



# MONITORING AND EVALUATION REPORT

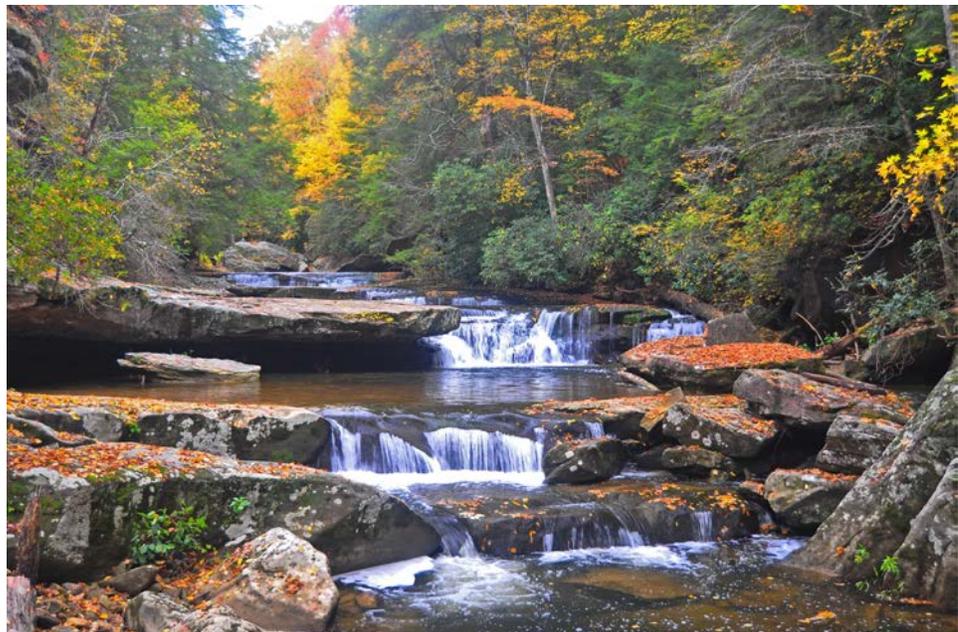
## FISCAL YEAR 2012

(October 1, 2011 through September 30, 2012)

## DANIEL BOONE NATIONAL FOREST

UNITED STATES  
DEPARTMENT OF  
AGRICULTURE  
  
FOREST SERVICE  
  
SOUTHERN REGION  
  
DANIEL BOONE  
NATIONAL FOREST  
  
KENTUCKY

September 2013



*Dog Slaughter Creek, London Ranger District*

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## FOREST SUPERVISOR'S CERTIFICATION

This report documents the results of monitoring activities that occurred during Fiscal Years 2012 on the Daniel Boone National Forest. Monitoring in some areas is long-term and evaluation of that data will occur later in time.

I have evaluated the monitoring and evaluation results presented in this report and endorse them. I find that there are no recommended changes to the Land and Resource Management Plan at this time, and therefore consider it sufficient to continue to guide land and resource management of the Daniel Boone National Forest for the foreseeable future.



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**FRANK R. BEUM**

**Forest Supervisor**

9/6/13

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**Date**

## INTRODUCTION

This report covers the Fiscal Year 2012 (FY12) period from October 1, 2011 through September 30, 2012. This report is structured to address the nineteen (19) monitoring questions described in Appendix D of the Forest Plan.

### Forest Plan

The Forest and Rangeland Renewable Resources Planning Act (RPA), as amended by the National Forest Management Act (NFMA), directs that each national forest develop a comprehensive forest management plan, and that these plans be reviewed and updated every 10 to 15 years, or earlier if conditions change significantly. In addition to the RPA and the NFMA, the National Environmental Policy Act of 1969 (NEPA), Government Performance and Results Act of 1993 and the 2000 Revision of the USDA Forest Service Strategic Plan guided the revision process.

The first Forest Plan for the Daniel Boone National Forest was approved in September 1985. That plan was amended fourteen (14) times over the years as new information became available, and issues and conditions changed. Even so, an analysis of the current management situation identified a need to revise the Forest Plan to better reflect changing conditions, evolving public values, new scientific findings, new laws and regulations, and current agency policy. The following is a summary of the milestones and dates that occurred in revising the Forest Plan:

**June 21, 1996** - Notice of intent (NOI) to prepare an environmental impact statement was published in the Federal Register.

**April 2003** - The Draft Environmental Impact Statement (DEIS) was released.

**November 6, 2003** - A Biological Assessment was prepared and formal consultation occurred between the Forest Service and the USDI Fish and Wildlife Service as required by the Endangered Species Act.

**March 20, 2004** - A Biological Opinion was released by the USDI Fish and Wildlife Service.

**April 16, 2004** - A Record of Decision (ROD) and accompanying Final Environmental Impact Statement (FEIS) and Forest Land and Resource Management Plan (Forest Plan) were released.

**May 24, 2004** - Implementation of the Forest Plan begins.

**July 2004** - Two appeals were filed; one appeal was filed on behalf of Kentucky Forest Industries Association, East Kentucky Chapter of the Society of American Foresters, Daniel Boone Forest Alliance, and the Southern Appalachian Multiple Use Council; and a second appeal was filed on behalf of Heartwood, Kentucky Heartwood, Cumberland Chapter of the Sierra Club, Wild South, and Wildlaw.

**July 25, 2006** - An Appeal Decision from the Washington Office was rendered affirming the Regional Forester's April 16, 2004 decision.

**April 23, 2007** - A revised Biological Opinion was released by the USDI Fish and Wildlife Service, after reinitiating of consultation to incorporate and consider new information regarding the Endangered Indiana bat.

**August 26, 2008** - The Forest Plan is amended to establish a 9,867-acre area of land within the State-designated Redbird Wildlife Management Area to the 3.H.1 *Ruffed Grouse Emphasis* prescription area. This is Amendment #1.

**April 2, 2012** - The Forest Plan is amended to include a new marina on Lake Cumberland within the 3.A *Developed Recreation Area* prescription area.

### Monitoring and Evaluation

Nineteen (19) monitoring questions were identified in Appendix D of the Forest Plan. Addressing these questions is accomplished by evaluating the results of annual monitoring activities. The Leadership Team for the Daniel Boone National Forest (DBNF, or Forest) prioritizes monitoring activities based on recommendations from forest resource specialists, and consideration of available funding and personnel. There are eighty-seven (87) monitoring tasks (Forest Plan, Appendix D), but not all are monitored each year. Monitoring and evaluation is documented on task sheets that are used to address the nineteen monitoring questions in this report.

Monitoring is used to validate assumptions and effectiveness of Forest Plan Standards, and help in determining whether a change to the Forest Plan is needed.

## FOREST PLAN MONITORING QUESTIONS

### **1. *Are rare communities being protected, maintained, and restored?***

Twelve rare community types were identified in the Forest Plan. The Plan set a goal of monitoring 1,200 acres over 10 years. To date, approximately between 40 and 200 acres per year have been inspected, putting the Forest a little behind for monitoring 1,200 acres over a 10-year period. Of these, streamhead seeps/bogs and slope seeps have been regularly inspected over the last five years. These are sensitive sites, easily damaged with heavy rain, animal activity or blow down. These wetlands are the most inspected sites. Three wetland areas were checked for qualification as rare communities, but did not qualify. These sites were heavily degraded and lacked most expected species and functions.

In the last five years, a project was completed to slow water flow and encourage buildup of sediment in a streamhead that was badly eroding through head cutting and down cutting. Fourteen log structures were installed to create sedimentation pools. To date, down cutting has slowed or possibly stopped, and head cutting has slowed. The water table on the lower end of the stream has been returned to levels present 15 years ago. By continually capturing sediment, the expectation is that this will help raise the water table closer to the rare species that occur in the wetland system.

At another site, degradation of stream conditions (occurring on private land) was leading to

damage in a stream head wetland on national forest system (NFS) land above the private land. The Kentucky State Nature Preserve Commission stepped in and provided funding to work with the landowner and correct the problem. The wetland is habitat for a state listed and Regional Forester's sensitive species.

Some other streamhead wetlands on the Forest show signs of degradation, and the Forest is pursuing various methods to correct identified problems, which may involve university research.

Three areas were chosen to develop into canebrake habitat, one on the London Ranger District, and two on the Stearns Ranger District. Plantings occurred in 2006, 2007 and 2008. The areas do not have the characteristics that would qualify them as canebrakes, but are expected to expand into canebrakes over the next 5-10 years. Several sites on the Redbird Ranger District have been examined for the feasibility of planting cane, which is scheduled for FY13.

Another sandstone glade was discovered on the Stearns Ranger District in 2011. The glade although small, provides habitat for the state (and forest) rare quill fameflower. The population is large and healthy and may provide seed to establish a breeding population to augment other impaired sites

### **2. *Are landscape-level and stand-level composition and structure of major forest communities within desirable ranges?***

**Trend in Forest Cover** - A significant change occurred to the forest during 1999-2001 because of a widespread southern pine beetle (SPB) outbreak. Based on the trends from the stand examinations done since then, some of the stands that were overstocked with mixtures of pine and hardwood have been naturally thinned and are now adequately stocked with hardwood sawtimber or poletimber. Some stands have become two-storied or multi-storied,

with various mixtures of hardwood regeneration. A few have regenerated with off-site tree species, vines, and shrubs and could benefit from reforestation.

Many of these former pine stands are included within landscape-prescribed burns, which are usually conducted on a 3-5 year cycle. Due to many variables that occur within a large landscape burn, vegetation character of some

stands can change markedly following fire. For example, in young stands as trees re-sprout following fire, the stand year-of-origin becomes the date of the latest burn. Stand inventory has seldom kept pace with such vegetation change caused by fire.

Due to the high variability in the stands damaged by the SPB, remotely sensed photography has not given enough detail for accurate classification of former pine stands. A more accurate report of the Forest's age-class /community type distribution cannot be made until a field inventory cycle is completed. An inventory cycle will take 10-15 years at the current funding level. At the end of FY12, we had inventoried about 23% of the 100,000-acre area that we estimated to have been affected.

