2005). Thinning may reduce clutter and lead to increased bat activity (Erickson and West 2003, Lacki et al. 2007), although some studies suggest no response by bats to thinning (Tibbels and Kurta 2003). Responses to clutter differ among bat species. Differences in bat size (mass), bat morphology and the echolocation frequencies used among species are believed to make some species more adapted to foraging in cluttered habitats, whereas others are more adapted to foraging in open habitats (Aldridge and Rautenbach 1987, Norberg and Rayner 1987). Northern long-eared bats and Indiana bats may readily utilize cluttered forests (Broders et al. 2004, Ford et al. 2005, Owen et al. 2003, Schirmacher et al. 2007.

Vegetation management and other habitat manipulation (e.g., the creation of water sources) can also be used to maximize insect (prey) availability for bats during spring emergence; the availability of such food resources in the general vicinity of hibernacula can be critically important to bats affected by WNS as they emerge in spring and attempt to restore body fat and repair tissue damage from WNS infection. In addition, within a forested landscape, vegetation management can provide edge habitat that is frequently used by bats for commuting and foraging, and can strongly influence both short- and long-term prey availability in a given area (Hayes and Loeb 2007).

Potential Impacts of Forest Management

The most direct influence of vegetation management on bat populations involves the creation or destruction of roost trees. While tree harvest can result in the loss of potential roost trees, adverse impacts can be avoided or minimized through a variety of management practices, including, but not limited to: conservation of riparian zones consistent with forest plans, leaving snags and other trees that have characteristics associated with known roost trees, and maintaining a basal area of potential roost trees across the landscape consistent with forest plans.

Conducting timber harvest activities outside the hibernation period could result in direct mortality or injury to NLEB by incidental felling of roost trees, particularly if non-volant bats are present. In areas of extensive intact forest, the likelihood that a given harvest will result in the loss of a maternity colony is small.

Other potential impacts include general equipment disturbance and noise associated with harvest activities, which are usually short in duration. In addition, management that results in alteration of microclimates (e.g., humidity and temperature) in and around roost sites (whether tree roosts, rock features, or structures) may expose bats to temperature or humidity extremes, causing death or site abandonment (Erdle and Hobson 2001).

Potential Benefits of Forest Management

Active forest management can also result in the creation, enhancement, and conservation of bat habitat over broad landscape areas. Vegetation management practices that sustain diversity in tree species, tree-size class, and snag-condition are important tools for providing diverse habitats for bats, particularly as fires and other historic disturbance regimes have been suppressed or altered. Because of the variable spatial and temporal habitat needs of bats (both within and across species), a heterogeneous landscape is advantageous even for forest interior ("clutter-adapted") species, assuming that the area is predominantly forest. In heavily forested landscapes, implementation of patch cuts, variable density thinning, and uneven-aged management prescriptions (e.g., group selection) can provide important habitat heterogeneity for bats, and may increase bat use relative to adjacent undisturbed forest (Hayes and Loeb 2007). Potential beneficial effects of vegetation management to NLEB include, but are not limited to: the creation of snags, canopy gaps with increased sun exposure to existing and potential roost trees, and foraging travel corridors; a reduction in understory clutter; and increased foraging opportunities (e.g., mobility and insect prey detection and foraging success). Within a broader forested landscape, silvicultural practices such as 2-aged harvests, shelterwood harvests, and single or group selection cuts should be compatible with NLEB management.

The use of silvicultural practices that allow for the retention of large-diameter snags and live trees along with regenerating forest, and the creation of additional snags through mechanical (e.g., girdling) or chemical (e.g., hack and squirt) means can provide potential habitat for NLEB, which can be especially important in areas where roost trees are a limiting factor (Lacki and Schwierjohann 2001). The presence of canopy gaps, whether man-made or natural, which allow sunlight and warmth to penetrate to roost trees, can be important in providing warm microclimates that maximize growth rates of the young (Johnson et al. 2009).

Vegetation management can affect foraging habitat for NLEB through both changes in the physical structure of the habitat and changes in prey abundance and availability. Provision of stands with both high and low levels of clutter (e.g., through creation of both even- and uneven-aged stands across the landscape), can offer suitable foraging habitat for NLEB. The effects of vegetation management on insect prey communities is varied and dependent on many factors, including management prescription, as well as a variety of landscape and climatic conditions that may vary both spatially and temporally. The high diversity of insect prey taxa and variation in response to vegetative treatments across differing landscapes and years precludes any broad-scale determination regarding the effect of vegetation management on prey populations. Some studies indicate that while regeneration cuts do result in a decrease in the abundance of Lepidopterans, the primary prey for many bat species, the use of selective harvest management practices does not result in significant alteration of these prey (Summerville and Crist 2002, Dodd et al. 2012). Despite this, studies in different geographic areas have consistently found an overall increase in bat activity in disturbed habitats (e.g., Brooks 2009, Loeb and O'Keefe 2011, Titchenell et al. 2011), suggesting that providing habitat structure that allows for more efficient foraging is more important than prey occurrence in determining spatial and temporal foraging patterns of forest bats (Morris et al. 2010, Dodd et al. 2012). In addition to terrestrial vegetation management, maintaining the integrity of riparian habitats in managed forests is often critical to NLEB conservation, because these riparian zones generally provide concentrated areas of roosting sites, water, and high-quality foraging habitats (Taylor 2006).

In addition to summer maternity and foraging habitat, vegetation management can affect spring staging and fall swarming habitat for NLEB and the integrity of the aboveground landscape for hibernacula and associated karst features. Fall swarming and spring staging habitat is generally

located in the immediate vicinity of hibernacula and provides essential habitat for bats in fall as they mate and put on body fat reserves in preparation for hibernation and when emerging in the spring in need of restoring body fat depleted during hibernation.

Fire Management

Fires ignited by lightning and Native Americans historically maintained a mosaic of forests, grasslands, savannas, and open woodlands throughout the eastern United States (Abrams 1992, Lorimer 2001). During the 20th century, fire suppression caused many forests that were previously open and park-like to succeed to dense closed-canopy forests where fire-adapted plant species were replaced by shade-tolerant and fire-sensitive vegetation (Lorimer 2001, Nowacki and Abrams 2008, Van Lear and Harlow 2002). It is assumed that bats adapted to fire across these landscapes over thousands of years of frequent fire. Fire may affect bats directly through heat, smoke, and carbon monoxide, or indirectly through modifications in habitat and changes in their food base (Dickinson et al. 2009).

Most tree-roosting bats switch roosts every 2-4 days (Lewis 1995); thus, an abundant supply of potential roost locations is needed to provide suitable roosting habitat within a forest stand. Bats roost under exfoliating bark, in hollow trees, and in small cavities of damaged or diseased trees (Ford et al. 2006, Lacki and Schwierjohann 2001, Perry and Thill 2007, 2008). Female maternity colonies are typically found in relatively tall trees with abundant solar exposure during summer (Brigham and Barclay 1996) where warmer roost temperatures promote fetal and juvenile growth (Speakman and Thomas 2003). Roosts in trees for both sexes combined average around 5-10 m above the ground (Lacki et al. 2009a, Menzel et al. 2002b, Perry and Thill 2008). However, males of some cavity- and bark-roosting species often roost in smaller snags or closer to the ground than females during summer (Broders and Forbes 2004, Lacki and Schwierjohann 2001, Perry and Thill 2007). For example, Perry and Thill (2007) found 21 percent of roosts of male northern long-eared bats were located in small (<10 cm diameter at breast height [d.b.h.]) midstory trees and snags during summer, whereas < 2 percent of female roosts were in these trees. Consequently, for some cavity- and bark-roosting species, males may be more susceptible than females to direct effects of fires during summer because of their closer proximity to the ground and thinner insulation provided by small diameter trees. Males may also enter torpor more frequently than reproductive females (Speakman and Thomas 2003), which could make arousal and escape from fire more difficult for males during cooler periods of summer.

Little is known of the direct effects of fire on cavity and bark roosting bats, and few studies have examined escape behaviors, direct mortality, or potential reductions in survival associated with effects of fire. Dickinson et al. (2009) monitored two northern long-eared bats (one male and one female) in roosts during a controlled summer burn. Both bats exited their roosts within 10 minutes of ignition near their roosts and flew in areas where the fire was not occurring. Among four bats they tracked before and after burning, all switched roosts during the fire, but no mortality was observed. Likewise, Rodrigue et al. (2001) reported flushing of a *Myotis* bat from an ignited snag during an April controlled burn in West Virginia.

Fire Effects on Cavity and Snag Dynamics

Age structure of stands and tree species affect snag dynamics. Natural disturbances such as insects, disease, wind and ice storms, lightning, drought, and wildfire all affect creation and destruction of snags. Snag densities are also affected by management prescriptions. Fire can affect the availability

of roosting substrate by creating or consuming snags. Although stand-replacing or intense wildfires may create large areas of snags, effects of multiple, low-intensity prescribed burning on snag dynamics may be difficult to predict, especially for forests consisting mostly of fire-adapted species. Low-intensity, ground-level fire may injure larger hardwood trees, creating avenues for pathogens such as fungi to enter and eventually form hollow cavities in otherwise healthy trees (Smith and Sutherland 2006). Fire may scar the base of trees, promoting the growth of basal cavities or hollowing of the bole in hardwoods (Nelson et al. 1933, Van Lear and Harlow 2002). Consequently, repeated burning could potentially create forest stands with abundant hollow trees. Trees located near down logs, snags, or slash may be more susceptible to damage or death, and aggregations of these fuels can create clusters of damaged trees or snags (Brose and Van Lear 1999, Smith and Sutherland 2006).

In stands with no recent history of fire, prescribed burns may initially create abundant snags by killing small trees of species that are not fire tolerant. Species with thin bark such as beech (*Fagus grandifolia*) and red maple (*Acer rubrum*), may suffer substantial damage or death. Furthermore, smaller-diameter trees are at greater risk from mortality due to fire (Brose and Van Lear 1999, Hare 1965, McCarthy and Sims 1935). Although burning often creates substantial numbers of small (< 15 cm d.b.h.) snags (Horton and Mannan 1988, Morrison and Raphael 1993, Stephens and Moghaddas 2005), effects on larger trees depends greatly on fire intensity, species of trees present, fuel loads, and past fire history. Bats often take advantage of fire-killed snags. Boyles and Aubrey (2006) found initial burning of forests after years of suppression created abundant snags, resulting in extensive use of these burned areas by evening bats for roosting. Similarly, Johnson et al. (2010) found that after burning, male Indiana bats roosted primarily in fire-killed maples. There is no reason to believe NLEB would respond differently.

Season of burning and topography also affect potential damage or death of overstory trees in hardwood stands. Winter burns tend to cause the least overstory damage because of cooler ambient temperatures and the dormant state of trees. Spring burns may cause the greatest damage to overstory trees because of higher ambient temperatures, sunlight on boles, and fully hydrated vascular tissues that may reach lethal temperatures when burned. Summer burns tend to be less damaging than spring burns, likely because of bole shading and lower intensity of fires (Brose and Van Lear 1999). Dry, upland sites on ridge tops and steep slopes tend to burn more intensely, and trees in these locations may be more susceptible to damage during fires.

Fire and Forest Structure for Roosting

Aside from creating snags, periodic prescribed burning may reduce the number of woody shrubs, understory trees, and midstory trees (10-25 cm d.b.h.) in the short term (Blake and Schuette 2000, Hutchinson et al. 2005). Longer-term applications of prescribed fire may reduce stand density (Hutchinson et al. 2005, Peterson and Reich 2001) and complexity (clutter). Repeated low-intensity fire reduces clutter in the midstory and understory and creates more open forests, which may provide more favorable roosting (and foraging) conditions for many bat species, especially females during the reproductive season. Studies often find roost trees (mostly female) further from other overstory trees and less canopy cover at roost sites compared to random locations (Kalcounis-Rüppell et al. 2005). Canopy gaps created by fire may provide favorable roosting sites with greater solar exposure during summer for maternity colonies of some cavity- and bark-roosting species (Johnson et al. 2009). Furthermore, maternity roosts may be located in areas with few midstory trees or relatively lower tree densities, which may provide both greater solar exposure and more open areas

immediately around and below roosts that would otherwise impede inexperienced juvenile flyers (Perry and Thill 2007). Thus, burned areas may have lower tree densities, less structural clutter, more open canopy, and greater numbers of snags, which may provide favorable roosting areas for many species.

Perry et al. (2007) found five of six species, including red bats, Seminole bats, northern long-eared bats, big brown bats, and evening bats roosted disproportionally in stands that were thinned and burned 1-4 years prior but that still retained large overstory trees. Boyles and Aubrey (2006) found evening bats used burned forest exclusively for roosting. Furthermore, Johnson et al. (2009) found northern long-eared bats, roost switching frequency, duration at roosts, and distance between successive roosts were similar between burned and unburned forests.

Caves and Mines

Little is known of the effects of fire on adjacent cave and mine habitats used by bats. Fire could alter vegetation surrounding entrances, which could potentially modify airflow (Carter et al. 2002, Richter et al. 1993). Smoke and noxious gases could enter caves, depending on air-flow characteristics of individual caves or mines and weather conditions such as temperature (Carter et al. 2002). Fire may not cause levels of gases high enough to be toxic to bats in caves or mines, but gases could potentially cause arousals during hibernation (Dickinson et al. 2009). Caviness (2003) noted smoke intrusion into hibernacula during winter burning in Missouri, but no arousal of hibernating bats was observed.

Fire and Insect Abundance

Fires may have indirect effects on insect production. In riparian areas, fires may increase nutrient delivery into streams and reduce canopy cover, which may increase water temperatures, all leading to increased productivity (Minshall et al.1997). Increases in emerging insects may result from this increased productivity (Malison and Baxter 2010, Minshall 2003), providing more food resources for bats. Malison and Baxter (2010) found streams in high severity burned areas had substantially greater insect emergence than streams in low severity burns or unburned areas, and bat activity in severe burn areas was substantially greater.

Moths are one of the most important insect groups in the diets of many eastern bat species. Although most larval caterpillars of moths feed on vegetation, adults either use nectar sources such as herbaceous flowers or do not feed as adults. Consequently, abundant and diverse herbaceous vegetation likely produces more food sources for those adults that feed. Restored woodlands subjected to periodic burning may produce substantially more nectar sources than mature unmanaged forests (Rudolph et al. 2006). In forests, caterpillars of most moth species feed on woody plants such as oaks (Summerville and Crist 2002). Early seral clearcut stands may be dominated by moth species whose caterpillars feed on tree species such as *Prunus* spp. and herbaceous vegetation, whereas mature forests may be dominated by species whose caterpillars feed on oaks, hickories, acorns, fungi, and lichens (Summerville and Crist 2002). Abundance and diversity of woody plants may be more important to moths than abundance and diversity of herbaceous vegetation in the understory. Lacki et al. (2009b) found a 22 percent increase in moth abundance the first year after burning in Kentucky, although the difference was not significant. In frequently burned pine woodlands of Arkansas, Thill et al. (2004) found moth abundance was

generally greater in forests managed using frequent fire compared to unburned controls, except for the first couple of months immediately following the burn.

Potential Affects of Fire on NLEB

Fire could have mixed effects on NLEB bat habitat. Fire could burn a suitable roost tree or weaken it to such an extent that it would fall shortly after. Also, a fire could burn off bark peeling from a roost, taking away preferred roosting locations on the tree. This would also make a roost tree suddenly become unsuitable for the NLEB. Because roost trees are ephemeral, bats are adapted to finding new roost trees should previous roosts be lost during the fire (personal communication O'Keefe). On the other hand, fire could kill some trees, creating new roosting habitat. Research has found that bats often take advantage of fire-killed snags (Perry 2012). Overall, fire may result in both the loss and the production of snags. Fire in any season that results in tree mortality may provide more benefit to NLEB through snag creation than any negative impacts that may occur. In the long term, fire may benefit NLEB bat habitat by reducing the threat of future severe fires. Removing fuel biomass will decrease the risk of major fire events within a stand, which would ensure the continued presence of suitable roosts and foraging habitat for the NLEB and other bats. In addition, the growth of remaining trees after prescribed fire may be promoted due to decreased competition with other vegetation.

NLEB's would likely not be harmed during a fire because they could fly away to avoid smoke and flames. In late spring and early summer, however, there is a possibility of direct mortality of nonvolant young, unless the mothers are able to carry their pups away from the fire (Luensmann 2005).

Looking at several studies Dickinson et al. (2009) examined bat responses to fire. Prescribed fires cause roost-switching behavior in tree-roosting bats that would reduce their exposure to smoke. Reproductive females are generally expected to maintain high body temperatures and, thus, be able to respond quickly to fires. However, use of torpor by pregnant female bats during spring storms has been demonstrated. Extensive use of torpor by roosting males and nonreproductive females would increase their risk of smoke exposure, though use of torpor and arousal times under typical burning conditions are unknown.

SUMMARY OF EFFECTS

Direct Effects: The direct effect of continuing to implement forest plans and associated projects could be direct mortality to NLEB, particularly non-volant young. If an unknown roost tree is cut or accidentally knocked down during harvest, non-volant young and potentially adults could be killed. Northern long-eared bats evolved with fire, so the likelihood of direct mortality from prescribed fire is extremely low, but not discountable. Non-volant NLEB may be killed from heat and toxic gases given off during prescribed burns. Adults have been shown to leave the area of the fire (Dickinson et al. 2009).

Indirect Effects: Indirect effects could be positive or negative. Negative effects could potentially occur during any tree cutting activity or prescribed burn through disturbance. The noise from equipment used in tree cutting or the heat and smoke generated burning prescribed fire could cause bats to flush, changing their roosting behavior. Potential beneficial effects could occur through improved habitat conditions across the landscape. Timber harvest and prescribed burning could

improve forest structure by creating canopy gaps, reducing stand density and midstory clutter. This should result in improved roosting and foraging habitat.

Cumulative Effects: Private and state land within the analysis area is predominantly forested and no change in reasonably foreseeable activities on private or state land is expected to occur. Therefore, no known cumulative effects to NLEB would occur.

Determination of Effect

The current level of management, along with existing Forest standards and guidelines as well as best management practices is likely to improve roosting and foraging habitat available for the northern long-eared bat. The Guidelines recognize that prescribed fire and certain forest management practices, such as those described in Forest Plans, can and do improve overall habitat conditions for NLEB and several other forest bat species. The Forest Service has taken proactive measures to protect hibernacula from the spread of WNS. The FS continues to implement adaptive forest management and prescribed fire activities as described in Forest Plans that are designed to minimize take of NLEB and other forest dependent species. Standards and guidelines have been adopted in Forest Plans, for among other reasons, to promote the conservation of listed species and to avoid and minimize potential adverse effects of projects implemented under the Forest Plans.

The presence of more than 700 million potential roost trees currently on the landscape, 43% of the forested lands classified as unsuitable for timber production providing long-term roosting habitat and implementation of conservation practices when conducting adaptive forest management in addition to the removal of less than 2% of the trees from the entire Forest Service landbase form the basis of our No Jeopardy Determination for the NLEB.

Because of the potential for the NLEB to occur in almost any type of habitat, during almost any time of the year, there is a small possibility of adverse effects resulting in take, a "may affect, likely to adversely affect" determination is made for the northern long-eared bat. Formal conferencing will be initiated so that a conference opinion can be obtained and converted to a biological opinion with incidental take upon the listing of NLEB. Incidental take issued should be equivalent to the treatments identified by forest in Appendix C.

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Appendix A

Summaries from 20 studies found in the literature that include specific roost tree (and random tree DBH data.

Label	Study	Location	N (bats)	Sex & reprod. condition	N (roost trees)	DBH (roost trees; cm) ± SE	DBH (random trees) ± SE	Comments
Br1	Broders 2003	New Brunswick, Can	6	females	55	43.8 ± 1.8	38.3 ± 1.9	More likely to roost in deciduous trees
Br2	Broders 2003	New Brunswick, Can	16	males	57	32 ± 1.6	27.2 ± 1.5	More likely to roost in coniferous trees
CF	Carter and Feldhamer (2005)	S. Illinois	10	adult females	19	37.3 ± 4.7	34.9 ± 2.2	
Cr	Cryan et al. 2001	S. Dakota		mixed females	21	39 ± 1.8	31.7 ± 2.3	
Fo1	Ford et al. 2006	West Virginia	3	males	6	16.6 ± 1.5		snags
Fo2	Ford et al. 2006	West Virginia	7	males	10	53.4 ± 6.3	25.9 ± 2.6	live
FK	Foster and Kurta (1999)	Michigan	12	mixed females	32	65 ± 1.0		
GB1	Garroway and Broders 2008	Nova Scotia, Can		pre/post-lactation	22	41 ± 3.2		
GB2	Garroway and Broders 2008	Nova Scotia, Can		lactation	22	43 ± 3.6		
Jo1	Johnson 2010	West Virginia	36 (total)	reprod females	27	24.3 ± 3.23	29.89 + 3.14	fire treatment
Jo2	Johnson 2010	West Virginia	36 (total)	reprod females	42	30.9 ± 2.64	29.65 + 2.03	control
Jo3	Johnson et al. 2012	West Virginia		reprod females	14	21.1 ± 1.55		fire - central node
Jo4	Johnson et al. 2012	West Virginia		reprod females	17	34.85 ± 5.16		conrol - central node
Ju1	Jung 2004	Ontario, Can	10	males	15	42.6 ± 3.8	28.1 ± 0.8	
Kr	Krynak 2010	Ohio	8	lactating females	21	55.8 ± 4.7		
LS1	Lacki and Schwierjohann (2001)	Kentucky	15 (total)	colony roosts	43	29.2 ± 3.51	8.31 ± 0.6	
LS2	Lacki and Schwierjohann (2001)	Kentucky	15 (total)	single roosts	14	12.2 ± 2.9	8.31 ± 0.6	
Me	Menzel et al. 2002	West Virginia	7	lact females	12	29.2 ± 1.6	34.7 ± 2.9	
PT1	Perry and Thill (2007)	Arkansas	17	adult males	34	15 ± 1.3		
PT2	Perry and Thill (2007)	Arkansas	23	mixed females	40	18.7 ± 1.0		
Lo1	Lowe 2012	Nova Scotia, Can	3	females (fall)	5	25.8 ± 3.5		
Lo2	Lowe 2012	Nova Scotia, Can	3	males (fall)	7	16.4 ± 2.7		
Ok1	Okeefe 2009	North Carolina	16	mixed males	35	31.9 ± 4.5	28.7 + 2.4	
Ok2	Okeefe 2009	North Carolina	18	mixed females	33	45.6 ± 4.3	29.7 + 2.7	
Ow	Owen et al 2002	West Virginia	20	pregnant females	43	27.2 ± 1.0	31.1 ± 1.4	roost dbh smaller than random, but random trees limited to snags or trees with a cavity or exfoliating bark; roosts were not sign. dif than all trees in the plot
SP	Sasse and Pekins (1996)	New Hampshire	26	mixed	47	40.9 ± 2.8	33 ± 1.0	Only 1 roost tree out of 47 was < 5" dbh
Sc	Schultes 2002	Ohio	7	mixed	21	24.0 ± 3.7	19.2 ± 3.7	Of 21 trees, 4 live trees (and 4 snags) were < 5" dbh
Si	Silvis et al. 2012	Kentucky	18	adult females	105	30.19 ± 1.8		
Ti	Timpone et al. 2010	NE Missouri	13	mixed	39	43 ± 2.3		

Appendix B

Definition of Proposed Treatments and Summary of Proposed Treatments

Clearcutting: A type of even-aged management. The cutting of essentially all trees, producing a fully exposed microclimate for the development of a new age class. Cutting may be done in groups or patches.

Clearing-Non-timber Related: Removal of selected trees for the purpose of clearing areas for non-timber related projects. Most often, this type of activity is small, generally less than 5 acres and does not happen frequently. Some examples may be activities such clearing for special use permits, gas well pads or clearing for wildlife opening or pond development.

Commercial Thinning: Any type of thinning producing merchantable material at least equal to the value of the direct costs of harvesting.

Even-aged Management (EAM): Management of stands of trees composed of a single age class in which the range of tree ages are usually $\pm$ 20 percent of rotation.

Firewood Cutting: Cutting or removal of dead trees along roads, for firewood. Most often, trees are for sold for personal uses although occasionally local timber operators may purchase the dead trees for commercial use via salvage harvest. This treatment can occur year round but generally occurs from October through March.

Group Selection: A type of uneven-aged management. Trees are removed and new age classes are established in small groups.

Mechanical Fuels Reduction: A type of cutting or thinning with mechanized equipment such as a carrier-mounted shear or a feller-buncher instead of by hand with a power saw. The primary purpose of this treatment is to reduce the likelihood of ignition or to lesson potential damage and resistance to control. To reduce the risk of potential catastrophic wildfires.