At year-end, 83,990 acres were still classified as yellow pine and yellow pine-hardwood forest types (50-100% pine composition). Additionally, 57,085 acres were still classified as oak-pine types (having 30-49% pine composition). Based on the small sample we have done, the estimate now would be that 8% of that acreage might be correctly classified as having a component of more than 30% pine; therefore an adjustment was made that reclassified 70,200 acres of pine to upland hardwood and 7,800 of pine to oak-pine

Table 2-1 and Figure 2-1 below display an increase in acreage in all age-classes greater than age ninety. Although much inventory work still is needed in damaged stands, a comparison

with the estimate that was prepared in 2001 for the Final Environmental Impact Statement for the Forest Plan (FEIS Table 3-75, p.3-277) shows some trends. The table and figure also shows a large decrease in 0-10 age-class since the Forest Plan estimate in 2001 and the data in 2012. However, from the stands that we have sampled since the SPB outbreak, we believe that the figures shown for 2001 in the Forest Plan FEIS for age 0-10 stands were over-estimated. Many of the pine stands sampled since then, have a significant component of hardwood of the same age remaining, although stocking has been significantly reduced. Therefore, the 2011 figures for the 0-10 age-class should be more realistic.

There was no pitch pine stands artificially or naturally regenerated on the Forest during FY12. Individual seedlings and cone-bearing trees are occasionally found. Efforts to locate superior specimens of pitch pine should continue for scion or cone collection, to initiate a source for seed at the region's seed orchard.

Field-sampled vegetation data in Figure 2-1 Age Class Trends (percent of all forested lands) also shows an increase in acreage in all age-classes greater than age 90, which shows progress toward the old-growth goals of the Forest Plan. The 2012 figure for 0-10 age-classes is below the early-succession goal of the Forest Plan (roughly 2.5-3% of all forested land).

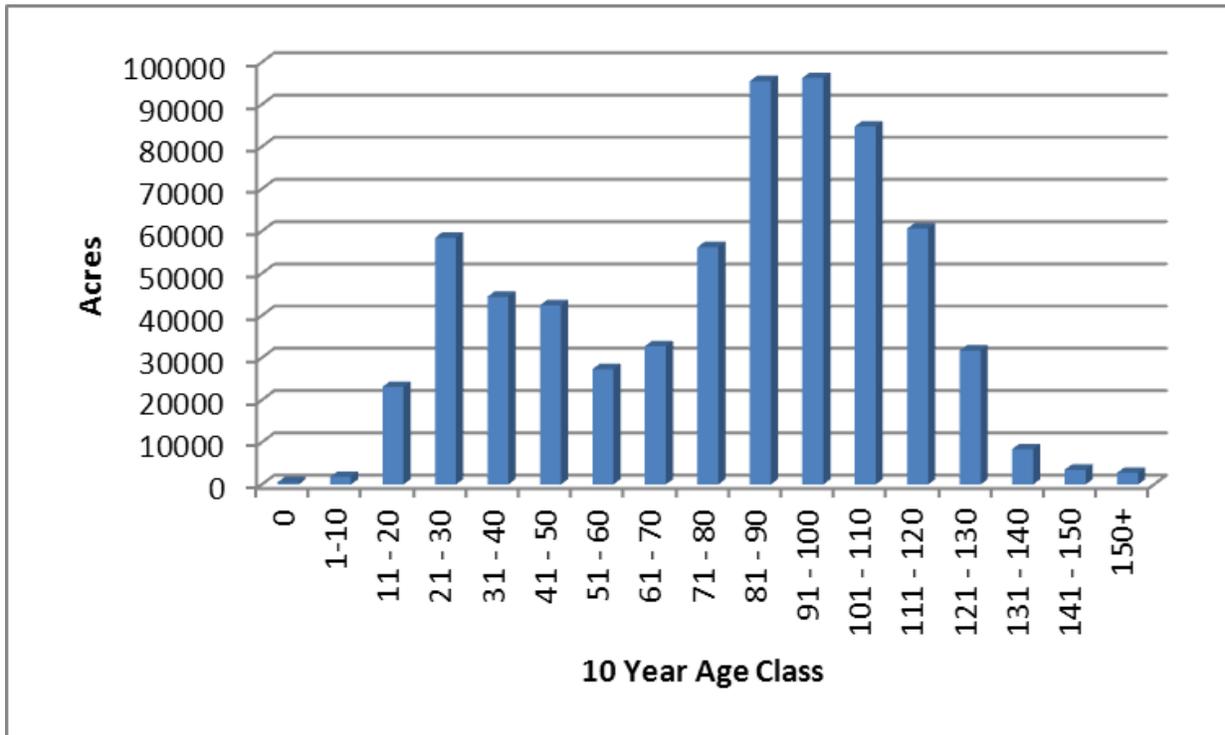
**Table 2-1 Community Type Trends (acres), FY12 M&E Report, DBNF**

	White pine / hemlock	Meso-phytic / flood-plain	Xeric and Mesic oak <sup>1</sup>	Oak-pine	Pine & pine-oak	Total identified as forest	Non-Forest	No Data	Total System Lands
<b>2001<sup>2</sup></b>	30,542	163,746	367,603	98,647	1,272	661,810	31,920	4,172	697,902
<b>2008</b>	32,199	170,006	384,667	57,019	6,972	650,863	36,402	20,498	707,763
<b>2011</b>	29,825	174,521	394,446	57,368	7,120	663,280	22,546	22,733	708,559
<b>2012</b>	32,371	179,014	388,381	64,885	5,990	670,641	21,880	16,037	708,559

<sup>1</sup> Enhanced estimated based on field sampling: 80,000 acres Pine-Pine Hardwood moved to upland oak.

<sup>2</sup> Forest Plan FEIS, page 3-277

**Figure 2-1 Age Class Trends (percent of all forested lands)**



**Silvicultural Treatments** - A record of silvicultural treatments has been kept in the Forest Activity Tracking System (FACTS) database since 2005. Data concerning forest community type is contained in the Field Sampled Vegetation database (FSVeg), which links to the geographic information system (GIS) stand layer. Data in FACTS can now be linked to the two FACTS-GIS layers; however as requested by the Washington Office, this GIS layer has only been used to record prescribed fire polygons. Therefore, there is no technical way to relate silvicultural treatments to community type (groups of forest types).

Based on field observation, most if not all of the following treatments occurred either in the Mesic or Xeric Oak community types. A list of silvicultural activities that occurred in FY07 through FY12 is shown in Table 2-2 below.

A significant amount of midstory thinning occurred for hazardous fuels treatment. Overstocked young stands were thinned to concentrate growth on remaining trees for faster development to larger sizes, which improves fire-resistance of these stands, as well as opening stands for advance oak regeneration.

Silvicultural treatments in the Licking, Middle Kentucky and Upper Kentucky River Management Areas focused on midstory removal and prescribed burning to establish advance oak and natural pine regeneration. Research continued on the Cold Hill Silvicultural Research Project, which is quantifying regeneration trends under various amounts of residual canopy cover. Three timber harvest projects are in the planning stage and activities should begin in FY13.

Silvicultural treatments in the Licking River Management Area concentrated on thinning of overstocked hardwood stands (Forest Plan Goal 2.1, p. 2-10); sanitation treatment of an ice storm damaged area (Forest Plan Goal 8.2); control of understory vegetation for stimulation of advanced oak regeneration (a pre-shelterwood treatment); and maintenance of seed production genetic improvement test areas (Forest Plan Goal 2., p. 2-112).

Silvicultural treatments in the Upper Kentucky River Management Area included non-commercial thinning treatments occurred in the Upper Kentucky River Management Area to stimulate growth and favor oak in hardwood

sapling stands (Forest Plan Goal 2.1 [p. 2-10] & Goal 8.3 [p. 2-15]).

Timber harvesting planned in both the Upper and Middle Kentucky River and the Upper Cumberland Management Areas will provide

regeneration to develop early-successional habitat (Forest Plan Goal 1.K-Objective 1.A, p. 3-35).

**Table 2-2 Silvicultural Treatments Acres, FY12 M&E Report, DBNF**

ACTIVITY	FY07	FY08	FY09	FY10	FY11	FY12
Shelterwood Prep Cut (2-aged system)	0	21	0	0	0	57
Shelterwood Seed Cut (2-aged system)	173	42	402	184	284	153
Improvement Cut	442	0	0	0	0	0
Commercial Thinning	186	98	190	29	75	212
Salvage Cut (intermediate treatment)	72	0	380	136	0	0
Sanitation Cut	108	341	394	626	892	417
Special Cut (Create Woodland)	156	0	0	0	0	0
Full Planting without Site Prep (fire area)	15	0	0	0	0	0
Full Planting concurrent with Site Prep	387	1	6	0	11	19
Fill-in Planting without concurrent site prep	0	15	78	0	16	5
Site Prep for Planting	0	2	0	27	0	0
Site Prep for Natural Regeneration	61	66	19	16	179	152
Individual [seedling] release	51	606	541	857	721	15
Pre-commercial Thinning (& midstory)	1,926	2,440	3,257	7,471	3,177	3,473
Insect Control (Hemlock Woolly Adelgid)	0	0	0	28	72	1,417
Seed Production Area Maintenance	26	4	12	0	0	4
<b>TOTAL AREA TREATED</b>	3,603	3,636	5,279	8,633	5,748	5,924

**Prescribed Burning and Wildland Fire** - Table 2-3 below displays the total acres burned and the prescribed burning objective on the Forest during the first eight years of the Forest Plan, as well as the acres of wildland fire for that same time period.

Most wildfires occur during the dormant season, during the area's historical arson fire period. For cove and bottomland forests, this is a more optimal time for fire than during the growing season. For other forest community types, growing season burns are generally considered more favorable to developing rich herbaceous understory. Therefore, many prescribed burns are scheduled during the early growing season.

Prescribed burn data are just beginning to be recorded in GIS in a form that allows determination of the extent of burning in various

forest types and desired fire regimes. A central latitude and longitude is entered for each burn unit, but very little polygon data is yet available. The FACTS GIS layers are still being created, and several prescribed burn polygons have been entered, but the linkage to the data has recently been established. As a result, it is not yet practicable to determine the acres of various forest community types burned in a particular season, or even how much of a community type was burned.