Prescribed Burn (RX Burn): To deliberately burn wildland fuels in either their natural or their modified state and under specified environmental conditions, which allows the fire to be confined to a predetermined area and produces the fireline intensity and rate of spread required to attain planned resource management objectives (aka-controlled burn, prescribed fire). Types of prescribed burns include:

- **Prescribed Managed Fire:** A fire ignited by management to meet specific objectives.
- **Prescribed Natural Fire:** A naturally ignited wildland fire that burns under specified conditions where the fire is confined to a predetermined area and produces the fire behavior and fire characteristics to attain planned fire treatment and resource management objectives.

Regeneration: 1.) The established progeny from a parent plant (ecology definition). 2.) Seedlings or saplings existing in a stand. 3.) The act of renewing tree cover by establishing young trees naturally or artificially (silviculture definitions).

Regeneration Cutting: Any removal of trees intended to assist regeneration already present or to make regeneration possible (aka-regeneration felling).

Regeneration Method: A cutting procedure by which a new age class is created; the major methods are clearcutting, seed tree, shelterwood, selection, and coppice. Regeneration methods are grouped into four categories:

- **Coppice Methods:** Method that achieves the majority of regeneration from stump sprouts or root suckers.
- **Even-Aged Methods:** Regenerate and maintain a stand with a single age class.
- **Two-Aged Methods:** Regenerate and maintain stands with two age classes.
- **Un-even Aged (Selection) Methods:** Regenerate and maintain a multi-aged structure by removing some trees in all size classes either singly, in small groups or in strips.

Release (Release Operations): A treatment designed to free young trees from undesirable, usually overtopping, competing vegetation.

Road Construction: For purpose of this BA, road construction can include construction, maintenance or reconstruction or decommissioning. Any of these activities have the potential to remove trees. General road management direction on the Forests is to expand the use of existing corridors (reconstruction) rather than to establish new roadways (construction). Construction involves removal and clearing of a corridor in a new area. Reconstruction can entail removing some trees to expand or widen an area. Maintenance generally does not require tree removal with the exception of a hazard tree that may fall across the road. Decommissioning primarily involves the closure of an existing road through a closure (usually a gate or berm), but can involve scattered tree felling to discourage road use.

Salvage Cutting: The removal of dead trees or trees damaged or dying because of injurious agents other than competition, to recover economic value that would otherwise be lost (aka-salvage felling, salvage logging, salvage sale). Can also be used for immediate public safety concerns near roads, trails and recreation areas.

Sanitation Cutting: The removal of trees to improve stand health by stopping or reducing the actual or anticipated spread of insects and disease.

Seed Tree: A type of even-aged management. The cutting of all trees except for a small number of widely dispersed trees retained for seed production and to produce a new age class in fully exposed microenvironment.

Shelterwood: A type of even-aged management. The cutting of most trees, leaving those needed to produce sufficient shade to produce a new age class in a moderated microenvironment.

Single Tree Selection: A type of uneven-aged management. Individual trees of all size classes are removed more or less uniformly throughout the stand, to promote growth of remaining trees for regeneration (aka-individual tree selection).

Stand: A contiguous group of similar plants (ecology definition).
A contiguous group of trees sufficiently uniform in age-class distribution, composition, and structure, and growing on a site of sufficiently uniform quality, to be a distinguishable unit (silviculture definition).

Thinning: A cultural treatment made to reduce stand density of trees primarily to improve growth, enhance forest health, or recover potential mortality; types of thinning include the following:

- **Chemical Thinning:** The killing of unwanted trees by using an herbicide.
- **Crown Thinning:** The removal of trees from the dominant or codominant crown classes in order to favor the best trees of those same crown classes (aka-thinning from above, high thinning).
- **Free Thinning:** The removal of trees to control stand spacing and favor desired trees, using a combination of thinning criteria without regard to crown position.
- **Low Thinning:** The removal of trees from the lower crown classes to favor those in the upper crown classes (aka-thinning from below).
- **Mechanical Thinning:** The thinning of trees in either even- or uneven-aged stands, involving the removal of trees in rows, strips, or by using fixed spacing intervals (aka-geometric thinning).
- **Selection Thinning:** The removal of trees in the dominant crown class in order to favor the lower crown classes (aka-dominant thinning).

Some examples of thinning could be recreation site maintenance, cutting trees around a lake or along a stream for fisheries habitat or general landscape thinning of overstocked conditions in even or uneven-aged managed forests.

Timber Harvest: The removal of timber through different types of treatments. The removal may be commercial and offered through a competitive bid process to achieve objectives including stand regeneration for forest health and wildlife habitat improvement.

Timber Stand Improvement (TSI): An intermediate treatment made to improve the composition, structure, condition, health and growth of even or uneven-aged stands**. A** few examples of TSI can be removal of kudzu or grapevines, non-native invasive species control or manipulating tree species composition and/or density.

Trail Construction: For purpose of this BA, trail construction can include construction, maintenance, reconstruction or decommissioning. Any of these activities have the potential to remove trees. Trail construction is the clearing of an area for recreational purposes, most often no wider than the width of a vehicle. However, some construction can be, for example, for walking trails, etc. which are not as wide. General trail reconstruction can entail removing some trees to expand or widen an area. Maintenance generally does not require tree removal with the exception of a hazard trees that may fall across the trail or pose a safety risk to the public. Decommissioning primarily involves the closure of an existing trail through a closure (usually a gate or berm), but can involve scattered tree felling to discourage trail use.

Un-even aged Management (UAM): Management of stands of trees of three or more distinct age classes, either intimately mixed or in small groups.

Wildland: Land other than that dedicated for other uses such as agricultural, urban, mining or parks.

Wildlife Stand Improvement (WSI): An intermediate treatment made to improve the composition, structure, condition, health and growth of even or uneven-aged stands to promote improved habitat for wildlife species. Some examples of treatments may include removing selected trees to allow more space and sunlight to reach mast producing trees, invasive species control, placement of grouse drumming logs or placement of logs for amphibian habitat.

Summary of Projected Treatments

Appendix B

Prescribed Burning

Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	2,000	18,000
Jefferson	1,500	13,500
Nantahala-Pisgah	1,000	15,000
Uwharrie	700	5,800
Croatan	4,200	25,800
Daniel Boone	3,000	47,000
Land Between the Lakes	4,000	23,000
Cherokee	10,000	21,500
Sumter	NA	5,000
Chattahochee-Oconee	5,000	50,000
Alabama	8,500	99,500
Mississippi	75,372	175,868
Kisatchie	41,250	123,750
Ouachita	25,000	225,000
Ozark-St Francis	25,000	95,000
Totals (Acres)	**206,522**	**943,718**
% of Total Potential Acres	**1.80%**	**8.21%**

Thinning

Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	1,291	1,115
Jefferson	969	781
Nantahala-Pisgah	445	1,155
Uwharrie	140	360
Croatan	291	1,234
Daniel Boone	7,500	7,500
Land Between the Lakes	300	300
Cherokee	1,781	687
Sumter	100	200
Chattahochee-Oconee	3,455	10,365
Alabama	2,700	5,950
Mississippi	4,476	10,444
Kisatchie	5,481	16,442
Ouachita	11,600	36,570
Ozark-St Francis	7,200	13,100
Totals (Acres)	**47,729**	**106,203**
% of Total Potential Acres	**0.42%**	**0.92%**

Even-aged Management		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	1,770	1,180
Jefferson	942	628
Nantahala-Pisgah	445	1,155
Uwharrie	85	220
Croatan	225	800
Daniel Boone	1,330	1,343
Land Between the Lakes	600	600
Cherokee	800	1,400
Sumter	850	450
Chattahochee-Oconee	310	1,200
Alabama	1,375	3,025
Mississippi	1,009	1,514
Kisatchie	476	1,400
Ouachita	1,840	7,360
Ozark-St Francis	1,083	4,119
Totals (Acres)	**13,140**	**26,394**
% of Total Potential Acres	**0.11%**	**0.23%**

Uneven-aged Management		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	30	20
Jefferson	24	16
Nantahala-Pisgah	167	433
Uwharrie	--	--
Croatan	--	--
Daniel Boone	100	200
Land Between the Lakes	250	250
Cherokee	300	350
Sumter	60	120
Chattahochee-Oconee	600	1,000
Alabama	0	0
Mississippi	2	18
Kisatchie	58	174
Ouachita	2,500	10,000
Ozark-St Francis	21	77
Totals (Acres)	**4,112**	**12,658**
% of Total Potential Acres	**0.04%**	**0.11%**

Salvage/Sanitation (Routine)		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	0	0
Jefferson	0	0
Nantahala-Pisgah	70	180
Uwharrie	30	70
Croatan	55	195
Daniel Booone	750	750
Land Between the Lakes	350	400
Cherokee	19	6
Sumter	100	100
Chattahochee-Oconee	100	300
Alabama	310	995
Mississippi	100	900
Kisatchie	50	50
Ouachita	1,200	2,800
Ozark-St Francis	509	1,931
Totals (Acres)	**3,643**	**8,677**
% of Total Potential Acres	**0.03%**	**0.08%**

Trail Construction		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	1	2
Jefferson	5	14
Nantahala-Pisgah	488	1,834
Uwharrie	32	120
Croatan	50	165
Daniel Boone	140	140
Land Between the Lakes	20	200
Cherokee	4	4
Sumter	NA	NA
Chattahochee-Oconee	7	50
Alabama	2	4
Mississippi	1	4
Kisatchie	60	180
Ouachita	82	191
Ozark-St Francis	288	1,632
Totals (Acres)	**1,179**	**4,540**
% of Total Potential Acres	**0.01%**	**0.04%**

Clearing-Non-Timber		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	37	37
Jefferson	28	28
Nantahala-Pisgah	7	18
Uwharrie	4	11
Croatan	3	12
Daniel Boone	925	925
Land Between the Lakes	15	50
Cherokee	92	92
Sumter	NA	NA
Chattahochee-Oconee	5	15
Alabama	10	34
Mississippi	2	18
Kisatchie	19	57
Ouachita	132	393
Ozark-St Francis	1,563	5,937
Totals (Acres)	**2,842**	**7,627**
% of Total Potential Acres	**0.02%**	**0.07%**

Road Construction		
Forests	Acres (Nonvolant Period)	Acres (Volant Period)
George Washington	2	2
Jefferson	13	9
Nantahala-Pisgah	1,806	4,645
Uwharrie	69	177
Croatan	178	669
Daniel Boone	258	258
Land Between the Lakes	100	250
Cherokee	5	5
Sumter	NA	NA
Chattahochee-Oconee	30	110
Alabama	12	22
Mississippi	18	55
Kisatchie	361	1,082
Ouachita	44	132
Ozark-St Francis	1,023	2,148
Totals (Acres)	**3,919**	**9,563**
% of Total Potential Acres	**0.03%**	**0.08%**

Summary-All Treatments		
Forests	Tot Acres (Nonvolant Period)	Tot Acres (Volant Period)
George Washington	5,131	20,356
Jefferson	3,480	14,975
Nantahala-Pisgah	4,428	24,420
Uwharrie	1,060	6,758
Croatan	5,002	28,875
Daniel Boone	14,003	58,116
Land Between the Lakes	5,635	25,050
Cherokee	13,001	24,044
Sumter	1,110	5,870
Chattahochee-Oconee	9,507	63,040
Alabama	12,909	109,530
Mississippi	80,980	188,821
Kisatchie	47,755	143,135
Ouachita	42,398	282,446
Ozark-St Francis	36,687	123,944
Totals (Acres)	**283,086**	**1,119,379**
% of Total Potential Acres	**2.46%**	**9.73%**

Appendix C
Individual forest design criteria.

2014 George Washington NF Forest Plan Direction

Land Allocation Strategy and suitability

Land Allocation of Management Prescription Areas, as mapped hierarchically

Code	Management Prescription Area Description	Rx Map Acres*
1A	Designated Wilderness	43,000
1B	Recommended Wilderness Study Areas	27,000
2C2	Eligible Wild and Scenic Rivers-Scenic	2,000
2C3	Eligible Wild and Scenic Rivers-Recreation	4,000
4A	Appalachian National Scenic Trail Corridor	9,000
4B1	Research Natural Areas (actual 3,900 acres)	2,000
4C1	Geologic Areas	3,000
4D	Special Biological Areas (actual 63,000 acres)	53,000
4D1	Key Natural Heritage Community Areas	3,000
4E	Cultural Areas	<100
4F	Mount Pleasant National Scenic Area	8,000
4FA	Shenandoah Mountain Recommended National Scenic Area	67,000
5A	Administrative Sites	<100
5B	Communication Sites	<100
5C	Utility Corridors	7,000
7A1	Scenic Byways	5,000
7B	Scenic Corridors and Viewsheds	34,000
7C	ATV Use Areas	10,000
7D	Concentrated Recreation Zones	1,000
7E1	Dispersed Recreation Areas – Unsuitable for Timber Production	24,000
7E2	Dispersed Recreation Areas – Suitable for Timber Production	4,000
7F	Blue Ridge Parkway Corridor	4,000
7G	Pastoral Landscapes	4,000
8E4a	Indiana Bat-Primary Conservation Areas	2,000
8E4b	Indiana Bat-Secondary Conservation Areas	14,000
8E7	Shenandoah Mtn Crest-Cow Knob Salamander (actual 58,000 acres)	24,000
11	Riparian Corridors (actual 51,000 acres)	Not mapped

Code	Management Prescription Area Description	Rx Map Acres*
12D	Remote Backcountry Areas	201,000
13	Mosaics of Habitat Areas	508,000
	Water – Lake Moomaw	2,500
Total Acres		1,066,000

Lands Suitable for Key Activities

Management Prescription Area		Timber Production	Timber Harvest for Other Resource Objective	Salvage	Permanent Road Construction	Temporary Road Construction
1A	Designated Wilderness	No	No	No	No	No
1B	Recommended Wilderness Study Areas	No	No	No	No	No
2C2	Eligible Scenic River Corridors	No	No	No	No	No
2C3	Eligible Recreation River Corridors	No	Yes	Yes	Yes	Yes
4A	Appalachian Trail Corridor	No	Limited	No	Limited	Limited
4B	Research Natural Areas	No	No	No	No	No
4C1	Geologic Areas	No	No	Limited	No	No
4D	Special Biological Areas	No	Limited	Limited	Limited	Limited
4D1	Key Natural Heritage Community Areas	No	Limited	Limited	Limited	Limited
4E	Cultural/Heritage Areas	No	Limited	Yes	Limited	No
4F	Mt Pleasant National Scenic Area	No	No	No	No	No
4FA	Shenandoah Mountain Recommended National Scenic Area	No	No	No	No	No
5A	Administrative Sites	No	Limited	Yes	Yes	Yes
5B	Communication Sites	No	Limited	Yes	Yes	Yes
5C	Utility Corridors	No	Limited	Yes	Yes	Yes
7A1	Highlands Scenic Tour Byway	Yes	Yes	Yes	Yes	Yes
7B	Scenic Corridor and Viewsheds	Limited	Yes	Yes	Yes	Yes

Management Prescription Area		Timber Production	Timber Harvest for Other Resource Objective	Salvage	Permanent Road Construction	Temporary Road Construction
7C	**All-Terrain Vehicle Areas**	Yes	Yes	Yes	Yes	Yes
7D	**Concentrated Recreation Zones**	No	Limited	Yes	Yes	Yes
7E1	**Dispersed Recreation-Unsuitable for Timber Production**	No	Yes	Yes	Yes	Yes
7E2	**Dispersed Recreation-Suitable for Timber Production**	Yes	Yes	Yes	Yes	Yes
7F	**Blue Ridge Parkway Corridor**	Limited	Yes	Yes	Yes	Yes
7G	**Pastoral Landscapes and Rangelands**	No	Yes	Yes	Yes	Yes
8E4a	**Indiana Bat Primary Protection Areas**	No	No	No	No	No
8E4b	**Indiana Bat Secondary Protection Areas**	Yes	Yes	Yes	Yes	Yes
8E7	**Shenandoah Mtn Crest - Cow Knob Salamander**	No	No	Limited	No	No
11	**Riparian Areas and Corridors**	Limited	Yes	Limited	Limited	Limited
12D	**Remote Backcountry Areas**	No	No	No	No	No
13	**Mosaics of Habitat Areas**	Yes	Yes	Yes	Yes	Yes

Wind Energy Development (Utility-scale)

The following Management Prescription Areas are not suitable for consideration of wind energy development:

- Designated Wilderness (1A)
- Recommended Wilderness Study Areas (1B)
- Eligible Scenic River Corridors (2C2)
- Eligible Recreation River Corridors (2C3)
- Appalachian Trail Corridor (4A)
- Research Natural Areas (4B)
- Geologic Areas (4C1)
- Special Biological Areas (4D)
- Key Natural Heritage Community Areas (4D1)
- Cultural Areas (4E)
- Mount Pleasant National Scenic Area (4F)
- Shenandoah Mountain Recommended National Scenic Area (4FA)
- Scenic Corridors and Viewsheds (7B)
- Developed Recreation Areas (7D)
- Blue Ridge Parkway Scenic Corridor (7F)
- Indiana Bat Protection Areas (8E4a, 8E4b)
- Shenandoah Mountain Crest – Cow Knob Salamander Area (8E7)
- Remote Backcountry Areas (12D)

DESIGN CRITERIA
FORESTWIDE STANDARDS

Ecological and Species Diversity

FW-35 Retain soft mast producing species (dogwood, black gum, hawthorne, grapes, serviceberry, etc.) during vegetation management treatments when consistent with overall regeneration and species composition objectives.

FW-36 Favor the retention of large (>20" dbh) standing snags and den trees when implementing silvicultural treatments. Active bear den trees are retained in harvest areas along with an unharvested buffer of at least 100 feet wide on all sides of the den.

Threatened, Endangered and Sensitive Species Management

FW-37 Maintain records of locations and conditions of federally listed threatened and endangered species and of Regional Forester's sensitive species within the planning area.

FW-38 Control non-native invasive species where they are causing negative effects to threatened, endangered, or sensitive species. Do not intentionally introduce non-native species that are known or suspected of causing negative effects to federally-listed threatened and endangered species in or near sites supporting these species.

FW-39 Do not issue permits for collection of threatened, endangered, sensitive, and locally rare species, except for approved scientific purposes.

Virginia Big-Eared Bat Management

FW-46 See standards related to Caves.

Indiana Bat Management

FW-47 Each Indiana bat hibernaculum has a primary and secondary cave protection area managed according to Management Prescription Area 8E4. If additional hibernacula are found, the desired condition and standards of Management Prescription Area 8E4 apply until an environmental analysis to consider amendment to the Forest Plan is completed.

FW-48 In order to promote potential summer roost trees and maternity sites for the Indiana bat throughout the Forest, planned silvicultural practices in hardwood-dominated forest types will leave all shagbark hickory trees greater than 6 inches diameter at breast height (dbh), except when they pose a safety hazard. In addition:

- Clearcut openings 10 to 25 acres in size will also retain a minimum average of 6 snags or cavity trees per acre, 9 inches dbh or larger, scattered or clumped.
- Group selection openings and clearcuts less than 10 acres in size have no provision for retention of a minimum number of snags, cavity trees, or residual basal area due the small opening size and safety concerns.
- All other harvesting methods (and clearcut openings 26-40 acres in size) will retain a minimum residual 15 square feet of basal area per acre (including 6 snags or cavity trees)

scattered or clumped. Residual trees are greater than 6 inches dbh with priority given to the largest available trees, which exhibit characteristics favored as roost trees by Indiana bats.

FW-49 To insure a continuous supply of roost trees and foraging habitat, the following forestwide conditions must be maintained:

- Minimum of 60% of the combined acreage of all FSVEG Forest Types on the Forest will be maintained over 70 years of age; AND
- Minimum of 40% of the combined acreage of all FSVEG Forest Types 53 (white oak, red oak, hickory) and 56 (yellow poplar, white oak, red oak) will be maintained at an age greater than 80 years old.

FW-50 When active roost trees are identified on the Forest, they will be protected with a ¼ mile buffer surrounding them. This protective buffer remains until such time the trees and associated area no longer serve as a roost (e.g. loss of exfoliating bark or cavities, blown down, or decay).

FW-51 No disturbance that will result in the potential taking of an Indiana bat will occur within an active roost tree buffer.

- Commercial timber harvesting, road construction, and use of the insecticide diflubenzuron (Dimilin) are prohibited.
- Prescribed burning, timber cutting, road maintenance, and integrated pest management using biological or species-specific controls during non-roosting season are allowed, following project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.
- Other activities within this buffer are allowed following determination that they will not result in a potential taking of an Indiana bat.

FW-52 Removal of known Indiana bat active roost trees will be avoided, except as specified in the next two standards.

FW-53 If during project implementation, active roost trees are identified, all project activity will cease within a ¼ mile buffer around the roost tree until consultation with U.S. Fish and Wildlife Service is completed to determine whether project activities can resume.

FW-54 In the event that it becomes absolutely necessary to remove a known Indiana bat active roost tree, such a removal will be conducted during the time period when the bats are likely to be in hibernation (November 15 through March 31), through informal consultation with the U.S. Fish and Wildlife Service. Trees identified as immediate threats to public safety may be removed when bats are not hibernating; however, informal consultation with U.S. Fish and Wildlife Service is still required. Examples of immediate threats to public safety include trees leaning over a trail, public road or powerline that could fall at any time due to decay or damage.

FW-55 Prescribed burning is allowed to maintain flight and foraging corridors in upland and riparian areas potentially used by bats in the summer. To avoid injury to non-flying young Indiana bats, prescribed burning within 2.5 miles of known active maternity roosting sites between June 1 and August 1 is prohibited.

FW-56 Opportunities should be sought to include creation of drinking water sources for bats in project plans, where appropriate, in areas where no reliable sources of drinking water are available. Opportunities will be considered when the creation is not detrimental to other wetland-dependent species (i.e., damage to natural springs and seeps).

FW-57 If active maternity roost sites are identified on the Forest, they will be protected with a 2.5-mile buffer defined by the maternity roost, alternate roost sites, and adjacent foraging areas.

FW-58 No disturbance that will result in the potential taking of an Indiana bat will occur within this active maternity roost site buffer.

- Commercial timber harvesting, road construction, and use of all insecticides (are prohibited.
- All other activities within this buffer will be evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats, through informal consultation with the U.S. Fish and Wildlife Service.

FW-59 If during project implementation, active maternity roost sites are identified, all project activity will cease within a 2.5-mile buffer around the maternity roost until consultation with U.S. Fish and Wildlife Service is completed to determine whether project activities can resume.

FW-60 Monitoring of timber sales and other activities will be implemented as follows:

- Timber sale administrators or biologists will conduct and report normal inspections of all timber sales to ensure that measures to protect the Indiana bat have been implemented. Timber sale administrators will conduct normal inspections of all timber sales to administer provisions for protecting residual trees not designated for cutting under provisions of the timber sale contract. Unnecessary damage to residual trees will be documented in sale inspection reports and proper contractual or legal remedies will be taken. The Forest will include this information in their annual monitoring reports and make available to the U.S. Fish and Wildlife Service, if requested.
- Informal consultations among the U.S. Fish and Wildlife Service and the Forest will occur as needed in order to review and determine any need to modify provisions of the biological opinion, and other issues regarding the Indiana bat.

FW-61 Where appropriate, training should be conducted for employees regarding bats in the national forests. Training should include sections on bat identification, biology, habitat requirements, and sampling techniques.

FW-62 Develop informational and educational displays about bats to inform the public about this misunderstood group of mammals.

Species Diversity

Species within in the Species Groups highlighted below are identified in the Species Diversity Report (FEIS Appendix F).

FW-65 When land disturbing projects are proposed in cliff, talus and large rock outcrop areas: a) identified species associated with the Cliff, Talus and Rock Outcrop Species Group will be searched for; and b) effects of the proposed project on these species will be evaluated.

FW-66 When land disturbing projects are proposed in areas where members of the Lepidopteran Species Group occur: a) the area where the species occurs and adjacent habitat will not be treated with Dimilin, BT or other insecticides that kill lepidopterans other than gypsy moth; and b) the entire area where the species occurs will not be part of a single prescribed burn; burning will be done only in patches of the occupied habitat.

Caves

FW-71 A minimum of 200 foot buffers are maintained around cave entrances and around areas known to open into a cave's drainage system like sinkholes, and cave collapse areas. There are no soil-

disturbing activities or harvest of trees within this buffer. Wider buffers are identified through site-specific analysis when necessary to protect caves from potential subterranean and surface impacts.

FW-72 The use of caves for disposal sites or the alteration of cave entrances is prohibited except for the construction of cave gates or similar structures to ensure closure.

FW-73 Management activities within any area draining into a cave are limited if they may affect the cave ecosystem through sedimentation, soil sterilization, the addition of nutrients or other chemicals (including pesticides and fertilizers), or if they change the cave's natural hydrology or micro-climate.