Although there is insufficient spatial data to determine changes over time in forest community types burned by prescription, the acres burned have become permanently located so that control lines can be used periodically. Control lines may follow creeks, but fire intensity

normally decreases in stands on north and east slopes and along damp drainages.

Most wildfire and prescribed fire<sup>3</sup> occur on upland oak/hardwood and upland yellow pine that are dominated by oaks. Based on the structure of oak bark and leaves, the nature of the sites on which they tend to grow, and the herbaceous species that often grow on the sites (fire enhanced or fire neutral), this appears to be an appropriate application of fire. Fire in cove and riparian areas is part of the natural range of variability on the landscape, but the areas would not be expected to burn intensely or frequently. Much of the wildfire acreage shown in Table 2-3 and Table 2-4 for these forest types represents areas that burned with cool backing fires, or did not burn at all, but which were included in the fire containment area for safety reasons

GIS data for wildland fire indicate 912 acres burned within the proclamation boundary in FY12, with most of that originating on NFS lands. Wildland fire data exist in GIS as points and polygons, depending on fire size. Point data include size and date of the fire, but no data regarding the shape and distribution of the fire. Point data do not allow the determination of a fire's extent with relationship to forest communities. Wildland fire polygon data showing size and spatial extent is linked to the corresponding point data, which includes ignition date. Some wildfire polygon data with dates exist that can be used to determine the relationship of a fire to a particular forest community type; this data is only available for FY03 through FY11 (Table 2-4)

**Management Indicator Species (MIS)** – data is being entered into corporate databases. Trend data analysis requires multiple years of data. Data from 1997 through 2004 was analyzed by Forest Service researchers in the following publication:

- La Sorte, F.A., F.R. Thompson, III, M.K. Trani, T.J. Mersmann. 2007. Population trends and habitat occurrence of forest birds on Southern National Forests, 1992-2004.
- General Technical Report NRS-9. U.S. Department of Agriculture, Forest Service, Northern Research Station. Newtown Square, PA. 260 p.

There has been no analysis of this extant for data after since the Record of Decision for Forest Plan was signed in 2004. Consequently, interpretation and evaluation has not begun.

The white-tailed deer is still one of the most sought after species for viewing and hunting, and was chosen as an MIS because of its high profile status as a game species. However, attempting to draw any meaningful connection between hunter success and habitat manipulation is impractical. There is a continued interest in harvesting bucks over does especially in the last few years. This in part is a function of the rules set for a given year's harvest.

Vegetation data was collected at all breeding bird survey points. No pitch pine stands were artificially regenerated, nor were any new naturally regenerated stands identified on the Forest during FY12. Inventories of former pitch pine stands have not occurred

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<sup>3</sup> Based upon information from Forest fire staff.

**Table 2-3 Acres of Fire on National Forest System Lands for FY2005-2012, FY12 M&E Report, DBNF**

	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	8-year average
<b>Acres of Prescribed Burn per Forest Plan Objective 2.4.C</b>	15,000	19,000	23,000	27,000	31,000	35,000	39,000	43,000	29,000
<b>Acres of Prescribed Burns Implemented</b>	19,052	17,659	8,473	15,342	9,439	10,442	10,074	10,979	12,683
<b>Acres of Wildland Fire</b>	6,446	2,930	6,730	2,771	1,864	2,119	3,291	912	3,382

**Table 2-4 Wildland Fire Acres (where available) by Forest Community Type, FY 2003-2012, FY12 M&E Report, DBNF**

Forest Community	Dormant Season	Growing Season			Total
	Winter (Nov-Mar)	Spring (Apr-May)	Summer (Jun-Aug)	Fall (Sept-Oct)	
<b>Cove</b>	1,076	186	20	204	1,487
<b>Yellow Pine</b>	733	299	127	501	1,660
<b>Upland Oak Hardwood</b>	7,010	2,156	282	2,560	12,008
<b>Bottomland</b>	63	14	0	4	81
<b>Oak/Cove<sup>4</sup></b>	3,104	2,209	4	1,433	5,585
<b>Brush, Non-Forest, and Un-inventoried<sup>5</sup></b>	247	96	6	62	411
<b>Total</b>	12,233	3,798	439	4,764	21,232

<sup>4</sup> The oak/cove forest community is recorded in FSveg as a type that ranges from mesic oak to cove hardwoods. Some fire is expected in mesic oaks while less fire is expected in cove hardwoods.

<sup>5</sup> The acre figures are large for this reporting period because many acres were recently inventoried. The plot data is entered in one database and then after a manual transformation, stand level data is entered into another database. At the time of extraction, the second data entry had not occurred.

### **3. (a) Are high-elevation habitats being provided?**

High elevation habitat of any kind is limited on the Forest. Only about 2,668 acres of NFS lands is at or above 2,000 feet in elevation and most of that is less than 2,200 feet in elevation. Some acquisition of lands above 2,000 feet has occurred since the adoption of the Forest Plan in 2004. Most of these higher elevation lands are located on the Redbird Ranger District, although some are in the Jellico Mountains of the Stearns Ranger District.

As of March 2013, 2,189 acres of NFS lands are in the 2,000 to 2,199-ft. elevation range. This consists of 396 parcels, the largest of which is about 55 acres, with 25 parcels above 20 acres in size, and 125 parcels under 5 acres, with about ½ under 1 acre. On average, the 2,000 to 2,199-ft elevation parcels are about 5.5 acres in size. Within this group, none of the stands is under than 10 years of age but about 50 acres total is in grass shrub condition. These latter acres may provide some habitat for early high-elevation early successional species such as the golden-wing warbler. The remainder of NFS lands in this elevation range does not provide high quality habitat for high elevation species although these species may use it.

As of March 2013, 536 acres on NFS lands are in the 2,200 to 2,499-ft. elevation range. This

consists of 80 parcels, the largest of which is about 55 acres. On average, these parcels are about 7 acres in size, with five parcels above 20 acres and 49 parcels less than 5 acres, many much smaller than 1 acre. Most of this does not readily provide useable habitat for high elevation species because: 1) it is not high enough, and 2) the parcels are too small. Approximately 2.2 acres in this elevation range is in grass and/or shrubs. In this elevation range there is no forested land that is 10 years old or younger. The remainder of NFS lands in this elevation range does not provide high quality habitat for high elevation species although these species may use it.

As of March 2013, 27 acres on NFS lands are in the ≥ 2,500 ft. elevation range. This consists of five parcels of land, the largest of which is about 14 acres. On average, these parcels are about 5.5 acres in size, with no parcels above 20 acres and three parcels less than 5 acres. All lands in this elevation range are mature forests and do not readily serve as useable habitat for early successional high elevation species. The remainder of NFS lands in this elevation range does not provide high quality habitat for high elevation species although these species may use it.

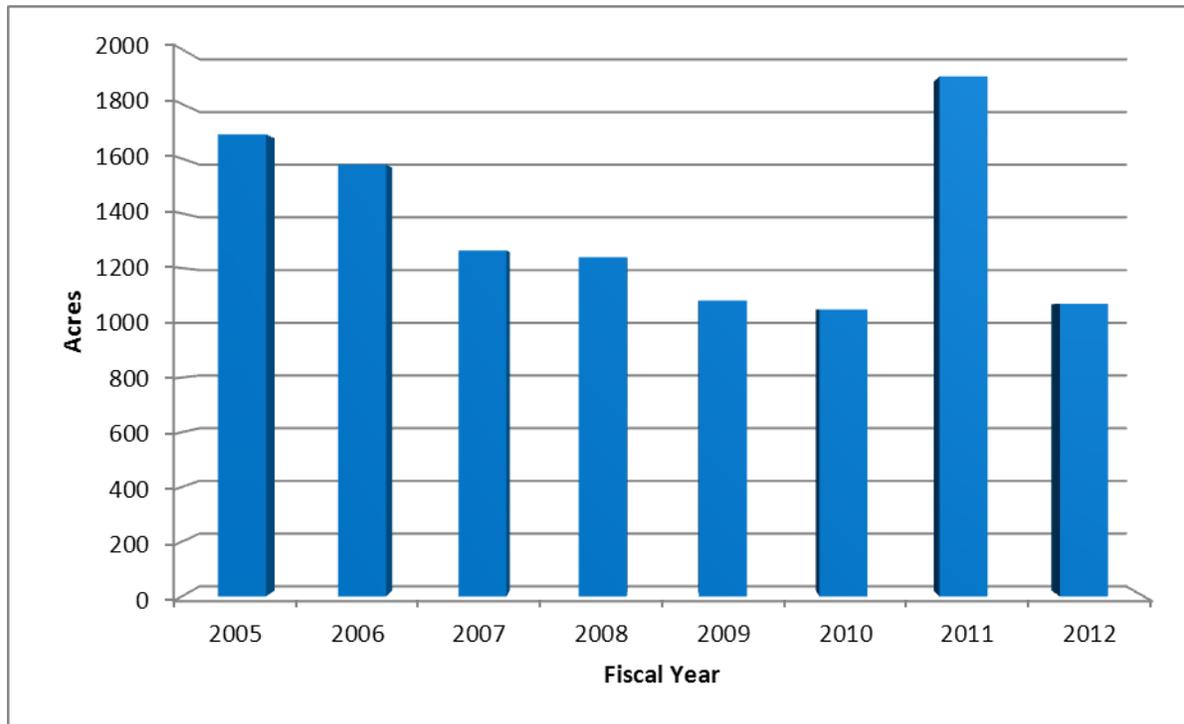
### **3. (b) Are permanent grassy openings being maintained?**

There are currently 2,170 acres of grassy openings habitat on the Forest; this acreage identified in the Forest Plan was based on data in the Continuous Inventory of Stand Condition data and GIS taken in 1998. A simple comparison suggests that the permanent grassy openings are being maintained (Figure 3-1). Based on field observations, there are also least 250 acres of grassland across the forest in utility rights-of-way.

Openings do not require annual maintenance. A lag of 2-3 years between treatments is sufficient

to maintain the desired characteristics. Thus, in order to maintain 2,170 acres in an open condition, 723 - 1,085 acres would need to be treated annually. Approximately 50-78% of that total is maintained annually. If the acres treated are in a 2-3 year rotation (data sources do not allow verification of this) then Forest Plan Objective 1.5.A. (p. 2-7) of 2,200 acres of grassland habitat in various prescription areas is being met.

**Figure 3-1 Acres of Grassy Openings Maintained by Fiscal Year, FY12 M&E Report, DBNF**



### 3. (c) Are key successional stage habitats being provided?

Grassy field/old field habitat is being provided. See Figure 3-1 above for more information.

**Old-growth** is addressed at a minimum of once every 5 years, and was last addressed in the FY09 report. The information from that report is provided here.

Existing old-growth is limited on the Forest. A portion of each of the Rock Creek Research National Area (RNA), the Tight Hollow proposed RNA, and the Right Fork Elisha Creek proposed RNA is considered old-growth. Numerous stands on the Forest are considered potential old-growth (POG), that is, they have the minimum age of, but not necessarily other characteristics of reference old-growth sites. Analysis of POG was summarized in the FEIS for the Forest Plan (Table 3-24, p. 3-92). Data was displayed by old-growth community type.

Essentially, the 1.I. Designated Old-Growth prescription area has remained unchanged; no land has been removed from this prescription area, and no additional acres have been added.

Table 3-1 below shows the distribution of acres by district, designated old-growth unit and community type, comparing 2004 from Forest Plan revision, and 2012 analyses. Some of the old-growth units show the same or nearly the same. The total acres for the 1.I Designated Old-Growth prescription area shown for the two analysis periods differ by 19 acres. This amount is attributed to stand line corrections, rounding differences and corrections to ownership assignment in the database.

Table 3-2 below shows the amount of forested land within the 1.I Designated Old-Growth prescription area by forest community type and the age classes defined in the FEIS on page 3-98:

- A - Currently meets minimum old-growth age (POG definitions);
- B - Is less than 70 years old;
- C - Is at least 71 years old but less than minimum old-growth age

- Unknown includes stands for which there is a community type, but no recorded age.

Overall, acres in age class A and age class C have increased while acres in age class B have decreased; at this time, the increases indicate that forest stands within the Designated Old-Growth prescription area are getting older. The 9-acre difference in the total between 2004 and 2012 is largely rounding differences. No stands have been removed from the 1.I Designated Old-Growth prescription area.

Analysis of POG data to community type level is more feasible than for the 1.I Designated Old-Growth prescription area. While either or both spatial data and tabular data for some stands have been corrected or updated since 1998, the analysis for this subset of old-growth is for the entire forest and not a small subset of the forest. The differences in area and forest types while potentially large are spread out over a large area and are less pronounced in any one spot. As about 12,000 acres have been acquired by the Forest since 1998, some change will be included in those acres.

Some of the acreage change shown in Table 3-3 and Table 3-4 below is the result of some older stands being acquired in the last 5 years. All community types except xeric yellow pine and yellow pine-oak forest gained POG acres due to general aging of the forest. Another 10,000 acres of POG is entirely possible in the next 10 years, again the result of general aging of the forest. The yellow pine community type decreased in acres because of further efforts to inventory forest stands following the southern pine beetle irruption of 1999-2001. The POG acres presented here as of 2010 may still be above actual for pine and pine-oak types, but represent the best estimate based on several years of sampling. This estimate of pine/oak forest types was not monitored for FY12.

Future old-growth (FOG), areas of the forest, based on predominate management direction tend to age in place, are also growing older. Analysis of FOG using March 2010 FSveg data was based on the summarized data in the FEIS in Tables 3-27 and 3-28 indicated a change of 256,377 acres (2004 FEIS) to 224,089 acres (current). This change is an artifact of the analysis process as the base spatial data for prescription areas has only changed for the 1.K Habitat Diversity Emphasis, and 3.H.1 Ruffed

Grouse Emphasis prescription areas. Forest Plan Amendment #1 moved approximately 10,000 acres from prescription area 1.K. to 3.H.1 with the establishment of a ruffed grouse prescription area within the Upper Kentucky River Management Area on the Redbird Ranger District. All other prescription area spatial data sets have remained the same even though there has been acquisition of land including at least 1.E Riparian Corridor and 1.C Cliffline Community prescription areas. The approximately 32,000-acre difference is not the result of changes to prescription areas considered here. The change is attributed to differences in the analysis, which may include differences in how water in riparian areas is handled and what portion of the 5.C Source Water Protection prescription area was used.

FSVeg Spatial database data was extracted in December 2012 to produce the age class distribution shown below (Figure 3-2). Acres shown in age class 0 include utility, road and railroad rights-of-way, wildlife openings; surface mine lands, some special uses, and water (about 75% of the acres). As at the time of the adoption of the current Forest Plan, the age class distribution was bimodal with peaks in the 21-50 year age class and the 71-120 year age classes. The first is the result of management practices in the 1960s to the 1990s. The second is the result of the history of management on the land prior to its inclusion in the National Forest System. The amount of 0-10 age classes is below the Forest Plan 1.K-Objective 1.A of 5-6% within prescription area 1.K. lands (about 2.5-3% of all forested lands); approximately 18,750 to 22,500 acres under 11 years of age, or 1,875 to 2,250 acres per year). Currently about 1,800 acres are in this age class, about 0.5% of 1.K. lands. Older forest is being provided as well as mid-age forest. Forest older than 150 years is limited, but this habitat can only be grown with time. Additional information on stand-level composition and structure of major forest communities is provided in Forest Plan Monitoring Question # 2 above.

**Table 3- 1 Acres of Designated Old-growth by District, Unit, and Community, Including Acres of Openings, FY12 M&E Report, DBNF**

District (Current)	District (Former)	Old-growth Unit	Analysis Year	Conifer northern hardwood forest	Mixed Mesophytic forest	River floodplain hardwood forest	Dry-mesic oak forest and woodland	Dry-xeric oak forest, woodland, wooded grassland	Xeric yellow pine and yellow pine-oak forest, woodland and wooded grasslands/ shrubland	Dry and dry-mesic oak-pine forest and woodland	Eastern riverfront forest	Beech (totals included in mixed mesophytic forest)	Total forested acres per old-growth unit <sup>6</sup>	Openings	Total acreage per age class <sup>7</sup>	
Cumberland	Morehead	Yocum Cr. <sup>8</sup>	2004	39	783	29	587	112	43	171	0	0	1,764	143 <sup>2</sup>	1,907	
			2012	74	880	0	497	112	39	171	28	0	1,801	143	1,944	
		Caney Cr.	2004	0	86	21	1,506	72	189	595	0	0	2,469	85	2,554	
			2012	0	125	21	1,669	33	203	417	0	0	2,468	133	2,601	
	Stanton	Cave Hollow	2004	0	293	0	436	0	0	184	0	0	913	0	913	
			2012	0	293	0	437	0	0	184	0	0	914	0	914	
		Claw Tract	2004	0	278	0	48	0	0	0	0	0	68	326	0	326
			2012	0	278	0	48	0	0	0	0	0	68	326	0	326
London	London	White Oak Cr.	2004	353	95	0	1,398	93	202	21	0	0	2,162	0	2,162	
			2012	353	104	15	1,381	91	201	21	0	0	2,166	0	2,166	
		Horselick Cr.	2004	6	1,020	51	567	87	223	15	43	56	2,012	5	2,017	
			2012	6	1,180	0	590	87	66	40	19	52	1,988	5	1,993	
Stearns	Somerset	Straight Creek	2004	0	381	0	543	0	223	88	0	47	1,235	0	1,235	
			2012	0	380	0	540	0	225	89	0	47	1,234	0	1,234	
	Stearns	Jellico	2004	0	966	0	783	413	41	0	0	46	2,203	100	2,303	
			2012	0	966	0	784	413	41	0	0	46	2,204	13	2,217	

<sup>6</sup> Forest acres exclude managed openings and water.

<sup>7</sup> Total acres are forested land and openings/water.

<sup>8</sup> Water was called an opening in Yokum in 2004 due to an error in an analysis algorithm and so is included again in 2012.

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District (Current)	District (Former)	Old-growth Unit	Analysis Year	Conifer northern hardwood forest	Mixed Mesophytic forest	River floodplain hardwood forest	Dry-mesic oak forest and woodland	Dry-xeric oak forest, woodland, wooded grassland	Xeric yellow pine and yellow pine-oak forest, woodland and wooded grasslands/ shrubland	Dry and dry-mesic oak-pine forest and woodland	Eastern riverfront forest	Beech (totals included in mixed mesophytic forest)	Total forested acres per old-growth unit <sup>6</sup>	Openings	Total acreage per age class <sup>7</sup>
Redbird	Redbird	Big Double Cr.	2004	47	1,239	108	446	0	0	0	23	589	1,863	55	1,918
			2012	47	1,264	0	446	0	0	0	109	590	1,866	55	1,921
			<b>2004</b>	445	5,141	209	6,314	777	921	1,074	66	806	14,947	388	15,335
			<b>2012</b>	480	5,470	36	6,392	736	775	922	156	803	14,967	349	15,316

**Table 3- 2 Acres by Community Type and Stand Age Class in the Designated Old-growth Prescription Area, FY12 M&E Report, DBNF**

Stand Age Class <sup>9</sup>	Year	Conifer northern hardwood forest	Mixed Mesophytic forest	River floodplain hardwood forest	Dry-mesic oak forest and woodland	Dry-xeric oak forest, woodland, wooded grassland	Xeric yellow pine and yellow pine-oak forest, woodland and wooded grasslands/shrubland	Dry and dry-mesic oak-pine forest and woodland	Eastern riverfront forest	Beech (totals included in mixed mesophytic forest)	Total acreage per age class
A <sup>10</sup>	2004	0	0	0	0	43	43	92	13	0	191
	2012	0	70	0	174	127	188	78	13	70	650
B <sup>11</sup>	2004	169	1,607	53	1,077	68	490	257	56	66	3,777
	2012	234	1,360	36	820	69	287	316	0	66	3,122
C <sup>12</sup>	2004	246	3,534	143	5,237	665	387	725	10	740	10,947
	2012	246	4,038	0	5,398	540	301	527	143	667	11,193
Unknown <sup>13</sup>	2004	31	0	0	0	0	0	0	10	0	41
	2012	0	0	0	0	0	0	0	0	0	0
Total	2004	446	5,141	196	6,314	776	920	1,074	89	806	14,956
	2012	480	5,468	36	6,392	736	776	921	156	803	14,965

**Table 3- 3 Possible Old-growth on the Daniel Boone National Forest by Community Type, FY12 M&E Report, DBNF**

Community	Pre-SPB acres	Post-SBP acres	2010-11 acres	2012 acres
Conifer-northern hardwood forest	1,400	1,400	2,643	2,636
Mixed mesophytic forest	728	728	986	1,560
River floodplain hardwood forest	61	61	131	160
Dry-mesic oak forest	532	532	2,906	4,870
Dry and xeric oak forest	1,483	1,483	6,975	12,031
Xeric yellow pine and yellow pine-oak forest	11,017	7,065	5,542	3,500
Dry and dry-mesic oak-yellow pine forest	912	912	6,930	4,810
Eastern river front forest	-	-	20	98
<b>Total</b>	<b>16,133</b>	<b>12,181</b>	<b>26,133</b>	<b>29,665</b>

<sup>9</sup> Stand age classes are defined on page 3-98 of the FEIS.