FW-74 Post and enforce seasonal closure orders around entrances of caves and abandoned mines occupied by significant populations of bats, to reduce the frequency and degree of human intrusion. Prohibit camping and campfires at the entrance to caves, mines, and rock shelters used by bats.

FW-75 If such closure orders are found to be ineffective, construct and maintain gates or other structures that allow for entrance and egress by bats. If necessary to further discourage human disturbance to caves occupied by significant populations of bats, close non-essential public access routes controlled by the Forest Service within ¼ mile of cave entrances during periods of use by bats.

FW-76 Human access to caves for educational and recreation use may be allowed during periods when bats are not present. If damage to a cave occurs as a result of such use, close the cave. Allow human access (i.e. scientific study) on a case-by-case basis when bats are present.

FW-77 The specific location of a Significant Cave (as defined in the Cave Resources Protection Act) cannot be made available to the public unless it is determined that disclosure of this information would not create a substantial risk of harm, theft, or destruction of the cave. Significant and potentially significant caves on the Forest are managed in accordance with the Cave Resources Protection Act of 1988 (16 U.S.C. 4301-4309) to protect them through regulating their use, requiring permits for removal of their resources, and prohibiting destructive acts.

MANAGEMENT PRESCRIPTION AREAS

8E4 - INDIANA BAT HIBERNACULA PROTECTION AREAS

These areas are located around caves that are known to contain the Indiana bat (*Myotis sodalis*), a federally listed endangered species that occurs in several locations across western Virginia, where it is near the eastern edge of its global range. There are approximately 16,000 acres allocated to this management prescription area.

These Indiana bat "hibernacula" areas are divided into two areas: the Primary Cave Protection Area and the Secondary Cave Protection Area. A primary cave protection area consists of a radius of no less than one-half mile around each hibernaculum, defined by National Forest surface ownership and topography. This area is intended to protect the integrity of the cave and the immediate surrounding uplands where bats swarm and forage in the fall. A secondary cave protection area consists of a radius of approximately 1.5 miles around each primary cave protection area, defined by easily recognizable features on the ground. This area is designed to further maintain and enhance swarming, foraging, and roosting habitat. (Please note that the term "hibernacula" refers to caves in which bats hibernate and is used interchangeably with caves throughout this document. The singular form is hibernaculum.)

Indiana bats are known to be hibernating in four caves located on or near the George Washington National Forest. These prescription areas are intended to contribute to the goals of reversing population declines and reestablishing healthy populations of Indiana bats across the eastern United States. Management is based on the guidelines of the Indiana Bat Recovery Strategy for the George Washington and Jefferson National Forests (April, 1997).

Management activities are designed to: 1) protect hibernacula (caves in which the bats spend the winter); 2) maintain and enhance upland and riparian swarming and foraging areas; and 3) identify and protect summer roosting and maternity site habitat. The proposed conservation measures identified in the Indiana Bat Recovery Strategy for the protection and promotion of habitat for Indiana bats on the George Washington National Forest are applied at three scales:

1) A **primary cave protection area** as consisting of a radius of no less than one half mile around each hibernaculum, defined by national forest surface ownership and topography. This area is intended to protect the integrity of the cave and the immediate surrounding uplands where bats may swarm and forage in the fall.

2) A **secondary cave protection area** as consisting of a radius of approximately 1.5 miles around each primary cave protection area, defined by easily recognizable features on the ground. This area is designed to further maintain and enhance swarming, foraging, and roosting habitat.

3) Because Indiana bats are known to travel over 200 miles between winter and summer habitats, standards are also applied to the George Washington National Forest as a whole. These can be found specifically in the Chapter 2-Forestwide Direction, Indiana Bat Management. These standards are designed to protect foraging areas; non-cave associated roosts and maternity sites, if any are discovered on the Forest.

8E4a - Indiana Bat Primary Cave Protection Areas

Emphasis

Within this prescription area, habitats are managed to maintain, restore, and enhance Indiana bat populations. Management of the primary cave protection area is focused on protecting the watershed of the cave along with maintaining and enhancing the surrounding environment where bats swarm, forage, and roost. Timber harvest is not appropriate within this prescription area. There are approximately 2,000 acres within primary cave protection areas.

Desired Conditions for 8E4a - Indiana Bat Primary Cave Protection Areas

DC 8E4a-01: This prescription area includes caves known to contain the Indiana bat, as well as the primary cave protection areas surrounding these hibernacula. Indiana bat hibernacula maintain winter temperatures between 39^{o} and 50^{o} F, and relative humidity above 54%. The hydrologic functioning, atmospheric conditions, and structural integrity of these caves are maintained. The ability of bats to enter, exit and move within hibernacula is unhampered. At a minimum, they are free from human disturbance from September 1 until June 1, when bats are hibernating and swarming. It is a long-term goal to acquire lands surrounding caves within the Forest's proclamation boundary that are known to contain the Indiana bat.

DC 8E4a-02: The landscapes of these areas predominately feature a structurally diverse older aged forest community with an open forested canopy. Grazed pastures are maintained and open woodlands may be restored through prescribed fire or wildfire management. These types of open habitats provide direct sunlight to roost trees and abundant Indiana bat prey. Cavity trees, cull trees, standing dead trees, storm

and fire damaged live trees, and down logs are common throughout the area. Active roost trees are identified and protected from disturbance.

DC 8E4a-03: At least six roost trees that retain slabs of exfoliating bark, greater than nine inches in diameter, with at least some daily exposure to sunlight are provided per acre. Indiana bat movement and flight paths are not restricted by dense understory vegetation. Indiana bat prey, such as flying insects, is abundant in terms of both numbers of individuals and diversity of species.

DC 8E4a-04: Natural processes eventually result in large patches of late successional to old growth forests. Activities to benefit bat habitat are limited to management of forest visitors, prescribed fire, wild fire, domestic livestock grazing, selected non-commercial tree cutting, and integrated pest management to control non-native invasive species like gypsy moth and autumn olive. Gaps may occur naturally or purposefully to increase sunlight exposure on selected roost trees. No activities which could lead to disruption of the cave environment or the taking of an Indiana bat occur in this area.

DC 8E4a-05: Insects and diseases play a natural role in shaping future plant and animal species composition and successional stages across these areas; however, non-native vegetation occurs only as transients and is not self-perpetuating. Biological or species-specific pesticide controls of gypsy moth, hemlock woolly adelgid, and other non-native species are permitted with full consideration of the effects on the Indiana bat, their habitat, and their prey. Timber harvest and pesticide controls may be implemented to aid in the study of effects of non-native pests on the Indiana bat.

DC 8E4a-06: Drinking water sources are available in created upland or ridgetop ponds. Ponds typically adjoin mature forest and most have a flight corridor, such as a pasture, road or wildlife linear strip, leading into them. Existing wildlife openings may be maintained. Aside from Indiana bats, wildlife species associated with mid- to late-successional deciduous forest habitats that are expected to inhabit this area include: hooded warbler, southern pigmy shrew; whip-poor-will; least weasel, downy woodpecker; eastern gray squirrel; and orchard oriole. Because the landscapes in which this prescription lies, including private lands, are over 70% forest cover, one could also expect to find area-sensitive mid- to late-successional forest species including: ovenbird, cerulean warbler, black-billed cuckoo, and Swainson's warbler. This management prescription also provides suitable habitat for eastern wild turkey and black bear.

DC 8E4a-07: Low-impact (dispersed) recreational uses of these prescription areas are compatible with the long-term conservation of the Indiana bat. These include hiking, hunting, backpacking, picnicking, photography, and wildlife study. Spelunking may be allowed when the bats are not using the caves for hibernation. Existing trails and roads are used for access to specified areas for these activities, although decommissioning of existing roads may occur. Off-highway vehicle use is prohibited. Educational materials describing the Indiana bat, its geographical distribution, its habitat, fragility, and conservation efforts are readily available to visitors of the area. The Indiana bat is actively protected against collection and killing, except for specified scientific purposes authorized under permit. Trail and road reconstruction, minor relocation, and new parking facilities are permitted. All activities are conducted with full consideration of effects on Indiana bat populations.

8E4b - Indiana Bat Secondary Cave Protection Areas

Emphasis

Within this prescription area, habitats are managed to maintain, restore, and enhance Indiana bat populations. The goals of the secondary cave protection area are to maintain and enhance swarming,

roosting, and foraging habitat and to involve regularly scheduled vegetation management activities to maintain and enhance mid- to late-successional oak-hickory forests, open woodland habitats, and the trees that are most likely to develop and retain slabs of exfoliating bark. Commercial timber harvest is frequently the most practical and economical method of achieving these goals. There are approximately 14,000 acres within secondary cave protection areas.

Desired Conditions for 8E4b - Indiana Bat Secondary Cave Protection Areas

DC 8E4b-01: Management of the secondary cave protection area is focused on maintaining and enhancing swarming, roosting, and foraging habitat. The landscapes of these areas feature a structurally diverse older aged forest community with a forested canopy. Where ecologically suitable, open pine-oak woodlands with a mature overstory and grassy understory are restored. Oak-hickory forests are managed to favor trees which develop and retain slabs of exfoliating bark including: shagbark hickory, bitternut hickory, white ash, red oak, chestnut oak, white oak, red maple, sugar maple, black gum, sycamore, black locust, and southern yellow pines. Cavity trees, cull trees, standing dead trees, storm and fire damaged live trees, and down logs are common throughout the area. These areas contribute small patches of late-successional to old growth forests to the forestwide matrix. Active roost trees are identified and protected from disturbance. At least six roost trees that retain slabs of exfoliating bark, greater than nine inches in diameter, with at least some daily exposure to sunlight are provided per acre. Indiana bat movement and flight paths are not restricted by dense understory vegetation. Indiana bat prey, such as flying insects, is abundant in terms of both numbers of individuals and diversity of species.

DC 8E4b-02: Management activities designed to benefit bat habitat are used more frequently in the secondary cave protection area to maintain and enhance mid- to late-successional oak-hickory forests, open woodland habitats, and the trees that are most likely to develop and retain slabs of exfoliating bark. Additional trees with roosting potential are selected and sunlight conditions surrounding them are improved. Larger diameter snags with exfoliating bark are promoted and retained. Optimal foraging habitat with 50-70% canopy closure is provided to maximize both flying insect production and Indiana bat foraging success. Sixty percent of these areas are greater than 70 years of age, and 40% of the oak-hickory forest types are greater than 80 years of age. Structural diversity within mixed mesophytic and dry-to-mesic oak forest communities may be enhanced through commercial and non-commercial vegetation management activities.

DC 8E4b-03: Four to ten percent of the secondary cave protection area may be in early successional forest conditions to provide flight corridors and foraging habitat, provided other habitat objectives are also met. Drinking water sources are available in created upland or ridgetop ponds. Ponds typically adjoin mature forest and most have a flight corridor, such as a road or wildlife linear strip, leading into them. Existing wildlife openings are maintained along with occasional creation of new openings. Wildlife species associated with mid- to late-successional deciduous forest habitats and mixed landscapes that are expected to inhabit these areas include: hooded warbler, southern pigmy shrew; whip-poor-will; least weasel, downy woodpecker; eastern gray squirrel; and orchard oriole. This management prescription also provides suitable habitat for ruffed grouse, eastern wild turkey and black bear. These areas provide excellent opportunities for wildlife viewing and hunting. Because the landscapes, in which this prescription lies, including private lands, are over 70% forest cover, one could also expect to find area-sensitive mid- to late-successional forest species including: ovenbird, cerulean warbler, black-billed cuckoo, and Swainson’s warbler.

DC 8E4b-04: Non-native vegetation occurs only as transients and is not self-perpetuating. Biological or species-specific pesticide controls of gypsy moth, hemlock woolly adelgid, and other non-native species are permitted with full consideration of the effects on the Indiana bat, their habitat, and their prey. Timber harvest and pesticide controls may be implemented to aid in the study of effects of non-native pests on the Indiana bat.

DC 8E4b-05: Low-impact (dispersed) recreational uses of these prescription areas are compatible with the long-term conservation of the Indiana bat. These include hiking, hunting, backpacking, picnicking, photography, and wildlife study. Existing trails and roads are used for access to specified areas for these activities, although decommissioning of existing roads may occur. Off-highway vehicle use is prohibited. Educational materials describing the Indiana bat, its geographical distribution, its habitat, fragility, and conservation efforts are readily available to visitors of the area. The Indiana bat is actively protected against collection and killing, except for specified scientific purposes authorized under permit. Trail and road reconstruction, minor relocation, and new parking facilities are permitted. All activities are conducted with full consideration of effects on Indiana bat populations.

Standards for 8E4 – Indiana Bat Hibernacula Protection Areas

Forestwide standards for protection and management of the Indiana bat are supplemented in this prescription area by the following standards specific to cave-associated habitats.
When not specifically stated otherwise, these standards refer to both the primary (8E4a) and secondary (8E4b) cave protection areas.

Primary Cave Protection Areas

8E4-001 Each Indiana bat hibernaculum will have a primary buffer consisting of a radius of no less than one-half mile around each hibernaculum, defined by national forest surface ownership and topography.

8E4-002 No disturbance that will result in the potential taking of an Indiana bat will occur within this buffer.

- Commercial timber harvesting, road construction, use of the insecticide diflubenzuron, expansion or creation of permanent wildlife openings, and mineral exploration and development are prohibited.
- Prescribed burning, tree cutting, road maintenance, and integrated pest management using biological or species-specific controls are evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.

8E4-003 All currently known hibernacula are gated. If additional hibernacula are found, the caves are gated, if necessary, to protect Indiana bats during the critical hibernation period.

8E4-004 All caves may be opened for public use during the summer months for recreational use from June 1 to September 1.

Secondary Cave Protection Areas

8E4-005 A secondary buffer consisting of a radius of approximately 1.5 miles around each primary cave protection area, defined by easily recognizable features on the ground, will have limited disturbance.

8E4-006 Within the secondary cave protection area, the following management activities can occur following evaluation to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula:

- Regeneration timber sales;
- Thinning;
- Road construction or reconstruction;
- Prescribed burning;
- Trail construction or reconstruction;
- Special uses; and
- Biological or species-specific pesticide use.

Active Maternity Site Protection

8E4-007 If active maternity roost sites are identified on the Forest, they are protected with a 2.5-mile buffer defined by the maternity roost, alternate roost sites, and adjacent foraging areas. See Forestwide standards.

Active Roost Tree Protection

8E4-008 As active roost trees are identified on the Forest, they are protected with a quarter-mile buffer surrounding them. This protective buffer remains until such time they no longer serve as a roost (e.g. loss of exfoliating bark or cavities, blown down, or decay). See Forestwide standards.

Terrestrial and Aquatic Species

8E4-009 Management for other plant and animal species within the primary cave protection areas is evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.

8E4-010 Opportunities should be sought to include creation of drinking water sources for bats in project plans, where appropriate, in areas where no reliable sources of drinking water are available. Opportunities are considered when the creation is not detrimental to other wetland-dependent species (i.e., damage to natural springs and seeps).

8E4-011 Limit creation of early successional habitat to 10 percent of forested acres in the secondary cave protection area. Creation of early successional habitat in the primary cave protection area is prohibited.

8E4-012 Existing old fields, wildlife openings, and other habitat improvements for fish and wildlife may be present and maintained within both the primary and secondary cave protection areas, but no expansion of openings or creation of new permanent openings of this type occurs within the primary cave protection area. Native species are emphasized when establishing food plants for wildlife. Some openings provide permanent shrub/sapling habitat as a result of longer maintenance cycles.

8E4-013 Structural habitat improvements for fish and other aquatic species are allowed.

Threatened, Endangered and Sensitive Species

8E4-014 Management for other known populations of threatened, endangered, sensitive, and locally rare species within the primary cave protection areas are evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.

Vegetation and Forest Health

8E4-015 Allow vegetation management activities within primary cave protection areas to:

- Promote trees that retain slabs of exfoliating bark;
- Promote large diameter roost trees with some daily exposure to sunlight;
- Thin dense midstories that restrict bat movement;
- Improve other threatened, endangered, sensitive, and locally rare species habitat;
- Maintain rare communities and species dependent on disturbance;
- Reduce fuel buildups;
- Restore historic fire regimes, particularly in pine and pine-oak woodlands;
- Reduce insect and disease hazard to oak-hickory forest communities;
- Control non-native invasive vegetation;
- Maintain trails

8E4-016 Allow vegetation management activities within secondary cave protection areas to:

- Maintain oak-hickory forest communities; and restore pine and pine-oak woodlands;
- Promote trees that retain slabs of exfoliating bark;
- Promote large diameter roost trees with some daily exposure to sunlight;
- Thin dense midstories that restrict bat movement;
- Improve other threatened, endangered, sensitive, and locally rare species habitat;
- Maintain rare communities and species dependent on disturbance;
- Reduce fuel buildups;
- Restore, enhance, or mimic historic fire regimes;
- Reduce insect and disease hazard;
- Control non-native invasive vegetation;
- Salvage dead and dying trees as a result of insects, diseases, or other natural disturbance events;
- Provide up to 10% early successional habitat conditions;
- Maintain trails

8E4-017 Strive for optimum roosting habitat of 16 or more Class 1 and/or Class 2 trees greater than 9 inches diameter at breast height (dbh) per acre, as averaged across the prescription area associated with each hibernaculum. Class 1 trees are those species which are most likely to have exfoliating bark either in life or after death, and which are most likely to retain it for several years after they die. Class 2 trees characteristically have exfoliating bark as well, but are considered to be of slightly lower quality than Class 1 trees.

Class 1 Trees	Class 2 Trees
Carya cordiformis (bitternut hickory)	*Acer rubrum* (red maple)
Carya laciniosa (shellbark hickory)	*Acer saccharum* (sugar maple)
Carya ovata (shagbark hickory)	*Aesculus octandra* (yellow buckeye)
Fraxinus americana (white ash)	*Betula lenta* (sweet birch)
Fraxinus pennsylvanica (green ash)	*Carya glabra* (pignut hickory)
Quercus alba (white oak)	*Carya* spp. (other hickories)
Quercus prinus (chestnut oak)	*Fagus grandifolia* (American beech)
Quercus rubra (red oak)	*Liriodendron tulipifera* (tulip poplar)
Quercus stellata (post oak)	*Nyssa sylvatica* (black gum)
Ulmus rubra (slippery elm)	*Platanus occidentalis* (sycamore)
	Robinia pseudoacacia (black locust)
	Quercus coccinea (scarlet oak)
	Quercus velutina (black oak)
	Sassafras albidum (sassafras)
	Pinus echinata (shortleaf pine)
	Pinus virginiana (Virginia pine)
	Pinus rigida (pitch pine)
	Pinus pungens (table mountain pine)

Timber Management

8E4-018 Primary cave protection areas are unsuitable for timber production. Commercial timber harvest is not allowed.

8E4-019 Secondary cave protection areas are suitable for timber production. Some portions of the areas are identified as unsuitable for timber production due to the timber suitability analyses in Appendix C.

The remainder of the Timber Management standards under this section refers only to the Secondary Cave Protection Areas.

8E4-020 Clearcutting is prohibited.

8E4-021 In order to promote fall foraging and swarming areas, timber activities will leave all shagbark hickory trees and retain a minimum average of 6 snags or cavity trees (greater than or equal to 9 inches diameter at breast height, dbh) per acre as potential roost sites (except where they pose a safety hazard). For the group selection harvest method, all shagbark hickories are maintained (except where they pose a safety hazard) with no provision for minimum number of snags or cavity trees due to the small opening size.

8E4-022 Forested communities are maintained using either of two following criteria:
A minimum of 60% of the acreage of all Forest Types are maintained over 70 years of age; and a minimum of 40% acreage of FSVEG Forest Types 53 (white oak, red oak, hickory) and 56 (yellow poplar, white oak, red oak) are maintained at an age greater than 80 years old;

OR

When the above age criteria cannot be met, forest stands receiving even-aged regeneration harvesting are maintained with a minimum of 20 trees per acre in the 10-16 inch dbh class and 15 trees per acre in the greater than 16 inch dbh class, of which two trees per acre must be 20 inches dbh or greater.

8E4-023 The 0 - 10 age class will not exceed 10% at any time (regardless which of the criteria above are used).

8E4-024 Timber marking and harvesting crews will receive training in the identification of potentially valuable roost trees.

8E4-025 Timber harvesting operations will be suspended from September 15 until November 15.

Non-timber Forest Products

8E4-026 Do not issue authorizations for the commercial or personal use of any forest products, including firewood.

Wildland Fire Management

8E4-027 Prescribed burning and wildfires are allowed to manage vegetation to maintain flight and foraging corridors in upland and riparian areas potentially used by bats in the summer.

Recreation

8E4-028 Maintain trails to the minimum standard necessary for protection of the soil, water, vegetation, visual quality, user safety, and long-term maintenance.

8E4-029 New trail construction is allowed only within the secondary cave protection area.

Scenery

8E4-030 Management activities are designed to meet or exceed the following Scenic Integrity Objectives:

Inventoried Scenic Class	1	2	3	4	5	6	7
Scenic Integrity Objectives	H	M	M	M	M	M	M

H=High; M=Moderate

8E4-031 Management activities are designed to meet or exceed a High Scenic Integrity Objective in semi-primitive non-motorized areas within this prescription area.

Minerals

8E4-032 The primary cave protection areas are not suitable for oil and gas and other Federal leasable minerals. These areas are not available for mineral materials for commercial, personal, or free use purposes. Administrative use of mineral materials is allowed when: a) the materials are used within the primary cave protection area itself; and b) use is necessary to protect Indiana bat habitat.

8E4-033 Within the secondary cave protection areas, areas are suitable for federal oil and gas leasing with a no surface occupancy stipulation to protect Indiana bat habitat. Other Federal minerals are allowed on a case-by-case basis after full consideration of effects on Indiana bat habitat. Permit mineral materials for commercial, personal, free, and administrative use purposes with conditions to protect Indiana bat habitat. Seismic exploration would only be allowed during periods of time when Indiana bats are not hibernating.

Roads

8E4-034 Within the primary cave protection area, do not permit road construction, subject to valid existing rights or leases. Road reconstruction and minor relocation are permitted to benefit the Indiana bat and its habitat.

8E4-035 New construction and reconstruction are allowed in the secondary cave protection area.

8E4-036 Decommission roads when they are adversely affecting caves, their hydrology, or Indiana bat habitat security.

Lands and Special Uses

8E4-037 Primary cave protection areas are unsuitable for new special uses, except for research and outfitter-guide operations. Phase out existing non-conforming uses.

8E4-038 Allow commercial use by outfitters and guides if compatible with preservation of the primary cave protection areas. Do not allow contest events such as foot races or horseback endurance events. Require outfitters and guides to use leave-no-trace techniques. Do not allow permanent camps.

8E4-039 Within secondary cave protection areas, new special use proposals are analyzed on a case-by-case basis to determine the potential effects on the Indiana bat.

8E4-040 Both the primary and secondary cave protection areas are unavailable for wind energy development.

Jefferson NF Forest Plan Direction

Land Allocation Strategy and suitability

Management Prescription	Total Acres on Jefferson National Forest	Acres of Lands Suitable for Timber Production
0B Custodial Management	3,500	0
1A Designated Wilderness	57,800	0
1B Recommended Wilderness Study Area	25,200	0
2C1 Eligible Wild River	900	0
2C3 Eligible Recreational River	4,400	0
4A Appalachian Trail	30,700	0
4C1 Geologic Areas	1,500	0
4D Botanical-Zoological Area	4,700	0
4E Cultural-Heritage Area	1,700	1,000
4F Scenic Area	1,000	0
4J Urban-Suburban Interface Area	3,900	1,900
4K1 North Creek Special Area	5,200	1,500
4K2 Hoop Hole Special Area	4,400	0
4K3 Mount Rogers Crest Zone Special Area	5,100	0
4K4 Whitetop Mountain Special Area	5,100	0
4K5 Whitetop Laurel Special Area	4,200	0
4K6 North Fork Pound Special Area	5,500	0
5A Administrative Sites	200	0
5B Designated Communication Sites	200	0
5C Designated Utility Corridors	3,700	0
6A Old-Growth Forest – Communities not associated with disturbance	300	0
6B Old-Growth Forest – Communities dependent on fire	800	0
6C Old-Growth Forest – Communities associated with disturbance	30,200	0
7A Scenic Byway Corridors	1,800	0
7B Scenic Corridors	23,500	17,000
7C OHV Routes and ATV Use Areas	1,500	400
7D Concentrated Recreation Areas	6,000	0
7E1 Dispersed Recreation Areas	19,600	0
7E2 Dispersed Recreation Areas	51,800	36,200
7F Blue Ridge Parkway Visual Corridor	3,900	1,300
7G Pastoral Landscapes	3,700	0
8A1 Mix of Successional Habitats	112,600	85,600
8B Early Successional Habitats	19,600	13,200
8C Black Bear Habitats	57,300	40,600

Management Prescription	Total Acres on Jefferson National Forest	Acres of Lands Suitable for Timber Production
8E1 Ruffed Grouse and Woodcock Habitats	16,000	11,500
8E2 Peaks of Otter Salamander Habitat Conservation Areas - Primary	2,400	0
8E2 Peaks of Otter Salamander Habitat Conservation Areas - Secondary	5,300	4,100
8E4 Indiana Bat Hibernacula - Primary	900	0
8E4 Indiana Bat Hibernacula - Secondary	8,800	6,400
8E6 Old Field Habitat	1,300	400
9A1 Source Water Protection Watersheds	19,200	12,800
9A2 Reference Watersheds	<100	
9A3 Watershed Restoration Areas	1,700	500
9A4 Aquatic Habitat Areas	6,500	0
9F Rare Communities	7,400	0
9G1 Maintenance and Restoration of Bottomland Hardwoods	100	0
9H Management, Maintenance, and Restoration of Forest Communities	24,700	12,900
10B High Quality Wood Products	16,200	11,600
11 Riparian Corridors	-73600	0
12A Remote Backcountry – Few open roads	9,700	0
12B Remote Backcountry – Non-motorized	91,300	0
12C Natural Processes in Backcountry Remote Areas	9,800	0
TOTAL	**723,300**	**258,900**

FOREST-WIDE DIRECTION

STANDARDS:

T/E/S Species Management

Gray Bat and Virginia Big-Eared Bat Management

FW-44: Maintain a ¼ mile buffer of undisturbed forest around gray bat maternity and hibernation colony sites and Virginia big-eared bat maternity, bachelor, or winter colony sites. Prohibited activities within this buffer include cutting of overstory vegetation, construction of roads, trails, or wildlife openings, and prescribed burning. Exceptions may be made when compatible with recovery of these species.

Indiana Bat Management

FW-45: Each Indiana bat hibernaculum has a **primary and secondary cave protection** area managed according to management prescription 8E4. If additional hibernacula are found, the desired condition and standards of management prescription 8E4 apply until an environmental analysis to consider amendment to the Forest Plan is completed.

FW-46: In order to promote **potential summer roost trees and maternity sites** for the Indiana bat throughout the Forest, planned silvicultural practices in hardwood-dominated forest types will leave all shagbark hickory trees greater than 6 inches d.b.h.[3] and larger, except when they pose a safety hazard. In addition:

- ▶ Clearcut openings 10 to 25 acres in size will also retain a minimum average of 6 snags or cavity trees per acre, 9 inches d.b.h. or larger, scattered or clumped.
- ▶ Group selection openings and clearcuts less than 10 acres in size have no provision for retention of a minimum number of snags, cavity trees, or residual basal area due the small opening size and safety concerns.
- ▶ All other harvesting methods (and clearcut openings 26-40 acres in size) will retain a minimum residual 15 square feet of basal area per acre (including 6 snags or cavity trees) scattered or clumped. Residual trees are greater than 6 inches d.b.h. with priority given to the largest available trees, which exhibit characteristics favored as roost trees by Indiana bats.

FW-47: To insure a continuous supply of **roost trees and foraging habitat**, the following forest-wide conditions must be maintained:

- ▶ Minimum of 60% of the combined acreage of all CISC[4] Forest Types on the Forest will be maintained over 70 years of age; AND
- ▶ Minimum of 40% of the combined acreage of all CISC Forest Types 53 (white oak, red oak, hickory) and 56 (yellow poplar, white oak, red oak) will be maintained at an age greater than 80 years old.

FW-48: When **active roost trees** are identified on the Forest, they will be protected with a ¼ mile buffer surrounding them. This protective buffer remains until such time the trees and associated area no longer serve as a roost (e.g., loss of exfoliating bark or cavities, blown down, or decay).

FW-49: No disturbance that will result in the potential taking[5] of an Indiana bat will occur within this active roost tree buffer.

- ▶ Commercial timber harvesting, road construction, and use of the insecticide diflubenzuron are prohibited.
- ▶ Prescribed burning, timber cutting, road maintenance, and integrated pest management using biological or species-specific controls during non-roosting season are allowed, following project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.
- ▶ Other activities within this buffer are allowed following determination that they will not result in a potential taking of an Indiana bat.

FW-50: Removal of known Indiana bat **active roost trees** will be avoided, except as specified in the next 2 standards.

FW-51: If during project implementation, **active roost trees** are identified, all project activity will cease within a ¼ mile buffer around the roost tree until consultation with U.S. Fish and Wildlife Service is completed to determine whether project activities can resume.

FW-52: In the event that it becomes absolutely necessary to remove a known Indiana bat **active roost tree**, such a removal will be conducted during the time period when the bats are likely to be in hibernation (November 15 through March 31), through informal consultation with the U.S. Fish and Wildlife Service. Trees identified as immediate threats to public safety may be removed when bats are not hibernating; however, informal consultation with U.S. Fish and Wildlife Service is still required. Examples of immediate threats to public safety include trees leaning over a trail, public road or powerline that could fall at any time due to decay or damage.

FW-53: Prescribed burning is allowed to maintain **flight and foraging corridors** in upland and riparian areas potentially used by bats in the summer. To avoid injury to non-flying young Indiana bats, prescribed burning of active maternity roosting sites between June 1 and August 1 is prohibited.

FW-54: Opportunities should be sought to include creation of drinking water sources for bats in project plans, where appropriate, in areas where no reliable sources of drinking water are available. Opportunities will be considered when the creation is not detrimental to other wetland-dependent species (I.e., damage to natural springs and seeps).

FW-55: If **active maternity roost sites** are identified on the Forest, they will be protected with a 2-mile buffer defined by the maternity roost, alternate roost sites, and adjacent foraging areas.

FW-56: No disturbance that will result in the potential taking of an Indiana bat will occur within this active maternity roost site buffer.

- ▶ Commercial timber harvesting, road construction, and use of all pesticides is prohibited.
- ▶ All other activities within this buffer will be evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats, through informal consultation with the U.S. Fish and Wildlife Service.

FW-57: If during project implementation, **active maternity roost sites** are identified, all project activity will cease within a 2-mile buffer around the maternity roost until consultation with U.S. Fish and Wildlife Service is completed to determine whether project activities can resume.

FW-58: Monitoring of timber sales and other activities will be implemented as follows:

- ▶ Timber sale administrators or biologists will conduct and report normal inspections of all timber sales to ensure that measures to protect the Indiana bat have been implemented. Timber sale administrators will conduct normal inspections of all timber sales to administer provisions for protecting residual trees not designated for cutting under provisions of the timber sale contract. Unnecessary damage to residual trees will be documented in sale inspection reports and proper contractual or legal remedies will be taken. The Forest will include this information in their annual monitoring reports and made available to the U.S. Fish and Wildlife Service, if requested.
- ▶ Informal consultations among the U.S. Fish and Wildlife Service and the Forest will occur as needed in order to review and determine any need to modify provisions of the biological opinion, and other issues regarding the Indiana bat.

FW-59: Where appropriate, training should be conducted for employees regarding bats in the National Forests. Training should include sections on bat identification, biology, habitat requirements, and sampling techniques.

FW-60: Develop informational and educational displays about bats to inform the public about this misunderstood group of mammals.

Caves

FW-63: A minimum of 200 foot buffers are maintained around cave entrances, sinkholes, and cave collapse areas known to open into a cave's drainage system. There are no soil-disturbing activities or harvest of trees within this buffer. Wider buffers are identified through site-specific analysis when necessary to protect caves from potential subterranean and surface impacts. Perennial, intermittent, channeled ephemeral stream standards will apply beyond the first 200 feet.

FW-64: The use of caves for disposal sites or the alteration of cave entrances is prohibited except for the construction of cave gates or similar structures to ensure closure.

FW-65: Management activities within any area draining into a cave are limited if they may affect the cave ecosystem through sedimentation, soil sterilization, the addition of nutrients or other chemicals (including pesticides and fertilizers), or if they change the cave's natural hydrology or micro-climate.

FW-66: Post and enforce seasonal closure orders around entrances of caves and abandoned mines occupied by significant populations of bats, to reduce the frequency and degree of human intrusion. Prohibit camping and campfires at the entrance to caves, mines, and rock shelters used by bats.

FW-67: If such closure orders are found to be ineffective, construct and maintain gates or other structures that allow for entrance and egress by bats. If necessary to further discourage human disturbance to caves occupied by significant populations of bats, close non-essential public access routes controlled by the Forest Service within ¼ mile of cave entrances during periods of use by bats.

FW-68: Human access to caves for educational and recreation use may be allowed during periods when bats are not present. If damage to a cave occurs as a result of such use, close the cave. Allow human access (i.e. scientific study) on a case-by-case basis when bats are present.

FW-69: The specific location of a **significant cave** cannot be made available to the public unless it is determined that disclosure of this information would not create a substantial risk of harm, theft, or destruction of the cave.

8E4 Indiana Bat Hibernacula Protection Areas

Standards

Forestwide standards for protection and management of the Indiana bat are supplemented in this prescription area by the following standards specific to cave-associated habitats.
When not specifically stated otherwise, these standards refer to both the primary (8E4a) and secondary (8E4b) cave protection areas.

Primary Cave Protection Area

8E4-001 Each Indiana bat hibernaculum will have a primary buffer consisting of a radius of no less than one half mile around each hibernaculum, defined by national forest surface ownership and topography.

8E4-002 No disturbance that will result in the potential taking of an Indiana bat will occur within this buffer.

- ▶ Commercial timber harvesting, road construction, use of the insecticide diflubenzuron, creation of early successional habitat, expansion or creation of permanent wildlife openings, and mineral exploration and development are prohibited.
- ▶ Prescribed burning, tree cutting, road maintenance, and integrated pest management using biological or species-specific controls are evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.

8E4-003 All currently known hibernacula are gated. If additional hibernacula are found, the caves are gated, if necessary, to protect Indiana bats during the critical hibernation period.

8E4-004 All caves may be opened for public use during the summer months for recreational use from June 1 to September 1.

Secondary Cave Protection Area

8E4-005 A secondary buffer consisting of a radius of approximately 1½ miles around each **primary cave protection area**, defined by easily recognizable features on the ground, will have limited disturbance.

8E4-006 Within the **secondary cave protection area**, the following management activities can occur following evaluation to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula:

- ▶ Regeneration timber sales;
- ▶ Thinning;
- ▶ Road construction or reconstruction;
- ▶ Prescribed burning;
- ▶ Trail construction or reconstruction;
- ▶ Special uses; and

▶ Biological or species-specific pesticide use.

Active Maternity Site Protection

8E4-007 If active maternity roost sites are identified on the Forest, they are protected with a 2-mile buffer defined by the maternity roost, alternate roost sites, and adjacent foraging areas. See Forestwide standards.

Active Roost Tree Protection

8E4-008 As active roost trees are identified on the Forest, they are protected with a ¼ mile buffer surrounding them. This protective buffer remains until such time they no longer serve as a roost (e.g., loss of exfoliating bark or cavities, blown down, or decay). See Forestwide standards.

Terrestrial and Aquatic Species

8E4-009 Management for other plant and animal species within the **primary cave protection areas** is evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.

8E4-010 Opportunities should be sought to include creation of drinking water sources for bats in project plans, where appropriate, in areas where no reliable sources of drinking water are available. Opportunities are considered when the creation is not detrimental to other wetland-dependent species (i.e., damage to natural springs and seeps).

8E4-011 Limit creation of early successional habitat to 10 percent of forested acres in the **secondary cave protection area**. Creation of early successional habitat in the **primary cave protection area** is prohibited.

8E4-012 Existing old fields, wildlife openings, and other habitat improvements for fish and wildlife may be present and maintained within both the **primary and secondary cave protection areas**, but no expansion of openings or creation of new permanent openings of this type occurs within the **primary cave protection area**. Native species are emphasized when establishing food plants for wildlife. Some openings provide permanent shrub/sapling habitat as a result of longer maintenance cycles.

8E4-013 Structural habitat improvements for fish and other aquatic species are allowed.

Threatened, Endangered and Sensitive Species

8E4-014 Management for other known populations of threatened, endangered, sensitive, and locally rare species within the **primary cave protection areas** are evaluated during project level analysis to determine the direct, indirect, and cumulative effects on Indiana bats and the hibernacula.

Rare Communities and Old Growth

8E4-015 Maintain rare communities in both the **primary and secondary cave protection areas**.

8E4-016 Old growth patches of all sizes and community types are maintained and restored.

Vegetation and Forest Health

8E4-017 Allow vegetation management activities within **primary cave protection areas** to:

▶ Promote trees that retain slabs of exfoliating bark;

▶ Promote large diameter roost trees with some daily exposure to sunlight;

▶ Thin dense midstories that restrict bat movement;

▶ Improve other threatened, endangered, sensitive, and locally rare species habitat;

▶ Maintain rare communities and species dependent on disturbance;

▶ Reduce fuel buildups;

▶ Restore historic fire regimes, particularly in pine and pine-oak woodlands;

▶ Reduce insect and disease hazard to oak-hickory forest communities;

- ▶ Control non-native invasive vegetation.

8E4-018 Allow vegetation management activities within **secondary cave protection areas** to:

- ▶ Maintain oak-hickory forest communities; and restore pine and pine-oak woodlands;
- ▶ Promote trees that retain slabs of exfoliating bark;
- ▶ Promote large diameter roost trees with some daily exposure to sunlight;
- ▶ Thin dense midstories that restrict bat movement;
- ▶ Improve other threatened, endangered, sensitive, and locally rare species habitat;
- ▶ Maintain rare communities and species dependent on disturbance;
- ▶ Reduce fuel buildups;
- ▶ Restore, enhance, or mimic historic fire regimes;
- ▶ Reduce insect and disease hazard;
- ▶ Control non-native invasive vegetation;
- ▶ Salvage dead and dying trees as a result of insects, diseases, or other natural disturbance events;
- ▶ Provide up to 10% early successional habitat conditions.

8E4-019 Strive for optimum roosting habitat of 16 or more Class 1 and/or Class 2 trees greater than 9 inches d.b.h. per acre, as averaged across the prescription area associated with each hibernaculum. Class 1 trees are those species which are most likely to have exfoliating bark either in life or after death, and which are most likely to retain it for several years after they die. Class 2 trees characteristically have exfoliating bark as well, but are considered to be of slightly lower quality than Class 1 trees. See Table 3-2.

Timber Management

8E4-020 **Primary cave protection areas** are unsuitable for timber production. Commercial timber harvest is not allowed.

8E4-021 **Secondary cave protection areas** are suitable for timber production. The remainder of the standards under this section refers only to the secondary cave protection area.

8E4-022 Clearcutting is prohibited.

8E4-023 In order to promote fall foraging and swarming areas, timber activities will leave all shagbark hickory trees and retain a minimum average of 6 snags or cavity trees (greater than or equal to 9 inches d.b.h.) per acre as potential roost sites (except where they pose a safety hazard). For group selection harvest method, all shagbark hickories are maintained (except where they pose a safety hazard) with no provision for minimum number of snags or cavity trees due to the small opening size.

8E4-024 Forested communities are maintained using either of two following criteria:

A minimum of 60% of the acreage of all Forest Types are maintained over 70 years of age; and a minimum of 40% acreage of CISC Forest Types 53 (white oak, red oak, hickory) and 56 (yellow poplar, white oak, red oak) are maintained at an age greater than 80 years old;

OR

When the above age criteria cannot be met, forest stands receiving even-aged regeneration harvesting are maintained with a minimum of 20 trees per acre in the 10-16 inch d.b.h. class and 15 trees per acre in the greater than 16 inch d.b.h. class, of which two trees per acre must be 20 inches d.b.h. or greater.

8E4-025 The 0 - 10 age class will not exceed 10% at any time (regardless which of the criteria above are

used).

8E4-026 Timber marking and harvesting crews will receive training in the identification of potentially valuable roost trees.

8E4-027 Timber harvesting operations will be suspended from September 15 until November 15.

8E4-028 Manage regeneration harvest areas with the following rotation ages:

Upland hardwoods	120-140
Cove hardwoods	100-120
White pine	80-100
Yellow pine	80-100
Scarlet oak/Black oak	80-100

Non-timber Forest Products

8E4-029 Do not issue authorizations for the commercial or personal use of any forest products, including firewood.

Prescribed Fire and Wildland Fire Use

8E4-030 Prescribed burning and wildland fire use is allowed to manage vegetation to maintain flight and foraging corridors in upland and riparian areas potentially used by bats in the summer.

Recreation

8E4-031 Maintain trails to the minimum standard necessary for protection of the soil, water, vegetation, visual quality, user safety, and long-term maintenance.

8E4-032 New trail construction is allowed only within the **secondary cave protection area**.

8E4-033 Licensed OHV use is permitted in this prescription area only on existing open roads.

Scenery

8E4-034 Management activities are designed to meet or exceed the following Scenic Integrity Objectives, which may vary by inventoried Scenic Class:

Inventoried Scenic Class	1	2	3	4	5	6	7
Scenic Integrity Objectives	H	M	M	M	M	M	M

8E4-035 Management activities are designed to meet or exceed a high Scenic Integrity Objective in semi-primitive non-motorized areas within this prescription area.

Range

8E4-036 In order to maintain open woodland and grassland conditions suitable for fall swarming and roosting, livestock grazing is permitted to continue where it currently exists.

Minerals

8E4-037 The **primary cave protection areas** are administratively unavailable for oil and gas and other Federal leasable minerals. Existing leases are not renewed upon expiration. These areas are not available for mineral materials for commercial, personal, or free use purposes. Administrative use of mineral materials is allowed when: a) the materials are used within the primary cave protection area itself; and b) use is necessary to protect Indiana bat habitat.

8E4-038 Within the **secondary cave protection areas**, oil and gas are allowed with a timing stipulation to protect Indiana bat habitat from September 15 to November 15. Other Federal minerals are allowed on a case-by-case basis after full consideration of effects on Indiana bat habitat. Permit mineral materials for commercial, personal, free, and administrative use purposes with conditions to protect Indiana bat habitat.

8E4-039 The Kelly Cave area is underlain by private mineral rights. Requests for access to a non-Federal interest in lands pursuant to a reserved or outstanding right are recognized, and reasonable access is granted. Encourage such interests to minimize disturbance to Indiana bat habitat when possible.

Roads

8E4-040 Within the **primary cave protection area**, do not permit road construction, subject to valid existing rights or leases. Road reconstruction and minor relocation are permitted to benefit the Indiana bat and its habitat.

8E4-041 New construction and reconstruction are allowed in the **secondary cave protection area**.

8E4-042 Decommission roads when adversely affecting caves, their hydrology, or Indiana bat habitat security.

Lands and Special Uses

8E4-043 The Rocky Hollow Cave (Clinch Ranger District) is given a high priority for acquisition (on a willing seller basis) since it is one of the largest known historic hibernacula in Virginia and is situated adjacent to national forest lands.

8E4-044 **Primary cave protection areas** are unsuitable for new special uses, except for research and outfitter-guide operations. Phase out existing non-conforming uses.

8E4-045 Allow commercial use by outfitters and guides if compatible with preservation of the **primary cave protection areas**. Do not allow contest events such as foot races or horseback endurance events. Require outfitters and guides to use leave-no-trace techniques. Do not allow permanent camps.

8E4-046 Within **secondary cave protection areas**, new special use proposals are analyzed on a case-by-case basis to determine the potential effects on the Indiana bat.

Nantahala and Pisgah NFs

Standards listed in Amendment #25 – Direction and Standards for Protection of the Indiana Bat

14 (1)

a. Retain standing live trees that have more than 25 percent exfoliating (separated from cambium) bark and are greater than 3 inches dbh.
b. Retain as many shellbark, shagbark, and bitternut hickories as practicable, regardless of size or condition (live, dead, or dying).
c. Retain as many standing snags greater than 3 inches dbh as practicable within regeneration and timber treatment units, regardless of species, unless specifically marked for removal.
d. Retain as many hollow, den, or cavity trees greater than 9 inches dbh as practicable.
e. Designate and retain living residual trees in the vicinity of one-third of all large (>12 inches dbh) snags with exfoliating bark to provide them with partial shade and some protection from wind throw, using trees from the Priority Leave Tree list when possible.
f. Conduct prescribed burns between October 15 and April 15 when possible. Protect leave trees and snags to the extent practicable during site preparation burns. Site preparation burns, when necessary before October 15, should be conducted after August 15 to prevent potential harm to non-volant young.
g. Inspect timber sales to ensure these standards are implemented. Report findings, including a pre and post-harvest inventory of Indiana bat habitat components.
h. Design regeneration units with irregularly shaped boundaries where feasible, so that some uncut live trees project into the regeneration unit.

14(2)

a. Use Indiana bat summer habitat as a riparian related value for delineation of riparian areas (Management Area 18). Within the first 30 feet on each side of perennial streams and other permanent water bodies, no standing trees (green, dead, dying, or leaning) shall be removed or felled. Retain 60 percent canopy cover in the remainder of the riparian area. For crossings, apply the standards for riparian areas (Management Area 18).

b. Maintain the existing contiguity of forest canopy along intermittent streams. No harvest within 15 feet of intermittent streams. Leave additional trees outside 15 feet as needed for maintaining canopy contiguity. For crossings, apply management standards for riparian areas (Management Area 18).

14 (3)

a. Protect all active roost trees.
b. Retain suitable standing snags greater than 3” in diameter during personal-use firewood permits, unless marked for removal.
c. Removal of standing snags between April 15 and October 15 that are habitat shall be evaluated by qualified personnel for Indiana bat occupancy using FWS protocols.
d. Consult with FWS about any activities that involve modification of habitat or potential adverse disturbance between April 15 and October 15 within a 1.5 mile radius of known maternity sites.
e. Consult with FWS for use of B.t. or other non-selective pesticides to control gypsy moth infestations or other forest pest insects. Reduction in non-target lepidopteran abundance will be considered when determining the size and configuration of spray blocks.

f. Notify FWS of any dead, injured, or sick specimens.

14 (4) Analyze the pre- and post-project conditions for activities impacting five or more acres of forest stands (this does not include linear projects), using an HSI approved by the FWS. For the FSW approved HSI, do not let any project or combination of projects decrease the HSI by more than the agreed upon amount.

14 (5)

a. Survey biennially at sites where Indiana bats are present (document occurrences) following FWS protocols.
b. Consult with FWS if an Indiana bat hibernaculum is found.
c. Characterize and quantify habitat at all sites where Indiana bats are documented.
d. Report survey results to FWS within 6 months of completion.
e. Report the amount of incidental take annually and within 6 months following the end of the previous year's activities.

14 (8) If reconstruction, demolition, or removal must occur while bats are present, adequate surveys (visual, acoustic, or mist-netting) must be conducted by a bat expert to insure that no federally listed species will be impacted.

Uwharrie NF

Vegetation/Wildlife

When project activities may negatively impact species having less than five known occurrences on the Uwharrie NF, project documentation shall disclose how the species will be protected and the population will be maintained.

Croatan NF

4.2.0.11 Retain existing hollow trees and hardwoods greater than 36 inches dbh during management activities.

4.2.0.12 Retain den trees greater than 25 inches dbh within regeneration units.

4.2.0.13 Restrict logging and skidding equipment from crossing vernal pools.

4.2.0.14 Prohibit camping, equestrian, bike, and, motorized use in permanent, maintained wildlife openings except by permit.

4.2.0.15 Mitigate activities or developments that would substantially alter natural movement patterns of black bear. Ensure there are no net losses of black bear habitat. Future acquisitions for bear habitat shall be contiguous with key bear habitat.

4.2.0.16 Within regeneration units, retain existing clumps of hardmast hardwoods equaling 10% of the total regeneration area. Give priority to dominant and co-dominant hardwoods, along with live cavity trees that are distributed across the unit.

4.2.0.17 Retain the equivalent of two snags per acre distributed throughout regeneration units.

4.2.0.18 Prohibit the cutting of snags for firewood.

4.2.1.11 Prohibit construction of new wildlife openings in riverine swamp communities.

4.2.1.12 Convert wildlife openings from annual grain plantings to grass/forb perennial plantings where openings are located within 500 feet of riverine swamp communities. Empahsize the planting of native annuals and perennials.

4.4.1.4 Do not salvage timber in units less than 1.0 acre. When salvage occurs, leave 25 percent of the downed timber. Salvage only trees that are down. Leave leaning and/or broken-topped trees for future snags and den trees. When salvage occurs, regeneration efforts may include site preparation for natural regeneration. Supplement by planting appropriate species when natural regeneration is not adequate. Select from the following species: water oak, laurel oak, willow oak, overcup oak, cherrybark oak, swamp chestnut oak, white oak, hickory species, American beech, hackberry, blackgum, swamp tupelo, water tupelo, green ash, bald cypress, and American holly.