<sup>10</sup> Minimum old-growth age (POG) stands. The age at which a stand qualifies for old-growth varies by forest type and is based on criteria in the USDA Forest Service 1997 publication *Guidance for conserving and restoring old-growth forest communities on national forests in the Southern Region* (For. Rep. R8-FR 62).

<sup>11</sup> Stands are 0-70 years old.

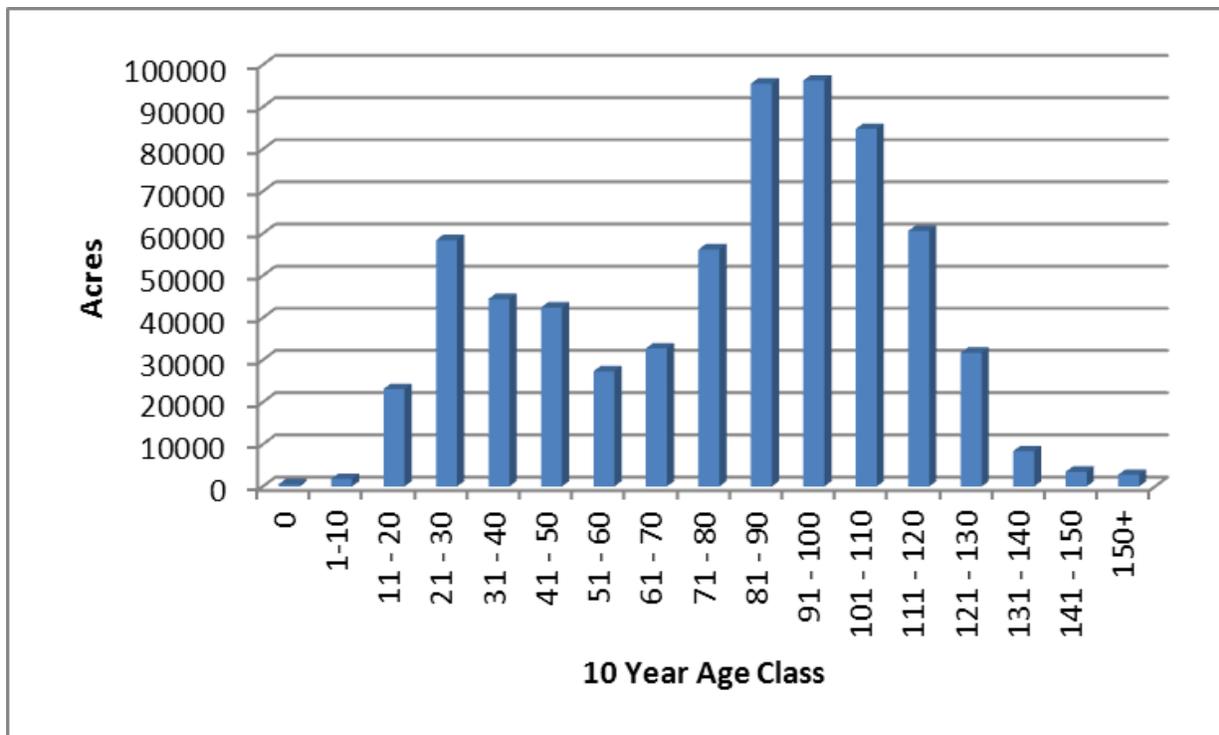
<sup>12</sup> Stands are more than 70 years old but not old enough to qualify as old-growth.

<sup>13</sup> Unknown means forest type known but age not determined for stand.

**Table 3- 4 Forest Communities, Pre- and Post-Southern Pine Beetle Attack, FY12 M&E Report, DBNF**

Community	Pre-SPB acres	Post-SBP acres	2010 acres
Conifer-northern hardwood forest	1,400	1,400	2,643
Mixed mesophytic forest	728	728	986
River floodplain hardwood forest	61	61	131
Dry-mesic oak forest	532	532	2,906
Dry and xeric oak forest	1,483	1,483	6,975
Xeric yellow pine and yellow pine-oak forest	11,017	7,065	5,542
Dry and dry-mesic oak-yellow pine forest	912	912	6,930
Eastern river front forest	-	-	20
<b>Total</b>	<b>16,133</b>	<b>12,181</b>	<b>26,133</b>

**Figure 3-2 Age Class Distribution by Acres, FY12 M&E Report, DBNF**



**4. How well are key terrestrial habitat attributes being provided?**

**Snags and Downed Wood** - As currently defined in the monitoring elements found in Appendix D of the Forest Plan (Forest Plan p. D-3), the method of data collection to answer this

question is “Map and update changes in forest composition and condition through routine inventories. Infer snag and downed wood by the acres of older age class forests and mortality

due to insects and disease.” As forests age, the number of dead and dying trees tends to increase. This in turn leads to an increase in the number of snags and eventually the amount of coarse woody debris on the ground. Table 2-1 above indicates a slight shift in the age of the forest over the last 9 years. For most age classes, the shift is an increase of 9 years in age. There is an expectation that this slightly older forest will have a slightly higher number of snags and slightly more downed wood. Through attrition of older or weaker trees, a supply of both snags and downed wood is maintained on the Forest.

Downed wood and snags are specifically addressed directly in the Forest Plan in one or more forms. For coarse woody debris, all vegetative management projects (outside of prescribed burning) are to leave at least two pieces of wood per acre measuring at least 12 inches diameter at midpoint and 10 feet long (Forest Plan 1.K-Objective 1.M, p. 3-36). For snags, Forest Plan Standard DB-WLF-2 states, “Retain or create at least three snags per acre equal to or greater than 9 inches diameter at breast height with all timber harvest, regeneration, sanitation, salvage, or thinning project units when available” (p. 2-22). It is desirable that snags be > 12 inches diameter at breast height.

Currently, there is no tracking method set up either for downed wood or snags that encompasses all forested areas of the Forest. In practice, there is usually sufficient coarse woody debris left to meet or exceed the objective, plus additional smaller diameter wood in harvested areas. In areas where biomass is harvested, much less downed wood is left.

Snag and downed wood is inferred by the acres of older age class forests and mortality due to insects and disease. For purposes of this estimation, “older age class forests” are defined here as stands 100 years old and older. The desired condition for older age forest is about 30-40% of total forest area based on the proportion of forest managed under Forest Plan 1.K. Habitat Diversity Emphasis prescription area. Table 4-1 below shows the trend in age 100 and older forests within the Forest.

**Table 4-1 Trend in Age, One-hundred Year and Older Forest Stands, FY12 M&E Report, DBNF<sup>14</sup>**

Year	Forest stands 100 years + (acres)	Total forest (acres)	Percent of total
2006	104,000	650,000	15 %
2007	136,759	655,000	21 %
2008	130,442	660,624	20 %
2009	169,614	660,629	26 %
2010/2011	177,207	670,743	27 %
2012	191,807	670,641	29%

About 100,000 acres of forest stands having various amounts of pine were affected by the southern pine beetle in an infestation that occurred from 1999 to 2001. An estimated 5,000 or more acres of older oak forest have been affected by the two-lined chestnut borer.

Although much of the pine forest impacted by the southern pine beetle has not been inventoried and reclassified, inventory data suggests that many of these stands retain a component of older hardwood in a multistoried (uneven-aged) condition. Pine snags are still available for cavity nesters. The initial density of pine snags has now decreased by about 80%, as many of these snags now have become downed wood and are in various stages of decay.

Hardwood snags are continuously being created and becoming more prevalent in those areas of the forest that are being affected by the two-lined chestnut borer. Most of these snags are still standing. Approximately 5,000 acres of older oaks have been affected by the two-lined chestnut borer leaving snags scattered across the landscape.

Hardwood snags are abundant in areas impacted by the 2003 ice storm at the north end of the Forest. Many are still being created because of top damage and droughty conditions. Uprooted, downed hardwoods also occur in scattered pockets throughout portions of the forest, due to random storm winds.

<sup>14</sup> Data from FSVeg Spatial database as of March 2012.

**Mast production capability** is inferred from the status of older age classes of oak forest community types. The latest summary of older-age oak forest is shown in Table 4-2. For purposes of mast production, stands with ages at least 80 years were considered as “older age”. Stands having  $\geq 50\%$  upland hardwood and having an oak component were considered as “Oak forest community types”. Those forest types include 43, 44, 45, 47, 48, 51, 52, 53, 54, 55, 57, 59, 60, 61, 84, and 85. Type 46, Bottomland hardwoods-yellow pine, was also included as white oak is often an important tree in this forest type. Data was not grouped by forest type in Fiscal Years 2006-2009, but totals from earlier reports are given.

Table 4-2 shows that over 211,000 acres of upland oak stands were potentially available for mast-production by the end of 2009. This increased to over 228,000 acres by 2011 and over 240,000 acres in 2012. In addition, other

forest types not shown, such as the mixed mesophytic hardwood or pine types, often have a significant component of oak, hickory, walnut, beech, and other nut producers.