4.4.1.7 Prohibit permits for removal of old trees, snags, or downed logs if they will alter old-growth structure.

4.5.0.6 Include the protection of snags and cavity trees as an objective of all prescribed fire burn plans.

DANIEL BOONE NF

WILDLIFE

DB-WLF-1. No snags equal to or greater than six inches in diameter at breast height (dbh) and equal to or greater than 10 feet in height are to be intentionally felled within timber harvest, regeneration, and thinning projects, unless identified as an immediate threat to human safety. This standard does not apply to salvage or sanitation projects.

DB-WLF-2. Retain or create at least three snags per acre equal to or greater than 9 inches dbh within all timber harvest, regeneration, sanitation, salvage, or thinning project units when available.

DB-WLF-3. Retain enough live trees to provide partial shading of about one-third of all snags equal to or greater than 12 inches dbh and equal to or greater than 10 feet in height that are suitable for roosting by Indiana bats.

DB-WLF-4. In the two-aged shelterwood method, retain a minimum of 10 to 15 square feet of basal area per acre (average in stand) of live potential roost trees (Indiana bat).

DB-WLF-5. In harvest units equal to or greater than 10 acres that prescribe the two-age or even-age systems, leave some clumps or strips averaging at least 50 square feet of basal area (of trees equal to or greater than 9 inch dbh) per acre, or the density of the original stand if less. “Leave areas” such as the Cliffline Community and Riparian Corridor Prescription Areas can provide this habitat based on site-specific conditions.

DB-WLF-6. In regeneration or thinning project areas, retain all shagbark, shellbark, and red hickories that are (equal to or greater than 6 inch dbh), unless the removal of these trees is specifically designed to improve habitat for PETS or Conservation species.

DB-WLF-7. During implementation of vegetation management, retain any immediate roost trees (Indiana bat) that are equal to or greater than 6 inches dbh. These trees must be designated prior to project implementation. This standard does not apply to salvage or sanitation projects.

DB-WLF-8. Tree cutting may not be conducted within 2.5 miles of any Indiana bat maternity colony from May 1 through August 15. (See Table 2 - 1)

DB-WLF-9. For non-vegetation management projects, currently suitable Indiana bat roost trees may be felled only from October 15 through March 31, if they are more than five miles from a significant bat caves (Indiana bat). If tree removal occurs at other times, the trees must be evaluated for current Indiana bat use, according to U.S. Fish and Wildlife Service protocol. (See Table 2 - 1)

Table 2 - 1. Summary of dates for restricted activities around Indiana bat habitat.

Activity	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.
No tree cutting activities within 2½ miles of Indiana bat maternity colony. (DB-WLF-8)									1st ↔			15th
Currently Suitable Roost Trees more than 5 miles from a significant hibernaculum may not be removed. (DB-WLF-9)	→	14th						1st	←			
Currently Suitable Roost Trees within 5 miles of a significant hibernaculum may not be removed. (DB-WLF-10)	→		15th				16th	←				
Tree cutting activities within 5 miles of known significant Indiana bat hibernaculum will not be allowed. (DB-WLF-12)	1st	↔		1st								
Prescribed burning is not to occur in known Indiana bat roosting areas. (DB-FIRE-8)									1st	↔	31st	

DB-WLF-10. For non-vegetation management projects, removal of currently suitable roost trees (Indiana bat) within five miles of a significant bat cave (Indiana bat) may occur only from November 16 through March 15. If removal occurs at other times, the trees must be evaluated for current Indiana bat use, according to U.S. Fish and Wildlife Service protocol. (See Table 2 - 1)

DB-WLF-11. Timber harvest will not occur on the DBNF within one mile of a known significant bat cave, or PETS bat staging cave (with the exception of the wooded grassland/shrubland habitat association), if this activity would result in more than 120 acres of forest less than 10 years of age on all ownerships (public and private).

DB-WLF-12. Within five miles of a significant Indiana bat hibernaculum, tree cutting is not to be conducted from September 1 through December 1. (See Table 2 - 1)

DB-WLF-13. Where caves exist outside Cliffline Community Prescription Area a minimum zone of 200 feet is to be maintained around openings to caves and mines suitable for supporting cave-associated species, as well as any associated sinkholes and cave collapse areas, except for designated recreational caves. Prohibited activities within this protective area include use of motorized wheeled or tracked equipment (except on existing roads and trails), mechanical site preparation, recreation site construction, tractor-constructed fire lines for prescribed fire, herbicide application, and construction of new roads, skid trails, or log landings. Vegetation in this buffer zone may be managed only to improve habitat for PETS or Conservation species.

DB-WLF-14. Activities that create a toxic water source (e.g. brine pits and oil catch basins) must be filled, covered, or otherwise modified in an environmentally appropriate manner to prevent contact with wildlife.

DB-WLF-15. Create, or retain where available, at least one snag 12 inches dbh or greater per acre in any area in which overstory trees are cut as part of habitat creation or maintenance, sanitation or salvage.

1.J. SIGNIFICANT BAT CAVES

Setting

The Significant Bat Caves Prescription Area includes significant bat caves and a ¼-mile radius around each opening. A significant bat caves contains a minimum of 50 Indiana bats (hibernacula) or 5 Virginia or Rafinesque's big-eared bats (maternity site or hibernacula). Such sites are found in a naturally occurring cavity or system of interconnected passages, or a tunnel or mine, located beneath the surface or within a cliff, ledge, or rockshelter. These sites occur in both limestone and sandstone.

This Prescription Area, found across all Management Areas, consists of approximately 6,100 acres.

This Prescription Area is classified as Unsuitable for Timber Production – Tree cutting, tree removal, or timber harvest may occur on an unscheduled basis to attain Desired Future Conditions.

Desired Future Condition

Emphasis of Condition: This Prescription Area is managed to restore or maintain the integrity of significant bat caves, cave openings, and associated underground physical, geological, hydrological, and biological features. These areas remain relatively undisturbed by management activities, except for those designed to protect or maintain PETS species or habitat for Conservation species. Microclimate conditions, primarily temperature and humidity associated with these landscape features, persist. In addition, protection is provided for heritage resources, which are often associated with these features.

Desired Ecosystem Conditions: Overstory trees within this Prescription Area are generally old and usually replaced by natural processes. The forest community within the area varies greatly because caves and rockshelters may occur anywhere on the Forest, ranging from low elevation streamside areas and higher elevation ridgetops. Depending on location, trees may be widely scattered to heavily stocked. Prescribed fire is allowed in this area and trees may show occasional scorch marks. Non-native, invasive species do not occur.

Spelothems, speleogens, and other unique cave formations continue to develop or erode under natural conditions. Water flowing into the cave system contains normally fluctuating background levels of sediment, organic matter, and dissolved minerals and is not polluted.

Desired Facilities and Human Activities: This Prescription Area is protected from human activities and surface disturbance that would cause impacts to cave ecosystems or heritage resources. Protection may include signing, gating, or other physical barriers for caves and rockshelters designated as significant bat caves. Dispersed recreation may occur within the ¼-mile zone, however, selected caves are closed to public entry or have seasonal restrictions. Prescribed fire may occur within the area.

Occasionally, management activities include the use of motorized equipment to construct or maintain roads and trails. Vegetation may be occasionally manipulated to maintain the desired ecosystem condition. Trees damaged or knocked down following unforeseen events such as wildland fire, wind, snow, and insect and disease outbreaks might be removed for public safety

or to facilitate restoration consistent with the desired ecosystem condition. Tree felling and removal using motorized equipment could occur. Fire suppression activities could include the use of heavy equipment to construct firelines, while aircraft may provide detection and suppression support.

Goals and Objectives

1.J-Goal 1. Protect or enhance caves designated as significant for PETS bat species.

1.J-Objective 1.A. Acquire from willing sellers private lands that contain or are adjacent to caves or significant sites known to be hibernacula or maternity sites for PETS bats species.

1.J-Objective 1.B. Generally avoid prescribed burning within five miles of significant Indiana bat hibernacula from September 1 through December 1.

1.J-Objective 1.C. Manage all fires to minimize smoke impact to cave and karst areas and associated species.

Standards

MINERALS

1.J-MIN-1. The surface is not to be disturbed during any federal mineral exploration or development activity; development of federally owned oil and gas is subject to the No-Surface-Occupancy stipulation.

RECREATION

1.J-REC-1. Restrict entry to significant colony sites for PETS bat species, where needed, with signs or gates.

1.J-REC-2. Prohibit camping and fire building within 200 feet of an opening to posted colony sites for PETS bat species.

VEGETATION

1.J-VEG-1. Leave existing forest cover undisturbed by management activities unless the activity is designed to improve habitat for PETS and Conservation species.

1.J-VEG-2. Do not permit tree-cutting activities from September 1 through December 1 within five miles of known significant Indiana bat hibernacula.

1.J-VEG-3. Currently suitable roost trees that are 6 inches dbh or greater may be removed without checking for bats only from November 16 through March 15.

1.C. CLIFFLINE COMMUNITY

Setting

A cliffline community is the area between 100-feet slope-distance from the top and 200-feet slope-distance from the dripline of a cliffline. A cliffline is a naturally occurring, exposed, and nearly vertical rock structure at least 10 feet tall and 100 feet long. A cliffline is continuous if segments are separated by no more than 300 feet. Wherever the described conditions are found, those sites will be included in this Prescription Area.

This Prescription Area, found in all Management Areas, is currently estimated at approximately 111,200 acres across the DBNF.

This Prescription Area is classified as Unsuitable for Timber Production – Tree cutting, tree removal, or timber harvest may occur on an unscheduled basis to attain Desired Future Conditions.

Desired Future Condition

Emphasis of Condition: This area is managed to protect, maintain, or enhance habitat conditions for cliffline associated PETS and Conservation species. Sandstone and/or limestone rock form most of the clifflines on the DBNF.

Microclimate conditions, primarily the temperature and humidity associated with this landscape feature, persist. Overstory trees within this Prescription Area are generally old and usually replaced by natural processes. The forest community within this area varies a great deal because clifflines may occur anywhere on the forest ranging from low elevation streamside areas and higher elevation ridgetops.

Desired Ecosystem Condition: This area is managed to maintain its unique ecosystem and to support habitat for viable populations of the flora and fauna that are cliffline associated. Clifflines also function as travelways for many forest species and serve to maintain connectivity between other habitat areas. This ecosystem contains diverse transition zones, from dry to xeric above the cliff, to mesic or riparian communities below. Old trees are often found both above and below clifflines. Depending on the specific location, these trees may be fairly widely scattered or heavily stocked. Prescribed fire is allowed in this area and trees may show occasional scorch marks. Non-native, invasive species do not occur within the Cliffline Community Prescription Area.

Dry to xeric forest communities above clifflines are dominated by yellow pine and oak forest types on sandstone cliffs and a mixture of oaks, other hardwoods, and redcedar on limestone cliffs. Below sandstone cliffs, in sheltered areas, such as east or north facing slopes, large hemlock and yellow-poplar trees may dominate the overstory vegetation. More exposed areas facing south and west below sandstone cliffs may be dominated by mixed oak and other hardwoods or by mixed oak and yellow pines. Below limestone cliffs, oaks tend to dominate the forest, however, in more sheltered areas, large sugar maples, yellow-poplars, hemlocks and yellow buckeyes may dominate.

Clifflines often have seasonal, or ephemeral, wet driplines containing both flora and fauna that require such environments. Cave openings and rockshelters are common in this area. Many species of bats and other small animals inhabit dark areas and caves at various points along these cliffs. In the Red River Gorge Geological Area, white-haired goldenrod may be found in rockshelters along the base of clifflines.

Desired Facilities and Human Activities: Where PETS species, habitat for Conservation species, and heritage resources are adequately protected, an occasional trail or stairway may allow access across clifflines. The rich heritage resources occurring here are evaluated and protected, but institutional research is authorized only by written agreement. Dispersed recreation (e.g., hiking, rock climbing, rappelling, bouldering, and camping) is generally allowed, unless adverse impacts to PETS species, habitat for Conservation species, or heritage resources listed or potentially eligible for listing on the National Register of Historic Places, cannot be mitigated.

Goals and Objectives

1.C-Goal 1. Maintain the physical and microclimate conditions so that habitat for species within this uniquely important ecosystem persists on the Forest over the planning period. Manage clifflines to maintain their ecosystems, thereby protecting habitat for flora and fauna that require these ecosystems.

1.C-Objective 1.A. Develop a comprehensive, Forestwide plan for managing cliffline-related recreational activities.

1.C-Goal 2. Bring about the delisting of white-haired goldenrod.

1.C-Objective 2.A. Complete recovery plan recommendations relating to white-haired goldenrod sites.

1.C-Objective 2.B. Participate in the delisting procedure for white-haired goldenrod.

1.C-Goal 3. Manage clifflines, including rockshelters, to protect and allow study of the rich archaeological deposits frequently found in this area. Respect Native American values and protect traditional heritage properties whenever possible.

1.C-Objective 3.A. Initiate a site-stabilization program for known archaeological sites, in consultation with the State Historic Preservation Officer and interested federally recognized tribes.

1.C-Objective 3.B. Initiate a data recovery plan for significant archaeological sites that cannot be adequately protected.

Standards

MINERALS

1.C-MIN-1. In the area above the cliffline, the surface is not to be disturbed during any federal mineral exploration or development activity; development of federally owned oil and gas is subject to the No-Surface-Occupancy stipulation. In the area below the cliffline, surface occupancy is authorized only when these activities will not negatively impact PETS species, habitat for Conservation species, or heritage resources listed or potentially eligible for listing on the National Register of Historic Places; in addition, development of federally owned oil and gas is subject to the controlled surface use stipulation.

ROADS/ENGINEERING

1.C-ENG-1. Subject to valid existing rights, new roads or rights-of-way will not be permitted in the cliffline zone, if they are likely to negatively impact PETS species, habitat for Conservation species, or heritage resources listed or potentially eligible for listing on the National Register of Historic Places.

RECREATION

1.C-REC-1. New recreation facilities will not be permitted in the cliffline zone if they are determined to negatively impact heritage resources listed or potentially eligible for listing on the National Register of Historic Places.

1.C-REC-2. Any new areas developed for cliffline related recreation activities, e.g. rock climbing, bouldering, or rappelling, must receive Forest Service authorization prior to development. Improvements to existing developments that may substantially increase use of a cliffline related area must also receive prior authorization from the Forest Service. Activities that constitute development include, but are not limited to:

a) Permanent installation of safety devices such as bolts, straps, cam devices, or chocks

b) Construction of access trails

c) Clearing of vegetation

1.C-REC-3. Camping is not permitted within 100 feet of the base of any cliff or the back of any rockshelter, unless at a designated site.

1.C-REC-4. No campfire or stove fire is permitted within 100 feet of the base of a cliff or the back of any rockshelter, unless at a designated site.

1.C-REC-5. Areas will be managed to meet or exceed the Recreation Opportunity Spectrum experiences defined as semi-primitive non-motorized, semi-primitive motorized, and roaded natural.

WILDLIFE

1.C-WLF-1. Permit site-specific vegetative manipulation only when its purpose and need is to improve or sustain habitat for PETS species or habitat for Conservation species.

1.C-WLF-2. Management activities will not concentrate public use in the vicinity of clifflines, if such is detrimental to PETS species or habitat for Conservation species.

1.C-WLF-3. Protect peregrine falcon aerie (nesting) sites from human disturbance between February 1 and June 30. Determine size of these protection areas, based on terrain and activities known to occur near the nest site, in consultation with the Kentucky Department of Fish and Wildlife Resources.

VEGETATION MANAGEMENT

1.C-VEG-1. Allow harvest of wood products only as an output in pursuing other resource objectives.

1.C-VEG-2. When timber is harvested, heavy equipment such as skidders or yarders are not to be allowed in this area. Cable logging corridors may cross this area when cable operations are necessary for the management of the cliffline or adjacent Prescription Areas, only when no other reasonable access is available. Logs may be end-lined or cabled from or through this area.

1.C-VEG-3. Collection of non-timber forest products within 50 feet of a cliffline is subject to the following restrictions:

a) Personal use moss collection is prohibited.

b) Collection of other species within this zone is limited to those species that cannot be feasibly collected elsewhere (e.g., no collection of mountain laurel is allowed within cliffline areas because it can be collected on other upland or midslope sites.)

c) For ground disturbing activities (transplants, root digging, etc.) a maximum of 10 plants will be allowed per permit, with no more than two permits sold to an individual per year.

d) Non-destructive activities (seed collection, cuttings, etc.) are allowed for all species unless otherwise prohibited.

Land Between the Lakes Plan Standards

Soil, Water, and Air Resources

1. Locate fords only where stable channel conditions will support the designed use. Maintain stream pattern and channel geometry when modifying a crossing.

2. Within the area, 25 feet either side of an ephemeral stream, management activities will maintain the ability of the area to filter sediment from upslope disturbances, provide sediment control within the area, and maintain channel stability downstream. New projects within areas adjacent to ephemeral streams will be designed and mitigated for soil types classified as hydric, highly erodible, or occurring on slopes greater than 30 percent.

3. All new stream crossings will be designed and constructed to allow passage of aquatic organisms, and to not significantly alter the natural stream flow regime.

4. When constructing stream crossings, ensure that approach sections are aligned with the stream channel at as near a right angle as possible in order to minimize the length of streamside disturbances. Wherever feasible, locate riparian corridor crossings to minimize the amount of fill material needed and minimize channel impacts.

5. If crossings and culverts are removed, stream banks and channels will be restored to a natural size and shape.

6. Disturbed soil must be stabilized promptly by mulching, geo-textiles, vegetation, or other approved means.

7. All areas requiring re-vegetation for erosion control will be treated within three months following the closeout of the ground disturbing activity. The areas will be considered successfully treated when 85 percent or greater vegetation cover is established within two years of the initial treatment.

8. Limit the sum of severely burned and detrimentally compacted, puddled, and displaced land (as defined in the R8 SWCP) to no more than 15 percent of any project or unit area.

9. Soil disturbing activities (excluding roads, trails, and restoration areas) will not take place on water-saturated soils. Standing water and puddling are evidence of a saturated condition. When soil moisture conditions make the soil prone to compaction, soil disturbing activities will not take place.

10. Closure of extensively-used trails and riding areas will be considered for rainfall events exceeding 4.5 inches within a 24-hour period (approximately 20 percent chance of occurrence per year). However, closure may be considered after lesser rainfall events depending upon time of year, expected use, and recent precipitation totals.

11. Water control structures, necessary for the control of surface water movement from disturbed sites, will be installed during construction for temporary roads and within two weeks following the completion of disturbing activity for skid trails.

12. Water control structures necessary for the control of surface water movement on prescribed fire lines will be installed during fire line construction.

13. Permanent fire lines will have water control structures maintained. Temporary fire lines will be rehabilitated as soon as practicable after any fire.

14. Existing barriers (e.g. streams, lakes, wetlands, roads, and trails) are used whenever possible to reduce the need for fire line construction and to minimize resource impacts. Fire line construction within riparian corridors must be designed in coordination with a resource advisor.

Forest and Open Lands Management

15. Intentional establishment of non-native, invasive plant species, as defined by the Regional Forester's invasive species list, is prohibited.

16. Areas are not burned under prescription for at least 30 days after herbicide treatment.

17. Weather is monitored and the herbicide treatment is suspended if temperature, humidity, or wind become unfavorable as follows:

	Temperatures Higher Than	Humidity Less Than	Wind (at Target) Greater Than
Ground:			
Hand (cut surface)	N.A.	N.A.	N.A.
Hand (other)	98°F	20%	15 mph
Mechanical (liquid)	95°F	30%	10 mph
Mechanical (granular)	N.A.	N.A.	10 mph
Aerial:			
Liquid	90°F	50%	5 mph
Granular	N.A.	N.A.	8 mph

18. A certified pesticide applicator supervises each Forest Service application crew and trains crew members in personal safety, proper handling and application of herbicides, and proper disposal of empty containers.

19. Application equipment, empty herbicide containers, clothes worn during treatment, and skin are not cleaned in open water or wells. Mixing and cleaning water must come from a public water supply and be transported in separate labeled containers.

20. No herbicide is ground applied within 30 horizontal feet of lakes, wetlands, or perennial or intermittent springs and streams. No herbicide is applied within 100 horizontal feet of any public or domestic water source. Selective treatments (which require added site-specific analysis and use of aquatic-labeled herbicides) may occur within these corridors only to prevent significant environmental damage such as noxious weed infestations. Corridors are clearly marked before treatment so applicators can easily see and avoid them.

21. Herbicide mixing, loading, or cleaning areas in the field are not located within 200 feet of private land, open water or wells, or other sensitive areas.

22. Herbicides and application methods are chosen to minimize risk to human and wildlife health and the environment. Diesel oil will not be used as a carrier for herbicides except as it may be a component of a formulated product when purchased from the manufacturer. Vegetable oils will be used as the carrier for herbicides when available and compatible with the application proposed.

23. Herbicides are applied at the lowest rate effective in meeting project objectives and according to guidelines for protecting human (National Research Council 1983) and wildlife health (EPA, 1986). Application rate and work time must not exceed levels that pose an unacceptable level of risk to human or wildlife health. If the rate or exposure time being evaluated causes the Margin of Safety (MOS) or the Hazard Quotient (HQ) computed for a proposed treatment to fail to achieve the current Forest Service R8 standard for acceptability (acceptability requires a MOS > 100 or a HQ of < 1.0 depending on the standard reported in

the Risk Assessment cited), additional risk management must be undertaken to reduce unacceptable risks to acceptable levels, or an alternative method of treatment must be used.

24. Nozzles that produce large droplets (mean droplet size of 50 microns or larger) or streams of herbicide are used. Nozzles that produce fine droplets are used only for hand treatment or open land treatment where distance from nozzle to target does not exceed 8 feet.

25. With the exception of permittee treatment of right-of-way corridors that are continuous into or out of private land and through Forest Service managed areas, no herbicide is broadcast within 100 feet of private land or 300 feet of a private residence, unless the landowner agrees to closer treatment. Corridors are clearly marked before treatment so applicators can easily see and avoid them.

26. With the exception of treatments designed to release designated vegetation selectively resistant to the herbicide proposed for use or to prepare sites for planting with such vegetation, no soil-active herbicide is applied within 30 feet of the drip line of non-target vegetation specifically designated for retention (e.g., den trees, hardwood inclusions, adjacent untreated stands) within or next to the treated area. Side pruning is allowed, but movement of herbicide to the root systems of non-target plants must be avoided. Corridors are clearly marked before treatment so applicators can easily see and avoid them.

27. No herbicide shall be broadcast ground-applied within 60 feet of any known threatened, endangered, proposed, or sensitive plant. Corridors are clearly marked before treatment so applicators can easily see and avoid them. Exceptions will be made when a treatment using herbicide is necessary to protect or prevent the loss of habitat, and a site-specific analysis and BE confirms that an acceptable risk from such use is possible.

28. No herbicide is broadcast on rock outcrops or sinkholes. No soil-active herbicide with a half-life longer than three months is broadcast on slopes over 45 percent. Such areas are clearly marked before treatment so applicators can easily see and avoid them.

29. Snags and den trees will not be intentionally felled during vegetation management unless necessary to protect employee or visitor safety, to control insect or disease infestations, or for timber salvage in cases of significant events of tree mortality. In timber salvage cases, a minimum of six snags per acre must be retained. Retained snags may be clumped within salvage areas. Den trees are defined as being a minimum of 10 inches DBH and having a visible cavity.

30. Timber sale areas and associated reforestation practices will have a minimum 30-foot, no-equipment zone around gully heads and sidewalls. Timber may be selectively removed from within the 30-foot zone through directional felling and end-lining of logs.

31. Forest management treatments, within Core Area Prescriptions, will be limited to the minimum necessary level for maintenance and restoration of native ecological communities or to provide visitor safety. Treatments may be considered to control or prevent insect infestation and disease, and invasive, non-native plant species.

32. Slash burns are to be prescribed so they do not consume all litter and duff and do not alter structure and color of mineral soil on more than 20 percent of the burn area.

33. No heavy equipment will be used for mechanical site preparation treatments on sustained slopes greater than 35 percent. Mechanical site preparation treatments are prohibited on erodible or failure-prone soils on sustained slopes greater than 20 percent.

34. When necessary to include deciduous forest communities on mesic and alluvial site types within burning blocks, allow low intensity fires such as backing fires. Direct firing will not be done unless needed to secure control lines and to encourage ecological restoration of native communities such as canebrakes.

35. Within General Forest and Oak-Grassland Demonstration Prescription Areas, riparian corridors of native vegetation will be maintained along each side of perennial and intermittent stream courses in order to maintain fluvial and riparian functions. Corridors along perennial streams will be 100 feet measured from bankfull stage. Corridors along intermittent streams will be 50 to 75 feet measured from bankfull stage at a minimum. If a 50-foot corridor is used, a minimum of 20 feet adjacent to management activities must be in a maintained native grass or other suitable vegetative filter strip. The remaining corridor should be in shrubs and trees. Without a native grass or other suitable vegetative filter strip, the minimum corridor along intermittent streams must be 75 feet of natural vegetation.

36. The removal of embedded, large woody debris (pieces greater than four feet long and four inches in diameter) from stream channels is not allowed unless it poses a risk to public or employee safety or damage to infrastructure. The need for removal is determined on a case-by-case basis.

37. The maximum size of an opening created by forest management treatments is 40 acres. These acreage limits do not apply to areas treated as a result of catastrophic conditions such as wildland fire, insect outbreak, or severe storms. Areas managed as open lands or non-forested areas (e.g. rights-of-way and grassy openings) are not subject to this standard and are not included in the calculations of opening size, even when within or adjacent to created openings.

38. Temporary openings created by forest management treatments will be separated from each other by a minimum of 330 feet. Such openings may be clustered closer than 330 feet as long as their combined acreage does not exceed the maximum opening size. A forest management area will no longer be considered an opening when the certified re-established stand has reached an age of five years.

39. Regeneration cuts must be done only where adequate stocking of desirable species (based on management objective) is expected to occur within five years after the final cut. In two-aged systems, the final cut is the establishment cut which leaves a residual overstory. The newly established regeneration must meet the minimum stocking levels of 150 trees per acre for hardwoods and pine (except for woodlands which will be guided by the desired conditions of

the prescription). This Standard applies to both artificial and natural means of stand regeneration.

40. Vegetation management activities may be conducted within 200 feet of a trail only as a means of enhancing the trail use experience or mitigating damage caused by insects, disease, or natural disaster. Where trails cross through, or are adjacent to fields and wildlife openings, open lands management may be conducted adjacent to the trail.

41. Rare communities are to be protected from detrimental effects associated with management activities and recreational use. Site-specific analysis of proposed management actions and proposed uses identifies any protective or active management practices to enhance the rare community.

42. Mesic coves and dry-mesic transitional sites that contain clumps of mature American beech larger than one acre will be protected from detrimental effects caused by management activities. Management activities occur within these sites only where maintenance or enhancement of composition or structure is expected. Areas are surveyed for beech communities prior to initiating projects that may adversely affect them.

Heritage Resources

43. Rights of former residents regarding access, burial, decoration, and maintenance of cemeteries will be protected. Access to cemeteries will meet or exceed the type that existed when it became federal property.

Wildlife Management

44. Wildlife refuges are closed to hunting year-round. Wildlife refuges are closed to other human disturbances during specified refuge periods.

45. Where roads, utility corridors, and recreational sites intersect with riparian corridors, the resulting interruption of the riparian corridor affecting both sides of the drainage should be of minimum width needed and no more than 60 feet in length. Interruptions affecting one side of a drainage should be no greater than 300 feet parallel to the drainage.

46. Protection zones, as specified in the current guidelines for bald eagle habitat management from the US Fish and Wildlife Service, will be delineated and maintained around all bald eagle nests and communal roost sites, unless exempted or modified by the US Fish and Wildlife Service.

47. Buildings, cisterns, old bridges and other structures will be surveyed for bats prior to modification or demolition. If significant bat roosting is found, structures are maintained or alternate roosts provided. Alternate roosts must be appropriately based on species and size of colony and must be provided prior to modification.

Infrastructure, Recreation, and Administration

48. OHVs are restricted to routes and areas specifically designated as open to such vehicles. Permits may be issued for special events according to appropriateness and timing of the event.

49. Administrative uses of OHVs for activities such as maintenance and inspection of trails, open lands and prescribed fire, and emergencies such as wildfire and search and rescue will be allowed. All other cross-country motorized use (all vehicle types) is prohibited.

50. Unnecessary roads and trails, identified by an interdisciplinary team and a transportation analysis, are to be eliminated or mitigating measures planned where soil and water quality cannot be maintained within acceptable standards.

51. If unacceptable resource damage is identified to a section of trail, that section will be closed for mitigation, rerouted, and/or obliterated.

52. Utility corridors within riparian corridors or those that provide critical habitat will limit exposed soil and utilize habitat-sensitive maintenance strategies.

53. Outdoor lighting will be limited to meet minimum safety and security needs and provide protection of the dark night sky.

Environmental Education

54. All project-level decisions will involve EE staff during project development and design to integrate appropriate EE messages.

Visual Resource

55. A Scenic Integrity Objective (SIO) of Moderate or higher will be applied to new projects within Visual Quality Zones (defined below). Existing conditions will be managed as closely as feasible to the assigned SIOs.

56. Along maintenance level 3, 4 and 5 roads, Visual Quality Zones (VQZs) will be a minimum of 100 feet from road shoulders.

57. VQZs will be a minimum of 100 feet from trails, the LBL shoreline, and around facilities.

58. A long-term SIO of Moderate will be applied to those areas of LBL that lie outside of the Visual Quality Zones.

Other Sources of Design Criteria

The Area Plan is a single integrated document. The following documents are referenced to provide additional administrative, program, and project guidance for activities at LBL. Some are legal requirements while others are policies, procedures, and manuals that will be used as

guidance in project level decision-making. This is not intended to be an all-inclusive list, as it is expected that over time some of these will be amended or deleted, while others will be added. LBL will comply with applicable laws, regulations, Executive Orders, and policies.

National Environmental Policy Act (NEPA) of 1969

National Forest Management Act (NFMA) of 1976, as amended in 1982

Land Between The Lakes Protection Act of 1998

USDA Forest Service National Strategic Plan Goals (as amended)

USDA Forest Service Handbook and Manual

United States Department of the Interior, Fish and Wildlife Service, Biological Assessment for the Land Between The Lakes Land and Resource Management Plan, FWS #05-0008, October, 2004

Tennessee Valley Authority Natural Resources Management Plan of 1994

Land Between The Lakes Heritage Resource Management Plan

Habitat Management Guide for the Bald Eagle in the Southeast Region

R8 Soil and Water Conservation Practices

Memorandum of Agreement incorporating the Land Between The Lakes National Recreation Area into the Regional Programmatic Agreement Between The USDA Forest Service, Southern Region; the State Historic Preservation Officers of AL, AR, FL, GA, KY, LA, MS, NC, OK, PR, SC, TN, TX, VA, WV; and the Advisory Council on Historic Preservation Concerning the Management of Historic Resources on Land Between The Lakes NRA, FS #01-MR-11086001-01.

Title 2600 – Wildlife Management; Memorandum of Understanding between Kentucky Department of Fish and Wildlife Resources and USDA Forest Service, May 19, 2000.

Title 2600 – Wildlife Management; Memorandum of Understanding between Tennessee Wildlife Resources Agency and USDA Forest Service, September 11, 2000.

Sportsmen's Access to Federal Public Lands Memorandum of Understanding between USDA Forest Service, USDI Bureau of Land Management Fish and Wildlife Service and Sportsmen's Groups; FS Agreement Number: 03-MU-11132424-275, July, 2003

Other federal statutes (as amended) are applicable to resource management at LBL include:

The National Historic Preservation Act of 1966

The Endangered Species Act of 1973

The Migratory Bird Act (Executive Order 13186)

The Clean Air Act of 1990

The Clean Water Act of 1977

Native American Graves Protection and Repatriation Act

Government to government relations with Native American Tribal governments (Executive Order dated 04/29/1994)

Indian Sacred Sites (Executive Order 13007, 05/24/1996)

Consultation and Coordination with Indian Tribal governments (Executive Order dated 05/14/1996)

Multiple Use Sustained Yield Act of 1960

The Archeological Resources Protection Act of 1979

Cherokee National Forest Revised Land and Resource Management Plan (RLRMP) Objectives and Standards pertaining to bat habitat

http://www.fs.fed.us/r8/cherokee/planning/final_forest_plan/index.shtml

- FW-1: Water is not diverted from streams (perennial or intermittent) or lakes when an instream flow needs or water level assessment indicates the diversion would adversely affect protection of stream processes, aquatic and riparian habitats and communities, or recreation and aesthetic values.

- FW-2: Resource management activities that may affect soil and/or water quality will implement Tennessee best management practices (BMPs) as a minimum to achieve soil and water quality objectives. When standards exceed BMPs, standards shall take precedence over Tennessee BMPs.

- FW-3: Streamside filter zones will be used between new areas of significant ground disturbance such as roads, skid trails, log landings and perennial and intermittent streams, and other bodies of water.

- FW-6: The width of the channeled ephemeral stream filter zone will be 25 feet on either side of these stream types.

- FW-7: Locate and construct roads, trails and other disturbed sites in a manner that minimizes sediment discharge from the disturbance into streams, lakes, channeled ephemerals and wetlands.

- FW-8: Motorized vehicles are restricted in the channeled ephemeral stream zone to designated crossings. Motorized vehicles may be allowed in the channeled ephemeral stream zone outside of designated crossings on a case-by-case basis, when motorized vehicle entry would create less ground disturbance than cable winching.

- FW-9: Within the channeled ephemeral stream zone, a minimum of 15-20 square feet of basal area will be left following removal activities.

- FW-10: The removal of large woody debris from within the channeled ephemeral stream zone is allowed only if the woody debris poses a significant risk to stream flow or water quality, degrades habitat for riparian-dependent species, or poses a threat to private property or forest service infrastructure (i.e. bridges). The need for removal is determined on a case-by-case basis.

- FW-11: New permanent and temporary roads on either side of channeled ephemeral crossings within the channeled ephemeral stream zone are treated to minimize impacts.

- FW-12: New OHV trails are not allowed within the channeled ephemeral stream zone except at designated crossings or where the trail location requires some encroachment,

for example, to accommodate steep terrain. When existing OHV trails within the channeled ephemeral stream zone are resulting in water quality impairment below Tennessee water quality standards appropriate mitigation measures (including OHV trail closure) will be implemented.

- FW-13: New federal mineral leases will contain a controlled surface use stipulation for the channeled ephemeral stream zone.
- FW-14: Soil-active herbicides are not broadcast within channeled ephemeral stream zones. Selective treatments with aquatic-labeled herbicides may occur within this zone following site-specific analysis. Stream zones are identified before treatment, so applicators can easily avoid them.
- FW-15: No herbicide is aerially applied within 200 horizontal feet, nor ground applied within 30 horizontal feet, of lakes, wetlands, or perennial or intermittent springs and streams. No herbicide is applied within 100 horizontal feet of any public or domestic water source. Selective treatments (which require added site-specific analysis and use of aquatic-labeled herbicides) may occur within these buffers only to prevent environmental damage such as noxious weed infestations. Buffers are clearly marked before treatment so applicators can easily see and avoid them.
- FW-16: Pesticide mixing, loading, or cleaning areas are not located within the channeled ephemeral stream zone.
- FW-17: Feeding troughs, watering troughs, and salt and mineral blocks are not allowed inside the channeled ephemeral stream zone.
- FW-18: When preparing for prescribed fire, use wet lines, black lines or hand lines within the channeled ephemeral stream zone and across ephemeral channels to minimize soil disturbance. Use water diversions to keep sediment out of the stream channel. Removal of litter and debris from the channel is permissible. Do not construct firelines in channels, but they may be used as natural firebreaks.
- FW-19: Do not plow firelines with heavy mechanized equipment (e.g. bulldozers and tractors) in channeled ephemeral zones when preparing for prescribed fire.
- OBJECTIVE 14.02 Provide upland water sources approximately every 0.5 miles, to provide an important habitat element for wildlife, including the endangered Indiana bat. Water sources are comprised of both permanent ponds and ephemeral pools and are often located in openings or near road corridors that allow access by bats.
- FW-28: Protect individuals and locations of federally listed threatened and endangered species, and individuals and locations of other species needed to maintain their viability

within the planning area. Site-specific analysis of proposed management actions will identify any protective measures.

- FW-30 Construct and maintain gates at entrances of caves and mines occupied by federally listed bats, or bats deemed at risk of losing viability within the planning area, as needed to reduce frequency and degree of human intrusion.

- FW-31: Gates or other structures that allow for entrance and egress by bats are constructed and maintained at entrances of caves and mines occupied by significant populations of bats to reduce frequency and degree of human intrusion. Forest supervisor closure orders are acceptable as long as monitoring indicates the orders are effective. If orders are ineffective, appropriate physical structures must be constructed. camping and fire-building at the entrance to caves, mines, and rock shelters used by these species is prohibited. to discourage human disturbance at these caves, nonessential public access routes within 0.25 miles of cave entrances are closed during periods when bats are present. Human access to caves for educational and recreational use may be allowed during periods when bats are not present. If damage to caves occurs as a result of human use, the caves may be closed to human uses. Access for activities such as surveys and scientific study during times when bats are present is determined on a case-by-case basis.

- FW-32: Before old buildings and other man-made structures are structurally modified or demolished, they are surveyed for bats. If TES bat roosting is found, these structures will be maintained, or alternative roosts suitable for the species and colony size will be provided prior to adverse modification or destruction, in consultation with the US Fish and Wildlife Service. Verify use of alternative structure prior to modification or destruction.

- FW-33: Trees known to have been used as roosts by Indiana bats are protected from cutting and/or modification until they are no longer suitable as roost trees, unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it occurs only after consultation with the US Fish and Wildlife Service.

- FW-34: The following points apply to roost tree retention for Indiana bat:

- GENERAL. For Indiana bat, snags with exfoliating bark are not intentionally felled unless needed to provide for immediate safety of the public, employees, or contractors. Exceptions may be made for small-scale projects such as insect and disease control, salvage harvesting, and facility construction.

- FUEL WOOD COLLECTION. For Indiana bats, no shagbark hickory greater than 6 inches dbh will be cut and no snags will be cut between May 1 and August 15 for fuel wood.

- Routine salvage harvesting. for non-catastrophic salvage events, an average of 6 of the largest suitable snags (snags with exfoliating bark and/or suitable cracks and crevices) per acre will be left. All shagbark hickories greater than 6 inches dbh will be left. Salvage harvesting can occur between May 15 and August 15 only if site-specific inventories indicate Indiana bats are not likely to be present. Inventories are good only for the season in which they are performed. Salvage harvesting can occur between August 16 and May 14 without a site-specific inventory, and additional Indiana bat coordination with US Fish and Wildlife is not required.

- CATASTROPHIC SALVAGE EVENTS. Project-level NEPA and ESA analysis will be conducted.

- FOREST REGENERATION TREATMENTS > 10 ACRES. When implementing regeneration treatments in hardwood-dominated forest types, a minimum average basal area of 15 square feet per acre is retained throughout the rotation. In some portion of the treatment area, residual basal area should be clumped or left in travel corridors. All snags and all shagbark hickory over 6 inches dbh are retained except those that are immediate hazards. If additional trees are needed to meet the basal area requirements, priority should be given to hollow/den trees or trees that exhibit, or are likely to develop, characteristics favored by roosting Indiana bats. Snags do not count toward the leave basal area. Borders of clearcut units will be irregularly shaped.

- FOREST REGENERATION TREATMENTS < 10 ACRES. No residual retention basal area (live trees) is required. All snags will be retained unless they are immediate hazards. Shagbark hickory greater than 6 inches dbh is retained.

- FW-35: During all silvicultural treatments in hardwood forest types, retention priority is given to the largest available trees that exhibit characteristics favored by roosting Indiana bats.

- FW-36: To avoid injury to non-volant young Indiana bats, prescribed burning of potential maternity roosting habitat between May 1 and August 15 is prohibited except where site-specific inventories coordinated with USFWS indicate Indiana bats are not likely to be present, unless otherwise determined by project-level consultation with USFWS.

- FW-37: a 0.25-mile buffer of undisturbed forest will be maintained around gray bat maternity and hibernation colony sites; Virginia big-eared bat maternity, bachelor, or winter colony sites; and Rafinesque’s big-eared bat maternity, bachelor, or winter colony sites. Prohibited activities within this buffer include cutting of overstory vegetation: construction of roads, trails, or wildlife openings: and prescribed burning. Exceptions may be made where coordination with U.S. Fish and Wildlife service determines these activities to be compatible with conservation and recovery of these species.

- FW-38: Appropriate consultation with the U.S. Fish and Wildlife Service is conducted on all projects within 20 miles of known gray bat maternity sites, when these projects may affect canopy cover within perennial riparian corridors or forested lakeshores.
- FW-62: Allow salvage of dead or down trees by personal use permit for fuelwood purposes only after coordinating with other resources (see Indiana bat standards).
- FW-90: Prescribed burn plans written for areas near caves or mines that contain bats are identified. These sites are designated as smoke sensitive targets and plan to avoid smoke entering cave or mine openings when bats are present.
- FW-97: Dormant season burns have a cutoff date of May 1st or the break of dormancy, as recommended by multi-disciplinary review and TWRA with decision by line officer.
- RX9F-27: As soon as possible following discovery, accessible caves and mines are surveyed to determine use by bats.
- RX9F-28: Until caves or mines have been surveyed for use by bats, it is assumed that federally-listed bats are present and habitat is maintained for them by applying appropriate standards for occupied caves and mines (see forestwide standards, terrestrial wildlife and tes species habitat).
- RX9F-29: A minimum buffer of 500 feet is maintained around the perimeter of portals associated with caves, cave collapse areas, mines and sinkholes that are capable of supporting cave-associated species. Prohibited activities within this buffer include use of wheeled or tractor vehicles (except on existing roads or as needed for cave protection and maintenance activities), mechanical site preparation, vegetation cutting, recreation site construction, tractor-constructed firelines, livestock grazing, herbicide application, and construction of new roads (including temporary roads), skid trails, and log landings. Wider buffers are identified through site-specific analysis when necessary to protect cave and mines from subterranean and surface impacts, such as recreational disturbance, sedimentation and other adverse effects to water quality, and changes in air temperature and flow.
- RX9F-30: Use of caves for disposal sites or alteration of cave entrances is prohibited, except for construction of appropriate cave gates or closures. Where previously modified entrances are causing adverse impacts to cave fauna, entrances are restored to eliminate adverse effects.
- RX9F-31: Construct and maintain gates at entrances of caves and mines occupied by federally listed bats, or bats deemed at risk of losing viability within the planning area, as needed to reduce frequency and degree of human intrusion.

- RX9F-32: Gates or other structures that allow for entrance and egress by bats are constructed and maintained at entrances of caves and mines occupied by significant populations of bats to reduce frequency and degree of human intrusion. Forest supervisor closure orders are acceptable if monitoring indicates the orders are effective. If orders are ineffective, construct appropriate physical structures. Camping and fire-building at cave and mine entrances and rock shelters used by these species is prohibited. To discourage human disturbance at these caves, nonessential public access routes within 0.25 miles of cave entrances are closed during periods when bats are present. Human access to caves for educational and recreational use may be allowed during periods when bats are not present. If damage to caves occurs as a result of human use, caves may be closed to human uses. Access for activities such as surveys and scientific study during times when bats are present is determined on a case-by-case basis.
- RX9F-33: In prescribed burn plans written for areas near caves or mines, identify these sites as smoke sensitive targets and plan to avoid smoke entering cave or mine openings when bats and other viability concern species are present.

Please refer to:

Revised Land and Resource Management Plan, Sumter National Forest

Pages 2-7 and 2-8.

Standards:

FW-18 Standing snags, bird peck trees, and living den trees will not be cut or bulldozed during vegetation management treatments unrelated to timber regeneration treatments, unless necessary to provide for public or employee safety.

FW-22 For all timber regeneration treatments, including salvage activities, two or more snags per acre from the larger size classes will be retained. Live den trees will not be cut unless necessary to provide for public or employee safety. Distribution of retained snags may be clumped.

FW-23 On the Andrew Pickens, potential black bear din trees will be retained during all vegetation management treatments occurring in habitats suitable for bears. Potential den trees are those that are greater than 20" diameter at breast height (DBH) and are hollow with broken tops.

Chattahoochee-Oconee National Forests Proposed LRMP Standards to be incorporated through a LRMP Amendment.

FW-233. Trees known to have been used as roosts by Indiana bats or other federally protected bat species are protected from cutting and/or modification until they are no longer suitable as roost trees, unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it occurs only after consultation with the U.S. Fish and Wildlife Service.

FW-234. No dead or live shagbark hickory greater than six inches DBH will be cut for fuel wood. No snags (standing dead trees) will be cut for fuel wood from April 1 through August 31.

FW-235. Snags are not intentionally felled from April 1 through August 31 unless needed to provide for immediate safety of the public, employees, or contractors. Exceptions may be made for projects such as insect and disease control, salvage harvesting, and facility construction. Exceptions will require evaluation by a qualified individual (i.e. biologist or other individual approved by the district biologist) for current Indiana bat or other protected bat species use and may require coordination with the U.S. Fish and Wildlife Service.

FW-236. For non-silvicultural projects which include, but are not limited to prescribed fire line construction, right of way clearing, hazard tree removal and recreation area management, currently suitable Indiana bat or other protected bat species roost trees will be felled from September 1 through March 31. If tree removal occurs at other times, the trees shall be evaluated by a qualified individual (i.e. biologist or other individual approved by the district biologist) for current Indiana bat or other protected bat species use and may require coordination with the U.S. Fish and Wildlife Service.

FW-237. During all silvicultural treatments, retention priority is given to the largest live available trees that exhibit characteristics favored by roosting Indiana bats or other federally protected bat species while still meeting stand prescription objectives.

> *Note: A typical roost is located under exfoliating bark of a dead ash, elm, hickory, maple, oak, poplar or pine although any live or dead tree that retains large, thick slabs of peeling bark is suitable. Average diameter of maternity roost trees is 45 cm (18 in) and average diameter of roosts used by adult males is 33 cm (13 in). Height of the tree (snag) is greater than 3m (10 ft.), but height of the roosting tree is not as important as height relative to surrounding trees and the position of the snag relative to other trees, because relative height and position*

affect the amount of solar exposure. Primary roosts usually receive direct sunlight for more than half the day. Access to the roost site is unimpeded by vines or small branches. The tree is typically within canopy gaps in a forest, in a fence line, or along a wooded edge. Primary roosts usually are not found in the middle of extensive open fields, but often are within 15m (50 ft.) of a forest edge. Primary roosts usually are in trees that are in early-to-mid stages of decay (U.S. Fish and Wildlife Service, 2007).

FW-238. Tree cutting, prescribed burning, aerial pesticide application may not be conducted within 2.5 miles of any Indiana bat maternity colony or other federally protected bat species maternity colony from May 1 through August 15, unless authorized by the U.S. Fish and Wildlife Service.

FW-239. Compliance of Indiana bat and other protected bat species standards will be monitored. The Forest will submit an annual report to the U.S. Fish and Wildlife Service documenting compliance with Standards. The documentation will include the amount of timber harvesting and amount of prescribed burning on the Forests that year.

FW-240. Monitoring for Indiana bats and other protected bat species will be conducted through acoustic surveys and mist netting efforts or other methods acceptable to the U.S. Fish and Wildlife Service. Acoustic survey routes and areas for mist netting surveys will be developed in coordination with the U.S. Fish and Wildlife Service and Georgia Department of Natural Resources.

The Chattahoochee-Oconee National Forests proposes to modify the following standards to the Land and Resource Management Plan. Projects will also comply with these standards when applicable as described above.

Existing Standard FW-090

Unless necessary for insect or disease control or to provide for public and employee safety, standing snags or den trees will not be cut or bulldozed during vegetation management treatments unrelated to timber salvage. For timber salvage treatments, all live den trees, and a minimum of five snags per acre from the largest size classes will be retained. Distribution of retained snags may be clumped (LRMP, p. 2-27).

Modified Standard FW-090

Unless necessary for insect or disease control or to provide for public and employee safety, standing snags or den trees will not be cut or bulldozed during vegetation management treatments unrelated to timber salvage. For timber salvage treatments, all live den trees, and an average of five of the largest suitable snags (snags with exfoliating bark) per acre will be left. Snags in the early stages of decay should be selected over older snags whenever possible. If possible, these snags should be clumped into groups instead of spread throughout the harvest area.

Existing Standard FW-091

In even-aged regeneration areas where at least two snags per acre are not present or cannot be retained as residuals, at least two standing snags per acre will be created from larger diameter classes within the original stand. In addition, a minimum of five of the largest diameter living trees per acre will be retained to provide potential future snags during the early and middle stages of stand development. Distribution of snags and live residuals may be scattered or clumped at stand scale. Live den trees are not to be used for snag creation, but may count toward live residuals (LRMP, p. 2-27).