Between 2006 and 2009, there was a 4% increase in upland oak stands (excluding poletimber) available for mast production. Additionally, other forest types, such as mixed mesophytic hardwood or pine types, often have a significant component of oak, hickory, beech, and other nut producers. However, even with oak decline and beech bark disease mortality, the forest is generally becoming older, and many pine stands have converted to hardwood, resulting in stable and plentiful mast production. Between 2009 and 2011, there was a 7% increase in upland oak stands that were available for mast production. Between 2009 and 2012, there was a 19% increase in upland oak stands that were available for mast production.

**Table 4-2 Age 80+ Oak Forest by Forest Type (acres), FY12 M&E Report, DBNF**

Forest type	2006	2007	2008	2009	2010/2011	2012
43 – Oak, Eastern Redcedar	-	-	-	-	0	34
44 – Southern Red Oak, Pine	-	-	-	-	482	525
45 – Oaks, Yellow Pine	-	-	-	-	15,042	15,684
46 -- Bottomland	-	-	-	-	544	796
47 – White Oak, Black Oak, Pine	-	-	-	-	23,713	24,532
48 – Northern Red Oak, Hickory, Pine	-	-	-	-	518	532
51 – Post Oak, Blackjack Oak	-	-	-	-	293	310
52 – Chestnut Oak	-	-	-	-	2,796	3,028
53 – Northern Red Oak, White Oak, Hickory	-	-	-	-	144,422	150,998
54 – White Oak	-	-	-	-	10,607	11,082
55 – Northern Red Oak	-	-	-	-	92	32
57 – Southern Scrub Oak	-	-	-	-	7	0
59 – Scarlet Oak	-	-	-	-	16,776	17,321
60 – Chestnut Oak, Scarlet Oak	-	-	-	-	10,492	11,186
61 – Swamp Oak, Chestnut Oak, Cherrybark Oak	-	-	-	-	0	39
84 – Chestnut Oak, White Oak, Scarlet Oak	-	-	-	-	1,595	2,862
85 – White Oak, Black Oak, Hickory	-	-	-	-	1,083	1,582
<b>Total</b>	<b>171,286</b>	<b>175,961</b>	<b>203,953</b>	<b>211,731</b>	<b>228,395</b>	<b>240,543</b>

**Riparian Area Management and Trends** - The riparian areas of the Forest within the 1.E Riparian Corridor prescription area are predominantly classified as Unsuitable for Timber Production if such timber production is intended for purposes other than improving riparian habitat. Zero acres of silvicultural work were reported as occurring in forest classified as unsuitable for timber production in the Riparian Corridor prescription area in FY12. Some management activities are being planned in the riparian prescription area within the Upper Kentucky River management area, which may occur in 2013-2014.

Table 4-3 below displays changes in 10-year age classes of stands, over the past four years, within the 1.E Riparian Corridor prescription area. Table 4-4 below displays forest community types in the same manner, and indicates that the Upland Oak community type continues to be the most common in the riparian area. Within this community, various species of oak and hickory make up at least 50% of the stand stocking. The second most common is the mixed-mesophytic/floodplain community type where “yellow-poplar/white oak/red oak” and

“hemlock/hardwood” are the most common forest types. Most of this occurs in intermittent and narrow drainages. As previously mentioned, the southern yellow pine types have not been completely updated and are therefore overestimated in the table. The table shows that many of the stands in the riparian corridor are still 80 and 119 years of age. Variations in the total riparian area acreage in Table 4-4

Although an analysis of forest type by age was not done for the revision of the Forest Plan, there are several years of trend information recently available. Based on the data, there has been little change in the riparian area composition during the period. From field observation, minor change has occurred within the riparian prescription area in the last five years due to isolated storm damage and scattered pine mortality. In some riparian stands, white pine was killed by the southern pine beetle. However, it is highly probable that extensive damage will occur to eastern hemlock trees from the woolly adelgid infestation that is continuing to expand into Kentucky

**Table 4-3 Stand Age Class within the Riparian Corridor, FY12 M&E Report, DBNF**

Stand Age Class	FY06	FY07	FY08	FY09	FY10-11	FY12
0 - 9	2,116	2,114	1,593	1,685	1,399	515
10-19	8,475	8,388	7,962	4,873	3,426	3,296
20 - 29	6,652	6,607	6,960	7,947	8,030	8,883
30 - 39	6,798	6,607	7,049	6,950	6,717	7,053
40 - 49	5,640	5,212	6,102	6,465	7,007	7,244
50 - 59	5,073	5,046	5,703	4,953	4,996	4,947
60 - 69	8,763	8,763	7,996	7,079	6,583	6,875
70 - 79	17,430	17,415	17,095	12,942	11,734	11,243
80 - 89	21,593	21,583	23,082	21,717	20,560	20,829
90 - 99	20,336	20,337	20,658	21,676	21,067	22,073
100 - 109	14,356	14,125	15,410	17,642	17,988	18,942
110 - 119	7,896	7,889	9,033	11,492	11,741	13,258
120 - 129	5,458	5,457	3,310	6,019	6,390	7,944
130 - 139	0	0	1,191	1,850	2,162	2,273
140 - 149	0	0	544	902	887	1,000
150+	0	0	1,101	1,226	1,346	1,348

Stand Age Class	FY06	FY07	FY08	FY09	FY10-11	FY12
No data	n/a	n/a	4,061	745	4,599	491

**Table 4-4 Community Type within the Daniel Boone National Forest Riparian Corridor, FY12 M&E Report, DBNF**

Community Type	FY06	FY07	FY08	FY09	FY10-11	FY12
Upland Oak	52,882	53,175	55,302	55,081	52,949	55,869
Mesophytic/Flood	37,819	37,081	34,718	39,147	35,145	40,858
Oak/Pine	11,420	11,145	16,938	12,624	11,679	11,620
Pine/Pine-Oak	14,124	14,124	13,740	13,663	13,129	13,351
White Pine/Hemlock	14,319	14,016	15,152	15,144	14,339	15,045
Non-forest	n/a	n/a	n/a	503	3,264	3,269
No Data	n/a	n/a	n/a		4,689	491
<b>Total Riparian Area</b>	-	-	-	<b>136,162</b>	<b>135,194</b>	<b>140,582</b>

## 5. What is the status and trend in aquatic habitat conditions in relationship to aquatic communities?

Methods for sampling fish and aquatic insects were established in 2005 in cooperation with U.S. Environmental Protection Agency (EPA), Forest Service research, and the Southern Regional Office. During 2012, aquatic biota, coarse woody debris, and stream substrate were sampled at a total of 14 random sites in the Upper Cumberland, Kentucky and Licking The random sites were located on wadeable tributaries that drained more than 5 square miles. The data was collected, and compiled by crews from the Center for Aquatic Technology Transfer (CATT), a Forest Service research project based in Blacksburg, VA. The

information collected is used on upcoming projects to address the status of aquatic habitat and communities. Conversely, trend analysis requires multiple years of data. Consequently, interpretation and evaluation has not begun. Trend analysis will be conducted in the future and the results will be reported in subsequent years.

In addition, a summer crew from CATT evaluated aquatic organism passage at several culverts across the Forest. The work included fish shocking, genetics testing, and monitoring passage with antennas.

## 6. What are status and trends of forest health threats on the forest?

**Air Quality Conditions** - The air pollutants of most concern on the Daniel Boone National Forest are particulate matter and ozone. Fine particulate matter is the leading cause of regional haze (also known as visibility impairment), while ozone can harm sensitive vegetation within the forest. Additionally, at elevated concentrations these two pollutants can

impair the health of both employees and visitors to the National Forest.

**Ozone** – Ozone is a pollutant formed by emissions of nitrogen oxides and volatile organic compounds in the presence of sunlight. At elevated concentrations, it causes human health concerns as well as negative impacts to vegetation. The EPA, as directed by Congress, has set a national ambient air quality standard

(NAAQS) of 0.075 parts per million (ppm) to protect both human health and the environment. However, EPA is required to reassess the standards every five years based on most recent scientific research, and as a result more stringent standards may be proposed sometime in the future. Figure 6-1 below shows the measured concentrations of ozone at the four monitoring sites closest to the Forest. As shown, most values are below the NAAQS. The 3-year rolling average for Pulaski County reached 0.076 ppm for the years 2010-2012, which exceeded the NAAQS.

**Particulate Matter** – Particulate matter is a mixture of extremely small particles made up of soil, dust, organic chemicals, metals, and sulfate and nitrate acids. The size of the particles is directly linked to health effects, with smaller particles causing the worst impacts to human health. As a result, EPA has set a primary NAAQS for ultra-small (less than 2.5 microns in diameter) particulate matter on both a short-term (24-hour) and annual basis. The 24-hour fine particulate matter (PM<sub>2.5</sub>) NAAQS is currently set at 35 µg/m<sup>3</sup>, while the annual PM<sub>2.5</sub> NAAQS is 13 µg/m<sup>3</sup>. As mentioned above, EPA may set more stringent standards in the future if scientific research suggests that the current standards are not protective enough of sensitive populations. Figure 6-2 below shows the measured PM<sub>2.5</sub> levels at the four fine particulate matter monitoring sites located near the Daniel Boone National Forest. As shown, levels are below the 24-hour and annual air quality standards, and continue to be improving.

**Emissions from Prescribed Fire Activity on the Forest** – Emissions from wildland fire include carbon dioxide, water, carbon monoxide, particulate matter, hydrocarbons or volatile organic compounds, and nitrogen oxides. Carbon dioxide and water generally make up over 90% of the total emissions. The most important pollutant from wildland fire emissions is fine particulate matter (PM<sub>2.5</sub>) due to the amount emitted and the effects on human health and visibility. During the calendar year of 2012, the Forest burned almost 11,000 acres in accordance to their prescribed burning program. The following graph shows the measured PM<sub>2.5</sub> concentrations near the Forest in comparison to both the annual and 24-hour average NAAQS. None of the four fine particulate matter monitors

near the Forest are currently exceeding the fine particulate NAAQS in 2012.