Modified Standard FW-091

For all Even-aged Management and Two-aged Management (Appendix F, LRMP)

- Retain all snags and shagbark hickory in cutting units unless they are an immediate hazard.
- Sales will be designed (landing and skid trails) to avoid snag removal when possible.
- When an average of five snags per acre is not present create snags from the dominant and co-dominant trees to reach an average of five snags per acre throughout the unit.
- To meet basal area requirements priority will be given to trees that exhibit characteristics favored by roosting Indiana bats or other protected bat species while still meeting stand prescription objectives.
- Snags closer to the forest edge will be favored over those out in the middle of a large expanse. Snags do not count toward the required residual basal area.
- Residual basal area will be clumped or left in travel corridors.
- Live potential bear den trees will be retained and not be used for snag creation (See standard FW-010).

For Clearcut (Even-aged Management) and Clearcut with Reserves (Two-aged Management).

- A minimum of 15 BA will be maintained for units greater than 10 acres. Overwood will not be removed.

For Seedtree and Shelterwood (Even-aged Management) and Seedtree with Reserves and Shelterwood with Reserves (Two-aged Management).

- A minimum of 20 BA will be maintained. Overwood will not be removed.
- Windthrow protection will be provided to an average of five snags per acre by retaining all trees within 20 feet of these snags. Trees left for windthrow protection may count towards the required basal area.
- Snags selected to receive windthrow protection are those most suitable for use by Indiana bats or other protected bat species, i.e., yellow pine and oak snags of the largest size classes with exfoliating bark.

National Forests in Alabama

Forest Plan Standards (including pending proposed changes) pertaining to bat conservation.

FW-2. Unless necessary for insect or disease control or to provide for public and employee safety, standing snags and den trees will not be intentionally felled during vegetation management treatments unrelated to timber salvage. For pine timber salvage treatments, all live den trees, and minimum of 5 snags per acre, if present, from the largest size classes will be retained. Distribution of retained snags may be clumped. Within Indiana bat range, refer to the more stringent Indiana bat standards within the T&E section of this chapter.

FW-3. Unless necessary for insect or disease control or to provide for public and employee safety, den trees will not be intentionally felled during vegetation management treatments. Within Indiana bat range, refer to the more stringent Indiana bat standards within the T&E section of this chapter.

FW-4. In even-aged regeneration areas where at least 2 snags per acre are not present or cannot be retained as residuals, at least 2 standing snags/acre will be created from the larger diameter classes within the original stand. In addition, a minimum of 5 of the largest living mature trees per acre will be retained to provide potential future snags during the early and mid-successional stages of stand development. Distribution of snags and live residuals may be scattered or clumped. Live den trees are not to be used for snag creation, but may count toward live residuals.

FW-94. Watershed boundaries are used to identify primary cave protection zones that extend approximately 0.5 miles surrounding Indiana bat hibernacula, and secondary cave protection zones that extend approximately 1-1/2 miles surrounding the primary zone (2 miles total). Management activities within these zones are coordinated with U.S. Fish and Wildlife Service to determine their compatibility with Indiana bat recovery.

FW-95. Within the secondary cave protection zone, a minimum of 60 percent of all forested acreage is maintained at greater than 70 years old, and a minimum of 40 percent of forest types with significant oak and hickory components is maintained at greater than 80 years old. The 0-10 age class does not exceed 10 percent of the forested acreage of the secondary buffer at any time.

FW-96. Trees known to have been used as roosts by Indiana bats are protected from cutting and/or modification until they are no longer suitable as roost trees, unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it occurs only after consultation with the US Fish and Wildlife Service.

FW-97. Snags are not intentionally felled unless needed to provide for immediate safety of the public, employees, or contractors. Exceptions may be made for projects such as insect and disease control, salvage harvesting, and facility construction, after coordination with the US Fish and Wildlife Service to determine appropriate protective measures for the Indiana bat.

FW-98. No snags or shagbark hickory greater than 6 inches DBH will be cut for fuel wood.

FW-99. During routine salvage harvesting (non-catastrophic events), an average of 6 of the largest suitable snags (snags with exfoliating bark) per acre will be left. All shagbark hickories greater than 6 inches DBH will be left. Salvage harvesting can occur at any season as long as site-specific inventories indicate Indiana bats are not likely to be present. Inventories are good only for the year they are performed. Salvage harvesting can occur between November 15 and April 15 without a site-specific inventory and additional coordination with FWS is not required.

FW-100. Gates or structures that allow for entrance and egress by bats are constructed and maintained at entrances of caves and abandoned mines occupied by significant populations of bats to reduce frequency and degree of human intrusion. Forest Supervisor Closure Orders are acceptable as long as monitoring indicates the Orders are effective. If Orders are ineffective, appropriate physical structures must be constructed. Camping and fire-building at the entrance to caves, abandoned mines, and rock shelters used by these species is prohibited. To discourage human disturbance at these caves, nonessential public access routes within 0.25 miles of cave entrances are closed during periods when bats are present. Human access to caves for educational and recreational use may be allowed during periods when bats are not present. If damage to caves occurs as a result of human use, the caves may be closed to human uses. Access for activities such as surveys and scientific study during times when bats are present is determined on a case-by-case basis.

New FW-101A. When implementing forest regeneration methods, recruit and retain snags and live loose-bark overstory species so that sufficient bat roosting habitat is provided. All snags will be retained unless they are immediate hazards.

FW-103. During all silvicultural treatments in hardwood forest types, retention priority is given to the largest available trees that exhibit characteristics favored by roosting Indiana bats.

New FW-104A. Provide and/or conserve upland water sources as appropriate for rare bats, where they are considered to be limiting habitat factors.

FW-105. To avoid harassment of swarming Indiana bats, tree-cutting and prescribed burning are prohibited between September 1 and December 1 within the primary and secondary zones of hibernacula.

FW-110. Gates or other structures that allow for entrance and egress by bats are constructed and maintained at entrances of caves and mines occupied by significant populations of bats to reduce frequency and degree of human intrusion. Forest Supervisor Closure Orders are acceptable as long as monitoring indicates the Orders are effective. If Orders are ineffective, appropriate physical structures must be constructed. Camping and fire-building at the entrance to caves, mines, and rock shelters used by these species is prohibited. To discourage human disturbance at these caves, nonessential public access routes within 0.25 miles of cave entrances are closed during periods when bats are present. Human access to caves for educational and recreational use may be allowed during periods when bats are not present. If damage to caves occurs as a result of human use, the caves may be closed to human uses. Access for activities such as surveys and scientific study during times when bats are present is determined on a case-by-case basis.

FW-111. Prescribed burn plans written for areas near caves or mines that contain bats identify these sites as smoke sensitive targets and plan to avoid smoke entering cave or mine openings when bats are present.

FW-112. Before old buildings and other man-made structures are structurally modified or demolished, they are surveyed for bats. If significant bat roosting is found, these structures will be maintained, or alternative roosts suitable for the species and colony size will be provided prior to adverse modification or destruction.

1. Stumps, standing snags, and den trees should generally be retained to maintain structural diversity during vegetation management treatments. Exceptions may be made when necessary to control insects or disease or to provide for public and employee safety. Distribution of retained snags may be clumped.

2. Project planning and implementation should include measures to provide protection for the "species needing occurrence protection" group (see final environmental impact statement (FEIS), appendix H).

3. Planning and implementation of timber harvests and other silvicultural treatments that reduce canopy cover should include measures to provide protection for threatened, endangered, sensitive, and locally rare species that are susceptible to damage or extirpation from canopy cover reduction. This group is referred to as "species sensitive to canopy cover modifications" (see FEIS, appendix H).

4. Dead and downed logs or other woody debris should generally not be removed from rare communities. Where needed to ensure public or employee safety, snags may be felled, but will be retained within the community as downed wood.

5. Before buildings, bridges, wells, cisterns, and other man-made structures are structurally modified or demolished, they should be surveyed for bats. If significant bat roosting is found, these structures should be maintained where consistent with multiple-use objectives, or alternative roosts suitable for the species and colony size should be provided prior to adverse modification or destruction when feasible.

6. New road bridge construction should include bat-friendly technology and construction materials to provide roosting habitat for bats.

7. If occupied Indiana bat maternity roost trees are discovered, protect them from physical disturbance until they naturally fall to the ground.

8. Based on site-specific consultation, Indiana bat areas of use (foraging and roosting) should be designated based on site conditions, radio-tracking or other survey information, and best available information regarding maternity habitat needs. Minimize human disturbance in the maternity colony areas of use until the colony has left the maternity area for hibernation.

9. Within the Indiana bat area of use (known or likely foraging and roosting) determined for each maternity colony, prescribed burning should generally be conducted during the hibernation season.

10. Protect occupied Indiana bat male roost trees discovered during the summer season (not migration), from physical disturbance by designating a 75-foot radius buffer zone around the tree(s). The buffer zone shall remain in place until migration to hibernacula begins (around September 1). Prohibit ground-disturbing activity or timber harvest within the buffer zone. Prescribed burning may be done within the buffer zone if a fireline is manually constructed no less than 25 feet from, and completely around, the tree to prevent it from catching fire.

11. Where Indiana bats are known to occur, maintain a component of large, mature trees in hardwood harvest areas, retaining at least three live trees per acre greater than 20 inches d.b.h. of these preferred species (leave trees will be located along edges of the harvest area or in clumps to maximize their benefit to bats): silver maple (Acer saccharinum), bitternut hickory (Carya cordiformis), shellbark hickory (Carya laciniosa), shagbark hickory (Carya ovata), white ash (Fraxinus americana), green ash (Fraxinus pennsylvanica), eastern cottonwood (Populus deltoides), white oak (Quercus alba), northern red oak (Quercus rubra), post oak (Quercus stellata), black locust (Robinia pseudoacacia), American elm (Ulmus americana), slippery elm (Ulmus rubra).

12. Where Indiana bats are known to occur, any dead, decadent or identified hazard tree that has

characteristics of a potential Indiana bat maternal roost tree (splintered bole that provides crevices, evidence of decay so that either their bark is exfoliating, it possesses cavities, or dead portions of the tree have been used, excavated, or occupied by species such as woodpeckers or other cavity nesting birds and, most importantly, exposure of the roost to sunlight) will not be removed until consultation with a Forest Service biologist has been completed. An exception is trees may be cut that are an immediate safety danger to an individual.

13. Where Indiana bats are known to occur, project areas where large overstory hardwood trees could be cut, mist-netting surveys, exit surveys, or other surveys approved by the U.S. Fish and Wildlife Service, must be done to identify known Indiana bat roosting habitats prior to harvest or cutting. Mature leave-trees in areas where the shelterwood or shelterwood-with-reserves harvest methods are applied (including the uplands) should include mixtures of tree species preferred by Indiana bats for roosting: Silver maple, bitternut hickory, shellbark hickory, shagbark hickory, white ash, green ash, eastern cottonwood, white oak, northern red oak, post oak, black locust, American elm and slippery elm.

14. Maintain a component of large over-mature trees, if available, in all uneven-aged harvest units to provide suitable roosting habitat for Indiana bats where they occur.

15. To protect Indiana bat foraging habitat and travel corridors along rivers and streams on the Holly Springs Unit, a forested stream buffer strip will be maintained in all areas receiving vegetation management activities. The buffer will be a minimum of 50 feet on each side of perennial streams or rivers and 25 feet on both sides of intermittent streams.

16. Ensure all Forest Service employees and contractors working within Indiana bat habitat are educated to recognize and avoid potential Indiana bat roost trees and the required habitat components for a complete Indiana bat home range.

17. When treating southern pine beetle infestations within an Indiana bat roosting area, trees vacated by southern pine beetle will not be cut or chemically treated. Un-infested trees within a 200-foot buffer zone will not be cut or chemically treated unless such efforts would likely prevent southern pine beetle infestation. Disturbance in the maternity roosting area will be kept to a minimum especially during breeding season.

18. Establish a maternity roosting buffer zone (75 feet) around all known Indiana bat roost sites. No ground-disturbing activities will take place within this buffer other than activities specifically designed to enhance or improve roosting habitat (i.e. removal of shade trees) and only when bats have left the maternity roost (September 1 to March 31). Prescribed burning will also only take place during the non-maternity roosting season (September 1 to March 31).

19. Establish a maternity foraging buffer zone (2.5 miles) around all known Indiana bat roost sites. No timber removal will take place during the non-hibernation/maternity season (April 1 and August 31), unless specifically designed to enhance foraging habitat.

20. For all vegetation management activities and commercial timber sales on the Holly Springs Unit, retain at least three (3) live trees per acre greater than 20 inches d.b.h. of these preferred species (shagbark, shellbark, and bitternut hickory; white and green ash; white, northern red, and post oak; American and slippery elm; eastern cottonwood, black locust, and silver maple).

21. For all vegetation management activities and commercial timber sales on the Holly Springs Unit, retain at least 5 snags per acre greater than 9 inches d.b.h. and 1 snag per acre over 19 inches d.b.h. Oaks, hickories, and ashes will be favored for retention of snags. During timber harvests, snags will not be removed except where they constitute a human safety hazard. Snags will be retained in groups with live trees to prevent snag loss to wind throw.

22. Planning and implementation of timber harvests and other silvicultural treatments that occur in hardwood dominated ecosystems should promote natural regeneration of desired species from existing root stocks and consider and incorporate measures that enhance wildlife habitat productivity.

23. Activities that could result in sedimentation or other changes in water quantity and quality should have project level design criteria that maintain or improve the hydrologic function of wetland communities.

24. Historical skid roads, haul roads, log landings, and mechanical firelines should be reused.

25. Filter strips should be used to protect perennial and intermittent streams. Filter strips should be at least 33 feet plus 1.5 times the percent slope. Activities that expose more than 10 percent mineral soil should be avoided unless the activity occurs at a designated crossing. Site-specific analysis should determine any mitigation measures in addition to standard best management practices needed to protect water quality.

26. Removal of any woody vegetation should be avoided within 5 feet of intermittent and perennial stream banks.

27. Mechanical equipment should not be allowed to operate in any stream channel except to cross at designated points, except where involved in stream improvement work. Crossings should be at right angles to the stream or riparian area.

28. Water should not be diverted from streams (perennial or intermittent) or lakes when an instream flow assessment indicates the diversion would adversely affect protection of stream processes, aquatic (including wetlands) and riparian habitats and communities, or recreation and aesthetic values.

29. Where roads or trails cross streams, crossings should be at right angles where possible.

30. Diverting surface water from existing roads or facilities into wetlands and streams should be avoided.

31. Where necessary and consistent with other uses, consideration should be given to seasonal closure of Forest roads during critical periods for wildlife species known to be sensitive to human disturbance and during seasons with higher rainfall or other seasonal conditions that make roads more vulnerable to erosion by normal traffic patterns.

32. Planning and implementation of prescribed burns should include measures to provide protection for known occurrences of threatened, endangered, sensitive, and locally rare species that are susceptible to damage or extirpation from fire injury. This group is referred to as “species sensitive to fire injury.”

33. Mechanical firelines which expose mineral soil are not located in filter strips along lakes, perennial or intermittent springs and streams, wetlands, or water-source seeps, unless tying into lakes, streams or wetlands as firebreaks at designated points with minimal soil disturbance. Low-intensity fires with less than 2-foot flame lengths may be allowed to back into the strip along water bodies, as long as they do not kill trees and shrubs that shade the stream. The strip's width in feet is at least 33 plus 1.5 times the percent slope.

34. Plowed firelines are not located within savannahs except when needed to protect facilities or threatened, endangered, proposed, or sensitive species.

35. A buffer of at least 250 feet would be the minimum allowance permitted for surface occupancy within riparian, wetlands, and floodplains. This provision would be based on site-specific analysis rather than a standard operating procedure.

Kisatchie National Forest Revised Land and Resource Management Plan items pertaining to potential bat habitat (The plan identifies approximately 286,397 (of 603,769) acres unsuitable for timber production)

- FW-510 Streamside habitat protection: Within a zone of at least 50 feet from a scour channel and extending at least 50 feet from the end of the channel, plan and conduct forest management activities to protect or enhance riparian associated resource values and characteristics. Riparian associated resources are defined as the plant and animal habitats and mesic sideslope communities that are found within or adjacent to riparian areas or scour channels. Within this zone, which shall be called a streamside habitat protection zone (SHPZ), prohibit the following practices:
  - Clear-cutting and shelterwood regeneration methods
  - Salvage of single/double trees
  - Removal of overstory or understory vegetation within 5 feet of the scour channel
  - Mechanical site preparation
  - Log decks or landings
- FW-510: Classify the areas within SHPZs as not suitable for timber production.
  - These zones provide important wildlife habitat components (key areas) such as hard and soft mast producers, water, snags, den trees and a variety of foods and cover.
- FW-650: No soil-active herbicide is applied within 30 feet of the drip line of non-target vegetation such as den trees, hardwood inclusion, adjacent stands within or next to the treated area. Side pruning is allowed, but movement of herbicide to the root systems of non-target plants must be avoided. Buffers are clearly marked before treatment so applicators can see and avoid them.
- FW-651: Obtain ID Team input before herbicide application in Streamside Habitat Protection Zones (SHPZs) or Riparian Area Protection Zones (RAPZs) to ensure protection of any threatened, endangered, sensitive and other rare aquatic species.
- FW-652: Don not aerially apply triclopyr within 300 feet, nor ground-apply within 60 feet of any occupied habitat of the Rafinesque's big-eared bat. Clearly mark buffers before treatment so applicators can easily see and avoid them.
- FW-653: No herbicide is aerially applied within 300 feet or ground-applied within 60 feet of any threatened, endangered, proposed or sensitive plant. Buffers are clearly marked before treatment so applicators can easily see and avoid them.
- FW-664: Protect and manage rare or sensitive communities to maintain their contribution to the overall biological diversity of the forest. Avoid the elimination of an undisturbed or recovered plant community or site.
- FW-705: During TSI, WSI and site preparation, selected groups of overstory and understory vegetation are protected and managed to assure a variety of soft-mast, hard-mast and cover species. During site preparation, active and potential den trees are retained in clumps (at least ½ per 20 acres) if they are not provided in adjacent stands

unsuitable for timber production, inclusions or SHPZs. During TSI and WSI, all recognized den trees are protected. In addition, during TSI, WSI and site preparation, an average of at least 2 standing snags are retained per acre – large hardwoods greater than 12 inches when possible. Appropriate treatments are used to create snags where they are lacking.

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- FW-716: Maintain (RCW) clusters, replacement and recruitment stands in an open park-like condition with a basal area ranging from 60 to 80 square feet per acre. Minimum tree spacing of 20 to 25 feet to reduce SPB risk is more important than actual BA, especially in non-longleaf forest types.
- FW-724: Timber harvest, other cutting or killing of trees is prohibited within clusters or replacement or recruitment stands, except where such actions as thinning, SPB control or midstory removal would protect or improve RCW habitat. Only snags or dead trees posing threats to public safety may be removed.
- FW-725: Cutting of living or dead cavity trees in active or inactive clusters, including inactive clusters identified as replacement or recruitment stands, is prohibited except to maintain public safety or to protect a cluster or replacement/recruitment stand from initial attack. The USFWS must be contacted and issue concurrence before any cavity tree is cut.
- FW-731: All hardwood midstory trees within a 50-foot radius of active and inactive cavity trees will be removed. On average, 3 selected midstory hardwoods per acre can remain throughout the rest of the stand. Examples of desirable species to leave are dogwood, redbud or other showy flowering species. However, no midstory treatment shall occur in natural hardwood areas, such as stream bottoms, which are within cluster boundaries unless essential to maintain the viability of the RCW group.
- FW-851: Enhance sensitive and conservation animal species' populations and habitats to maintain reproducing, self-sustaining populations. Conduct assessments to determine which listed rare species are at higher risk. Develop conservation assessments and strategies for higher-risk listed rare species first, with the intent of preventing the need for federal listing as T&E species.
- FW-853: Within the constraints of the other Forestwide and Management Area goals, desired future conditions and standards and guidelines, comply with the conservation measures presented in the 1995 Louisiana Black Bear Recovery Plan.
    - Maintain a diverse forest that provides preferred bear foods (hard-mast producers and soft-mast producers) and cover (thickets).
    - Using single-tree, group selection, patch clearcuts or a combination of these in uneven-aged or even-aged hardwood management.
    - Creating SHPZs, forested hardwood corridors (as wide as possible) along major drainages in hardwood forests and pine forests – to provide habitat diversity, mast production, den sites and travel lanes for bears.
    - Preserving present and potential cavity trees as denning trees.
    - Burning pine stands on a 3-5 year rotation always protecting SHPZs.

        - Limiting construction of permanent all-weather roads into forested areas and gating or closing such road when not in use.
- MA (Management Area)-1-01: Use a suppression (wildfires) strategy of direct control to minimize acreage burned.
- MA-1-03: Use prescribed fire where necessary to meet specific tree establishment and maximum growth objectives or to maintain safe levels of fuel loadings to reduce damage.
- MA-1-05: Management type for all SHPZs and RHPZs will be hardwood forest types.
- MA-2 Amenity Values: This management area is allocated as approximately 16,000 acres on the Evangeline Unit of the Calcasieu RD (48%) and the Caney RD (52%).
- MA-2-03: Classify this MA as unsuitable for timber production.
- MA-2-04: Along all streams where the area immediately adjacent to the scour channel is composed of mixed pine and hardwood habitat, extend the SHPZ out to a minimum of 100 feet. Mixed pine and hardwood habitats are defined as areas where more than 30% of the total overstory BA is composed of hardwood tree species.
- MA-2-06: Allow uneven-aged regeneration method techniques and stand improvement cuts to meet specific amenity resource objectives such as improving old-growth characteristics, wildlife habitats, scenic quality or plant community composition and structure.
- SMA (Sub-MA)-2AL-01: Apply prescribed fire at the landscape scale of every 2-5 years, with increased emphasis on growing season burns.
- SMA-2AL-02: Manage upland stands outside the SHPZ and RAPZ predominately for longleaf pine. Slash, loblolly and shortleaf pine are not appropriate management types within this sub-management area.
- SMA-2AL-03: Favor the retention of longleaf pine during stand improvement cuts in upland stands. Manage for an open canopy with variable tree densities having and average BA of 70.
- SMA-2AS-01: Apply prescribed fire every 7-10 years at the landscape level.
- SMA-2AS-02: Manage upland stands outside of the SHPZ and RAPZ predominately for mixed pine-hardwood. Longleaf, slash and loblolly pine are not appropriate management types within this sub-management area.
- SAM-2AS-03: Favor the retention of shortleaf pine, oaks and hickories during stand improvement cuts in upland stands. Manage for a relatively open canopy with variable tree densities having and average combined pine and hardwood BA of 80 per acre.
- SMA-2AM-01: Apply prescribed fire at the landscape scale every 15-20 years.
- SMA-2AM-02: Manage all stands predominantly for mixed hardwood-pine or hardwood. Longleaf, slash and shortleaf pine are not appropriate management types within this sub-management area.
- SMA-2AM-03: Favor the retention of oaks, hickories and other desirable hardwoods during stand improvement cuts. Manage for a relatively closed canopy with variable tree densities having an average combined hardwood and pine BA or 100 per acre.

- MA-3-05:Pursue restoration or maintenance of native plant communities on all sites through the re-establishment of natural community composition, structure and ecological processes.
    - Emphasize restoration of native, fire dependent longleaf pine communities in an intermediate time period while providing a moderate level of protection of other resources.
- SMA-3BL-01: Apply prescribed fire at the landscape scale every 2-5 years, with increased emphasis on growing season burns.
- SMA-3BS-01: Apply prescribed fire at the landscape scale every 7-10 years.
- SMA-3BS-02: Manage upland stands outside the SHPZ and RAPZ predominately for mixed pine-hardwood. Longleaf, slash and loblolly pine are not appropriate management types within this sub-management area.
- SMA-3BM-01: Apply prescribed fire at the landscape scale every 15-20 years.
- SMA-3BM-02: Manage all stands predominantly for mixed hardwood-pine or hardwood. Longleaf, slash and shortleaf pine are not appropriate management types within this sub-management area.
- MA-13 Kisatchie Hills Wilderness 8700 acres: Emphasize maintaining and protecting the enduring resource of wilderness as one of the multiple uses of KNF while providing a wide range of suitable wildlife habitats for all native wildlife.

DESIGN CRITERIA

Forest-Wide Design Criteria

Ecosystem Health

Threatened, Endangered, and Sensitive Species and their Habitats

Mine and Cave Habitat

TE002 Proposed mining operations affecting abandoned mine adits and shafts or natural dens and caves that could be considered suitable habitat for federally Threatened and Endangered species or Southern Region Sensitive species must include conservation measures to protect the species and habitat.

Indiana Bat Habitat (Bear Den Cave)

TE006 Maintain the cave gate to protect hibernating bats. The known hibernaculum and any other hibernacula that may be discovered will be protected by maintaining a buffer having a radius of 2 miles. Within this buffer, proposed ground-disturbing management projects and prescribed burning will be evaluated to determine their direct, indirect, and cumulative effects on Indiana bats and the hibernaculum.