**Acidic Deposition** – Deposition of acidic compounds onto the Forest can cause harmful effects to both aquatic and terrestrial ecosystems. Such deposition can occur in three forms: dry, wet and cloud. Dry deposition is the direct fallout of fine particulates and gases from the atmosphere. Wet deposition occurs when acidic pollutants combine with water in the atmosphere, which is then deposited in the form of rain, snow or hail. Both sulfur and nitrogen deposition can impact the water on the Forest by decreasing the acid neutralizing capacity and decreasing the pH in perennial streams.

The National Atmospheric Deposition Program (NADP; <http://nadp.sws.uiuc.edu>) and Clean Air Status and Trends Network (CASTNET; <http://epa.gov/castnet/javaweb/index.html>) operate three sites near the Forest. None of the locations are on the Forest, but the data collected represent a range of sites from north to south and are probably representative of conditions occurring on the Forest. Because small fluctuations do occur from year to year, trends over longer periods of time are more reliable. Figure 6-3 and Figure 6-4 show the total sulfur and total nitrogen deposition trends for the Crockett, Speedwell and Mackville monitoring locations as reported in the CASTNET database. Figure 6-5 shows the pH trends at the NADP sites (Clark State Fish Hatchery, Speedwell and Lilly Cornett Woods) over the past 10 years. There was no deposition data available for Mackville in 2002 and Speedwell in 2005. From 2001 through 2010 sulfur and nitrogen deposition rates indicate a decrease in acidic deposition. This would be directly related to emission reductions that have taken place as a result of air pollution control regulations required under programs such as the 1990 Clean Air Act Amendments.

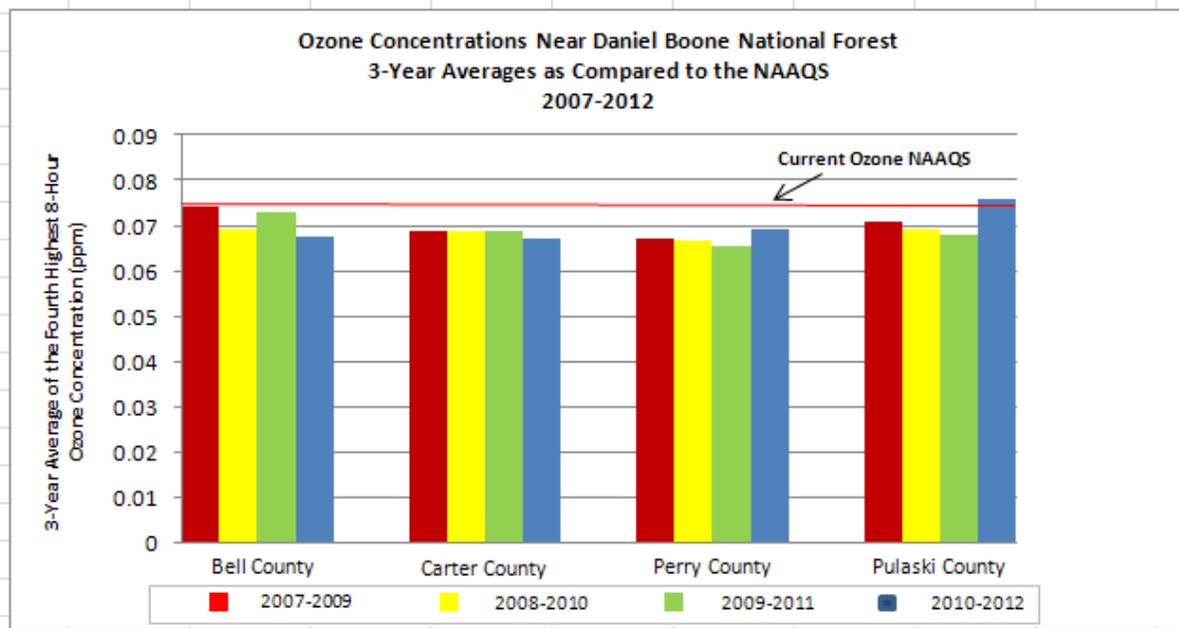
**Hazardous Fuels** - In eastern Kentucky, forest fuels can occasionally build up through natural processes and events to hazardous levels. Fuels reduction activities using mechanical methods and/or prescribed fire are used to reduce vegetation density and change understory vegetation composition. Effects on the overstory composition are usually minor, as these burns do not normally result in forest type changes.

Prescribed burning occurred on approximately 10,979 acres in FY12. This is less than the annual objective of 43,000 acres, and is still below the range of 22,500 to 50,000 acres Forest Plan Objective 2.4.C., p. 2-11).

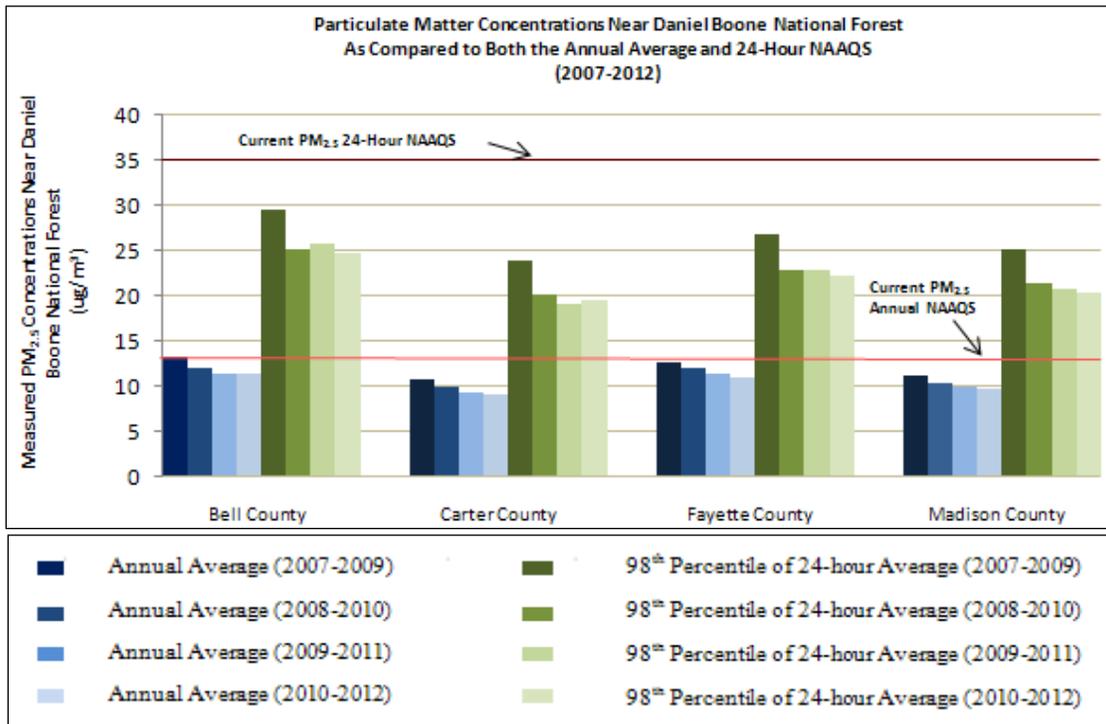
Barriers to meeting the objectives are primarily weather conditions that are outside of the

burning parameters identified in the burn plans. Typically, only about 10 days a year meet all of the weather parameters needed to conduct a safe and effective prescribed burn. Such barriers will continue to hamper objectives of increasing prescribed burning acres on the Forest.

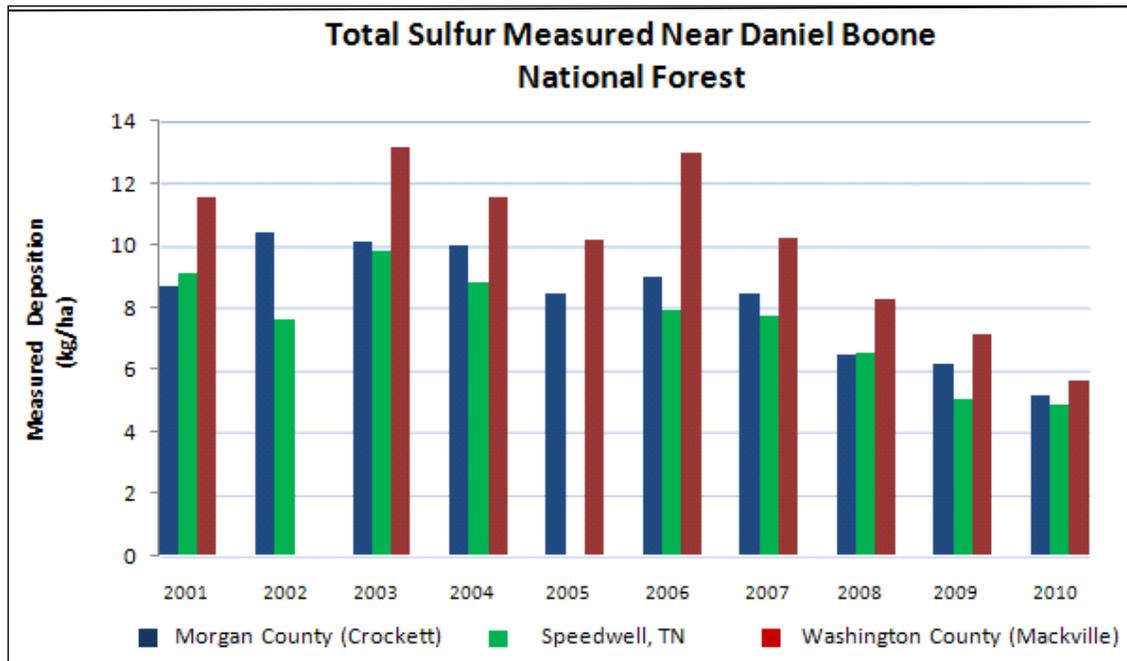
**Figure 6-1 Ozone Concentrations near Daniel Boone National Forest 3-Year Averages as Compared to the NAAQS 2007-2012, FY12 M&E Report, DBNF**