TE007 When planning and conducting prescribed burns inside or near the Bear Den Cave buffer, avoid inundating the cave with smoke.

Sensitive Bat Species

TE009 Before a structural modification is initiated to the roof of a building, bridge, mine, or well, a bat survey will be conducted for sensitive bat species. If evidence of sensitive roosting bats is present, habitat will be protected or an alternative roost will be provided (bat boxes).

Special Use and Special Forest Products Permits

SU004 New communication towers will be self-supporting and will be designed to mitigate collision impacts to bats and migratory birds. When authorized towers are reconstructed or replaced, the replacement tower will be self-supporting and designed to mitigate collision impacts to bats and migratory birds.

Wildlife Habitat

WF001 On a project-by-project basis, provide grass-forb or shrub-seedling habitats (include regeneration areas 0-10 years in age, areas of recent heavy storm or insect damage, and woodland conditions) at a rate of:

• a minimum of 6 percent of the suitable acres in MAs 14, 15, 16, 17, and 19 (Ouachita Mountains Habitat Diversity Emphasis, West Gulf Coastal Plain Habitat Diversity Emphasis, Lands around Lakes, Semi-primitive Areas, and Winding Stair Mountain National Recreation Area and Associated Non-Wilderness Designations, respectively)
• a minimum of 3 percent of the suitable acres in MA 21, Old Growth
• a minimum of 4 percent of the suitable acres in MA 22, Shortleaf Pine/Bluestem Grass/RCW

WF002 Limit even-age regeneration cutting in each project area to no more than 14 percent of the suitable acres managed under even-aged prescriptions, per 10-year entry except for the following:
• 6-10 percent in Semi-primitive Areas, MA 17
• 6 percent in Old Growth, MA 21
• 8.3 percent in Shortleaf Pine/Bluestem Grass/RCW, MA 22

WF004 Retain clumps of deciduous trees at a rate of one-half acre clump per 20 acres of regeneration cutting by even-aged methods in order to create den trees. Retain clumps around existing den trees. In addition, existing den trees will not be felled unless necessary for insect or disease control or to provide for safety.

WF005 Where timber is harvested, retain or create at least two snags per acre, minimum 12-inch diameter at breast height (dbh) with an objective of 16-inch dbh or larger. Where naturally occurring snags of this size are unavailable or cannot be created, retain or create snags near the required size. Standing snags will not be felled, unless necessary for insect or disease control or to provide for safety.

WF006 Retain or develop mature growth pine habitats (80 years old or greater) and mature growth hardwood habitats (100 years old or greater) at a rate of five percent of each broad cover type within each project analysis area.

WF008 Where open area habitats are not provided by other conditions, develop one permanent wildlife opening, one to five acres per 160 acres of habitat.
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WF009 Provide nest structures where suitable natural cavities do not occur and when needed to accomplish wildlife objectives.

WF010 Where there is no existing water source, provide at least one wildlife pond per 160 acres where needed to accomplish wildlife objectives.

WF011 Wildlife ponds less than one-half surface acre will be managed for native amphibian habitat and not stocked with fish.

Vegetation Management

General

VM001 Intentional establishment of non-native plant species included on the Regional Forester's invasive species list is prohibited.

VM004 Within managed pine stands, maintain or develop a component of 10 to 30

percent of the total basal area in hardwood trees in dominant or co-dominant crown classes. Favor oaks and hickories in meeting this objective.

Forest Regeneration

FR001 Maintain pines and hardwoods throughout the life of each stand in which timber harvesting takes place unless project-level concerns dictate a need for change.

FR002 During the regeneration of pine stands, retain large overstory hardwoods distributed throughout the stand at the rate of 5 sq. ft. of basal area per acre where available.

FR003 During the regeneration of pine stands, base the hardwood sprout/seedling component objective (10 to 30 percent of stems in hardwoods, primarily oaks and hickories), on the composition of the stand prior to regeneration cutting.

FR004 In mixed pine-hardwood forests subject to timber harvesting, maintain between 30 and 50 percent hardwood in each stand, including large overstory hardwoods distributed throughout the stand.

FR011 When using the seedtree method of regeneration cutting, the seed trees will be retained indefinitely.

Herbicide Use

HU001 Herbicides will be used only where necessary to achieve the desired condition in the treatment area, and then only when site specific analysis shows no unacceptable negative effects to human or wildlife health or the ecosystem as defined in HU002.

HU002 Herbicides will be applied at the lowest rate effective in meeting project objectives and according to guidelines for protecting human and wildlife health. Application rate and work time must not exceed levels that pose an unacceptable level of risk to human or wildlife health. Site specific risk assessments are required prior to herbicide application and must be calculated using the procedure developed by Syracuse Environmental Research Associates (SERA). Should contractor or methodology change, a standard at least equally restrictive will be imposed to define acceptable risk.

HU003 To minimize potential effects of herbicide use, whenever possible, use individual stem treatments, directed spraying, and crop tree release rather than broadcast or grid applications. Do not use broadcast or grid applications within SMAs (see MA 9 for other restrictions).

HU004 Herbicides and application methods are chosen to minimize risk to human and wildlife health and the environment. Herbicides that are not soil-active will be used in preference to soil-active ones when the vegetation management

Public Use and Enjoyment/Infrastructure

Transportation

TR005 As part of roads analyses conducted at the watershed or compartment scale, calculate open road density for wildlife purposes by including all open roads (permanent, local arterial and collector roads, regardless of jurisdiction) and designated Off-Highway Vehicle (OHV) trails. In calculating road density for wildlife purposes, a seasonally (March to August) closed road will be treated as a closed road. Where the current total open road density is greater than wildlife objectives call for (see Part 2 of the Plan), use roads analysis to identify opportunities to reduce the density of open roads and OHV trails under Forest Service jurisdiction.

TR008 Road locations in habitats of Proposed, Endangered, Threatened and Sensitive species, woodland seeps, glades, and other identified specific natural plant communities will be avoided. When road location outside of these areas is infeasible, consultation with the USFWS will be initiated for PET species.

Land Administration

LA002 Landownership adjustments:

- will not dispose of habitat for Proposed, Threatened or Endangered species within the boundaries of the National Forest except with another agency with equivalent responsibility for Proposed, Threatened or Endangered species or unless a net gain for the particular affected species is made in habitat acreages or habitat quality;
- will not dispose—or will result in net gains of—habitat for (or populations of) Southern Region sensitive species and unique or rare natural communities on National Forest lands.

Commodity, Commercial, and Special Uses

Special Use and Special Forest Products Permits

SU001 Road locations, utility corridors, or oil and gas pipelines in habitats of Proposed, Endangered, Threatened, or Sensitive species and/or identified, specific (rare) natural plant communities such as woodland seeps and glades will be avoided.

SU004 New communication towers will be self-supporting and will be designed to mitigate collision impacts to bats and migratory birds. When authorized towers are reconstructed or replaced, the replacement tower will be self-supporting and designed to mitigate collision impacts to bats and migratory birds.

Management Area Design Criteria

Management Area 1. Wilderness
1a. Designated Wilderness
Trails

1a.03 Fell snags adjacent to wilderness trails only when they pose a definite and immediate safety hazard.

Management Area 21. Old Growth Restoration
Wildlife Habitat

21.02 Retain all snags and den trees during timber harvest, site preparation, and wildlife habitat improvements. Standing snags will not be felled, unless necessary for safety.

PART 3-DESIGN CRITERIA

This section is the third of the three parts of the land management plans for the Ozark-St. Francis National Forests. Part 3 contains the design criteria or standards. Design criteria are used in combination with the description of desired conditions, objectives, and lists of actions or activities to guide the management of the Ozark-St. Francis National Forests.

FOREST-WIDE (FW) STANDARDS

RARE COMMUNITIES

FW15 As they are discovered, catalog, inventory, and classify wild caves according to the Cave Resources Protection Act (CRPA) guidelines and determine significance using established protocols. Management direction of cave resources will be made following the CRPA guidelines and will allow for input from interested outside agencies and the public. Known or suspected threatened or endangered species occupancy and/or use is adequate to define a cave or mine as significant.

FW16 Districts will be responsible for maintaining inventory records for caves on their district. Districts that permit wild cave use will maintain permit records to be used to document visitor use and aid in the safety of permitted cave users. Master copies of inventory and permit records will be kept at the Supervisor's Office.

FW17 Manage cave significance and public use on the basis of the Cave Resources Protection Act (CRPA) guidelines as either:

- Permitted open with year-round use.
- Permitted seasonally.
- Open with interpretation.
- Closed year-round.

FW18 Mature forest cover is maintained within 100 feet slope distance from the top of bluffs and 200 feet slope distance from the base to provide wildlife habitat associated with unique landform. Within this zone, activities are limited to those needed to ensure public safety or to maintain and improve habitat for federally listed species or other species whose viability is at risk.

Fish and Wildlife

FW33 Maintain the following average standing dead, existing, and potential hollow den and loose bark trees per acre forest wide:

- Primary and Secondary Indiana Bat Zones – 9 snags per acre
- All other areas:
  - 2 snags per acre greater than 12" dbh; plus
  - 4 snags per acre

  Total 6 snags per acre

Unless necessary for insect/disease control or to provide for public safety, standing dead and den trees will not be cut during salvage operations.

Snags will be left from the largest size classes and maybe clumped.

FW35 Provide up to four permanent water sources per square mile in upland sites.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

FW42 Karst features will be recognized and documented when they are found to occur across the landscape; these features include caves, springs, sinkholes, and losing streams.

FW43 Karst management zones (KMZs) will be applied in a manner similar to that of streamside management zones (SMZs). Where karst features are identified, the boundaries of the KMZs will be delineated according to significance of karst features or potential risks. For karst features that are of significance or where the potential risks to water resources are great, a KMZ of 100 feet will be applied. For karst features that are less significant or where minimal potential risks to water resources exist, a KMZ of 50 feet will be applied. Karst management zones are mitigation measures primarily for the protection and conservation of groundwater resources and cave dependent species. These buffer designations are minimums and can be increased as necessary to provide appropriate mitigation measures as deemed necessary. Activities prohibited within these areas include:

- Use of motorized wheeled or tracked equipment (except on existing roads and trails).
- Mechanical site preparation.
- Recreational site construction.
- Tractor constructed fire lines for prescribed fire.
- Herbicide application.
- Construction of new roads, skid trails, and log landings.
- Slash disposal.

FW44 Management activities within KMZs will be planned to use practices that result in minimal surface disturbance; this will be measured as less than five percent soil disturbance over the entire KMZ within the project area

FW45 Within KMZs, there will be no mechanical entry during management activities; low impact vegetation management is appropriate.

FW46 Exceptions to established KMZ guidelines can be made through site specific analysis and consultation with the US Fish & Wildlife Service (USFWS).

FW47 Optimal overstory density within the primary zone around Indiana bat hibernacula is a range of 60 to 80 percent canopy closure. Use timber harvest, non-commercial thinning, and prescribed fire to regulate and maintain this optimal density.

During normal order of entry for compartments within Indiana bat primary conservation zones, do landscape scale analysis of existing forest stand conditions. This analysis should be used to determine commercial and non-commercial treatments needed to shift percent canopy closure toward the optimal overstory density. The long-term goal of treatments is to adjust canopy closure so that 80 to 90 percent of the primary conservation zone is within the 60 to 80 percent canopy closure range. This will not be fully accomplished during this planning period. Annually report canopy cover adjustments accomplished with commercial and non-commercial treatments within Indiana bat conservation zones to the Arkansas Field Office , USFWS.

When designating trees to be cut to regulate overstory density, two approaches are recommended for equating canopy density to target leave basal area. A simple rule of thumb is to use site index plus 10 as the target leave basal area. Another option is the use of canopy density/basal area conversion charts defined by tree diameter classes.

FW48 Optimal overstory density within the secondary zone around Indiana bat hibernacula is a range of 50 to 70 percent canopy closure. Use timber harvest, non-commercial thinning, and prescribed fire as needed to regulate and maintain this optimal density.

During normal order of entry for compartments within Indiana bat secondary conservation zones, do landscape scale analysis of existing forest stand conditions. This analysis should be used to determine commercial and non-commercial treatments needed to shift percent canopy closure toward the optimal overstory density. The long-term goal of treatments is to adjust canopy closure so that 80 to 90 percent of the primary conservation zone is within the 50 to 70 percent canopy closure range. This will not be fully accomplished during this planning period. Annually report canopy cover adjustments accomplished with commercial and non-commercial treatments within Indiana bat conservation zones to the Arkansas Field Office, USFWS.

When designating trees to be cut to regulate overstory density, two approaches are recommended for equating canopy density to target leave basal area. A simple rule of thumb is to use site index minus 10 as the target leave basal area. Another option is the use of canopy density/basal area conversion charts defined by tree diameter classes.

FW52 Prescribed burn plans for areas containing caves or for areas near significant caves or mines will identify these sites as smoke sensitive targets. The prescribed burn plans will be written to avoid active combustion and smoldering phase smoke from entering these sites when bats are present.

FW53 No commercial timber harvest may be used in KMZs up to 200 feet from cave entrances except for habitat protection or enhancement for threatened and endangered species.

FW54 Prohibit camping and campfires within 200 feet from the entrance to caves, mines, and rock shelters used by TES species.

FW55 Close or restrict access to caves where disturbance or vandalism of critical resources may occur.

FW57 Identify caves or abandoned mines that contain significant populations of TES species as smoke-sensitive targets.

FW58 If significant bat roosting is found, these structures will be maintained or alternative roosts suitable for the species and colony size will be provided prior to adverse modification or destruction.

FW59 Do not issue permits for the collection of TES species except for approved scientific purposes. Permits are also required from U.S. Fish and Wildlife Service and Arkansas Game and Fish Commission.

FW60 The use of caves for disposal sites or the alteration of cave entrances is prohibited except for the construction of cave gates or similar structures to ensure closure.

FW61 Before old buildings, wells, cisterns, and other man-made structures are structurally modified or demolished, they will be surveyed for bats. If significant bat roosting is found (TES species), these structures will be maintained or alternative roosts suitable for the species and colony size will be provided prior to adverse modification or destruction.

FW62 Watershed boundaries and recognizable landmarks such as roads, streams, and bluff lines are used to identify primary and secondary conservation zones that extend out 0.25 (1/4) mile and 5 miles, respectively, surrounding Indiana bat hibernacula.

FW63 All known Indiana bat hibernacula should be evaluated for gates. If additional hibernacula are found, the caves should be evaluated for gating to protect Indiana bats during the critical hibernation period.

FW64 Project specific informal consultation will be done for all activities proposed within primary conservation zones. No disturbance that will result in the potential taking of an Indiana bat will occur.

FW65 In the primary conservation zone for the Indiana bat, the following new improvements and treatments are not permitted: permanent road construction, trails, grazing or hay allotments, wildlife openings, special uses, and integrated pest management using biological or species-specific controls. Other activities that create permanent openings are prohibited within the primary conservation zone.

FW66 Tree cutting and prescribed fires are prohibited in primary and secondary Indiana bat zones between May 1 and November 30. Adjustments to these dates may be made on a project-specific basis through coordination with the Arkansas Field Office, USFWS. Site-specific inventories are good for two calendar years from the date of survey completion.

FW67 Tree cutting and salvage operations can occur between December 1 and March 15 without a site-specific inventory. Additional coordination with USFWS is not required.

FW68 In the secondary zone buffer around Indiana bat hibernacula, a minimum of 60 percent of all forested acreage is maintained in nine inch or greater size classes. Of this total, about 40 percent will be trees in a mature condition. The 0 to 10 age class does not exceed 10 percent of the forested acreage of the secondary buffer at any time.

FW69 In the secondary zone buffer around Indiana bat hibernacula, live trees or snags, buildings, and other structures known to have been used as roosts by Indiana bats are protected from cutting and/or modification until they are no longer suitable as roost trees, unless their cutting or modification is needed to protect public or employee safety. Where roost tree cutting or modification is deemed necessary, it occurs only after consultation with the USFWS.

FW70 Shagbark hickory, because of its high value as roost/maternity sites, should receive special attention during sale layout and cultural treatments. In areas where shagbark hickory is uncommon, retain all shagbark hickory over six inches dbh (6" dbh) except those that are immediate hazards. If multiple 6-inch or greater stems are encountered, which are competing for moisture, nutrients, and growing space, thin to retain the largest shagbark trees with potential for crown development and longevity. Where shagbark hickory is common within the treatment stand and the surrounding landscape, retain the largest individual shagbark stems in the treatment stand as part of the 20 basal area (overstory) and allow smaller stems, which might be in excess of six inches dbh (6" dbh) to be removed during regeneration treatments.

FW71 A 200-foot buffer of undisturbed forest will be maintained around gray bat maternity and hibernation colony sites, Ozark big-eared bat maternity sites, bachelor sites, or winter colony sites. Prohibited activities within this buffer include cutting of overstory vegetation; construction of roads, trails, or wildlife openings or development of pastures; and prescribed burning. Exceptions may be made where

coordination with USFWS determines these activities to be compatible with recovery of these species.

Minerals

FW143 Drilling operations will not be allowed in karst KMZs.

MANAGEMENT AREA STANDARDS

1.H Scenic Byway Corridors

Standards

MA1.H-9 Allow vegetation management activities to

- Enhance or rehabilitate scenery including creating aesthetically desired stand structure and species composition including a pleasing mosaic of tree species of various densities and stem sizes, park-like effects, and enhancement of fall color species.
- Maintain natural mix of plant species.
- Maintain open areas, old field habitats, pastoral settings, and vistas that enhance the scenic qualities of the corridor.
- Maintain developed recreation facilities including roads and trails.
- Enhance both game and non-game wildlife habitat.
- Improve threatened, endangered, sensitive, and locally rare species habitat.
- Maintain rare communities and species dependent on disturbance.
- Reduce fuel buildups.
- Minimize impacts from insect or disease outbreaks and rehabilitate damaged areas.
- Control non-native invasive vegetation.
- Provide for public health and safety.
- Improve forest health.
- Allow salvage for scenic rehabilitation, fuels reduction, and economic value.

2.A Ozark Highlands Trail

Standards

MA2.A-8 Vegetation is managed to enhance the trail environment. Allow timber harvest, prescribed burning, wildland fire use, hand tools, power tools, mowing, herbicides, biological controls, and grazing to manage vegetation as appropriate. Vegetation management activities are limited to:

- Maintain open areas, old field habitats, and vistas that enhance the scenic qualities of the OHT.
- Control insects and diseases.
- Maintain or improve threatened, endangered, sensitive, and locally rare species habitat.
- Maintain rare communities, species dependent on disturbance, and wildlife viewing opportunities.
- Meet trail construction and maintenance needs.
- Manage fuels.
- Restore, enhance, or mimic historic fire regimes.
- Control non-native invasive vegetation.
- Provide for public safety or resource protection.

MA2.A-16 Reconstruct or relocate existing portions of the OHT as needed to enhance the recreation experience; protect threatened, endangered, sensitive, and locally rare species; protect the health of the ecosystem; or protect heritage resources. Such relocations provide a reasonable level of public safety.

Appendix D

Glossary of Terms

Acoustic surveys: use of a device (bat detector) to detect the ultrasonic echolocation calls emitted by bats. Acoustic surveys provide data concerning the presence/absence of bats at a site and allow for inferences to be made on their relative abundance based on activity levels.
Conservation measures: actions that contribute to the conservation of bat species and their habitat. Such measures may be intended to avoid, minimize or offset adverse impacts, or positively influence bat populations or habitat.
Conservation zone: area identified around a hibernaculum or TES bat maternity colony that is deemed important to the success of the population. The size of this zone is necessarily variable as it is informed by specific knowledge of the biology and life history of the bat species using the resource and the condition of the surrounding landscape; the shape of this zone may be irregular to take into account fall swarming and spring staging areas, likely flight paths, foraging habitat, and other important habitat features.
Emergence surveys: a method of sampling buildings/structures, trees, caves, etc., during the period when bats are present that provides data concerning the presence/absence of bats at a site, the degree of bat usage, the species that are present, and other information. Emergence surveys are generally conducted at dusk, when bats are emerging from roosts.
Hibernaculum (plural **hibernacula**): a site, usually a cave or mine, where bats hibernate during the winter. [**Important Hibernacula**: those hibernacula that are officially designated as "critical habitat" by the USFWS as well as sites that are considered locally important based on such factors as (1) the use of the site by at least one endangered species for multiple years, (2) use by multiple sensitive (RFSS) bat species, or (3) use by bat populations (regardless of current conservation status) considered to be significant based on local expert opinion.]
Hibernation season (winter): time of year when bats are largely confined to hibernacula (ranges from approximately September to May and varies by species of bat and geographic location).
Fall swarming: a phenomenon in which, during late summer and autumn, numerous bats are active at cave or mine entrances, though few, if any, of the bats may roost within the site during the day; this activity is likely related to fall breeding activities and locating potential hibernation sites (ranges from approximately August to November and varies by species of bat and geographic location).
Forest ecosystem: is a natural woodland unit consisting of all plants, animals and microorganisms (biotic components) in that area functioning together with all of the non-living physical (abiotic) factors of the environment.
Geophysical exploration: the practical application of physical methods (such as seismic, gravitational, magnetic, electrical and electromagnetic) to measure the physical properties of rocks, and in particular, to detect the measurable physical differences between rocks that contain ore deposits or hydrocarbons and those without.
Known habitat: areas known to be used by TES bat species.

Maternity colony: a group of reproductively active female bats and their young that occupy the same summer habitat and interact to varying degrees. **[Important Maternity (colony) sites]**: individual roosts or networks of roosts used by a maternity colony that are officially designated as "critical habitat" by the USFWS as well as sites that are considered locally important based on such factors as (1) the use of the site by at least one endangered species for multiple years, (2) the use by multiple sensitive (RFSS) bat species, or (3) use by bat populations (regardless of current conservation status) considered to be significant based on local expert opinion.
Maternity habitat: suitable summer habitat used by juveniles and reproductive (pregnant, lactating, or post-lactating) females.
Maternity roost: a summer roost, usually a tree, cave, or mine but sometimes a manmade structure or bat box, used by reproductively active female bats and their young
Maternity season (summer): time of year when reproductively active female bats and their young are present on the landscape (ranges from approximately April to September and varies by species of bat and geographic location).
Mist-net surveys: a method of sampling that typically employs a nylon mesh net stretched between two poles; unlike other survey methods, mist-netting allows for hands-on examination of species, making it an important tool for monitoring species diversity, relative abundance, health, population size, and demography.
Non-volant: flightless, or lacking the ability to fly.
Non-volancy period: the 3-4 week period following birth when bat pups (young) are unable to fly; mothers can and will move their young during this period.
Permanent habitat loss: the permanent removal/destruction of suitable habitat for TES bat species.
Permanent habitat modification: the permanent alteration of habitat to a degree that diminishes the long-term suitability of the habitat for TES bat species and/or the introduction of new uses, activities, or infrastructure to an area that will produce enduring effects that diminish the long-term suitability of the habitat for TES bat species.
Potential roost tree: tree exhibiting characteristics that make it suitable for bat roosting, such as presence of cavities, hollows, cracks, crevices, or exfoliating bark.
Rock feature roosts: cliffs, rock bluffs, rock shelters, vertical outcrops, glades, and talus slopes that are of the appropriate size and configuration to provide roosting habitat for bats. Generally these include sites that are 10 feet or more in height and 100 feet or more in length, although they may consist of discontinuous rock faces that should be considered as one. Often they contain fissures, openings of various sizes, and/or loose rocks. Vertical outcrops, glades, and talus slopes may have other configurations but are generally self-defined on the landscape.
Roost site: any location (tree, bat box, structure) where bats spend the day roosting singly or in colonies.
Roost tree: any tree in which bats roost during the day.
Snag: a standing dead tree.
Spring staging: the departure of bats from hibernacula in the spring, including processes and behaviors that lead up to departure (ranges from approximately March to May and varies by species of bat and geographic location).
Suitable habitat: habitat that is appropriate for use by TES bat species.

a. Suitable winter habitat (hibernacula): is largely restricted to underground caves, mines, and other cave-like structures (e.g., railroad tunnels, dams, storm sewers). Hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cooler temperatures (0-9°C) and high humidity and minimal air currents.
b. Suitable summer habitat: for TES bat species consists of the variety of forested/wooded habitats where they roost, forage, and travel. This includes forested patches as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure.
c. Suitable spring staging/fall swarming habitat: for TES bat species consists of the variety of forested/wooded habitats where they roost, forage, and travel in proximity to a hibernaculum. This includes forested patches as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure.
Suitable roost tree: live tree or snag with characteristics that support roosting by individuals or groups of TES bat species. Such characteristics may include loose bark, crevices, cracks, or hollows.
Underground maternity site: any subterranean feature used by reproductively active female bats and their young during the summer maternity season.
Volant: able to fly.