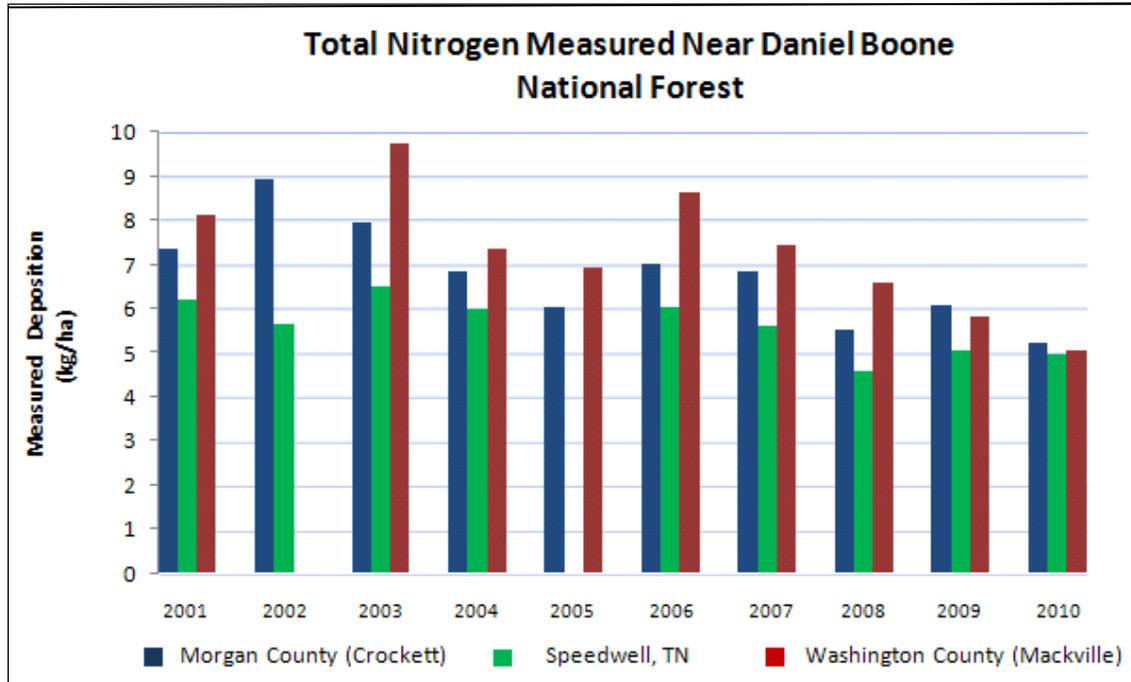
**Figure 6-2 Particulate Matter Concentrations near Daniel Boone National Forest as Compared to Both the Annual Average and 24-hour NAAQS (2007-2012), FY12 M&E Report, DBNF**



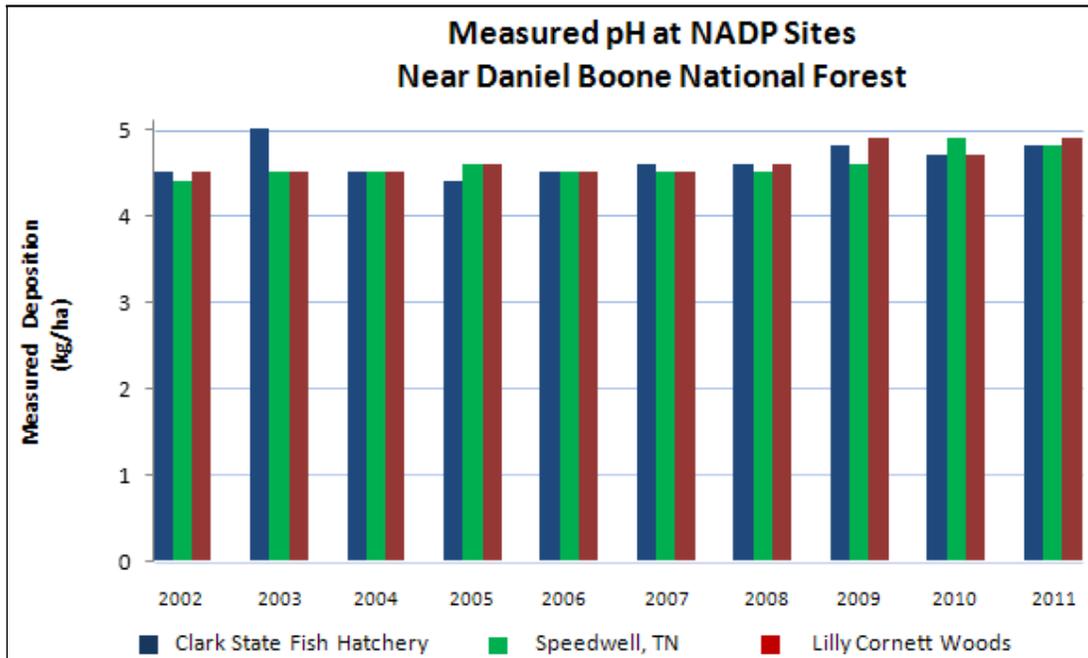
**Figure 6-3 Total Sulfur Measured Near the Daniel Boone National Forest, FY12 M&E Report, DBNF**



**Figure 6-4 Total Nitrogen Measured near the Daniel Boone National Forest, FY12 M&E Report, DBNF**



**Figure 6-5 Measured pH at NADP Sites near the Daniel Boone National Forest, FY12 M&E Report, DBNF**



***Insects and Disease*** - In FY12, activities to control destructive insects and disease consisted of monitoring of Southern Pine Beetle, Emerald Ash Borers and Gypsy Moth populations and the treatment of Hemlock Woolly Adelgid. Information was disseminated again to the public concerning the emerald ash borer quarantine. Posters were placed warning campers to not move firewood, but to use only local wood.

Hemlock Woolly Adelgid (HWA) - Surveys for *Aldelges tsugae* continued in Kentucky in 2012, and results are reported to the University Of Kentucky Department Of Entomology. Infestations occur in 15 counties in southeastern Kentucky and on all four districts of the Forest. Infestations occur on private, state and federal lands. There is a noticeable spread of HWA, although the rate of spread has not been examined. Four state agencies including the Division of Forestry, State Nature Preserves Commission, Department of Fish and Wildlife Resources and Division of Water have partnered and are treating on selected state lands. On the Forest, HWA was found feeding on hemlock trees on the Redbird, Cumberland and London and Stearns Ranger Districts. No new locations for HWA were found in 2012 on the Forest.

Forest personnel have been aware of the invasion of HWA since it was first identified on the Forest in 2008, and have been on the lookout for new infestations. Soil injection with the insecticide imidicloprid occurred around several infested hemlocks in campgrounds on the Stearns and Redbird districts. A cooperative agreement was signed with the Kentucky Division of Forestry and a crew began soil treatment in infested Forest-designated Hemlock Conservation areas.

Dogwood Anthracnose is caused by a fungus (*Discula distructiva*) that has infected and killed many flowering dogwood trees throughout the eastern forests over the last two decades. Diseased dogwoods can be found on the Forest. No practical treatment is known to reduce this loss in large forested areas. Dogwood trees grown in open conditions and along forest edges appear to do better than trees grown in interior forest conditions.

Southern Pine Beetle (SPB) - *Dendroctonus frontalis* had a negligible effect in Kentucky in 2012. SPB has only been occurring at low levels

across Kentucky since the last major outbreak occurred from 1999-2001. One SPB trap was placed on the Stearns Ranger District and one trap was placed on the London Ranger District. Zero SPB were caught in 2012 on the Forest but 82 clerid beetles (*Thanasimus dubius*) were captured indicating that biological control of SPB is still occurring.

SPB trapping results were negative in 2012. Based on this continuing monitoring, SPB populations are predicted to remain static and remain at Low levels on the Forest.

Gypsy Moth is an insect (*Lymantria dispar*) that has defoliated and killed many oaks in the northeastern United States. Trees are weakened by continual defoliation in successive years; then other insect and disease organisms take advantage of the stressed condition of the trees. Trapping of gypsy moth is designed to capture any moths brought into recreation areas on vehicles, or otherwise. This technique seems to be effective so far. No damage to trees or egg masses has been detected. In 2012, 76 gypsy moth traps were placed on all four Ranger Districts across the Forest. One trap placed on the Cumberland Ranger District caught one male gypsy moth. No gypsy moth females or egg masses were trapped or found in KY in 2012, indicating there is no established population of gypsy moth on the Forest.

Oak Decline continues to occur in the Appalachians and on the Forest. This disease is a result of a complex of stress factors such as drought or physical damage to mostly red oaks, but often to white oaks as well. The two major pests associated with oak decline are *Armillaria mellea*, a root disease commonly called armillaria root rot, and *Agrilus bilineatus*, the two-lined chestnut borer. No estimate has been made as to the extent of this disease on the Forest, although salvage timber sales have occurred where pockets of mortality are accessible. Oak decline interacts with gypsy moth and in combination can result in significant mortality to older trees.

Emerald ash borer (EAB) was discovered on May 18, 2009 in Shelby and Jessamine Counties in central Kentucky. Since that date, EAB has been identified in the following Kentucky counties: Anderson, Boone, Boyd, Boyle, Bracken, Campbell, Fayette, Franklin, Garrard, Greenup, Hardin, Henry, Jefferson,

Jessamine, Kenton, Oldham, Owen, Pike, Scott, Shelby and Woodford. All states surrounding Kentucky also have some level of EAB infestation. The north central region of Kentucky has additional counties under quarantine that restricts the movement of ash material. In Kentucky, tree mortality is present in both urban and rural areas. Some tree mortality seems to be as much as 2 – 3 years old. Introduction into Kentucky was from apparent firewood movement as well as natural spread from nearby states (Ohio and Indiana). Kentucky state parks have banned all non-certified firewood regardless of source location. No EAB has been found on the Forest, although the “Don’t Move Firewood” posters have been placed in campgrounds and public areas. In 2012, 16 traps were placed across the Forest but no EAB were captured. Across the state many additional EAB traps were placed by the University Of Kentucky Department Of Entomology, where the results are available. Statewide, four traps were positive for EAB, all of which occurred in Pike County, outside of the Forest boundaries.

**Nonnative Invasive Plant Species (NNIPS)** - During FY09, stiltgrass (*Microstegium vimineum*) was tracked in a few locations. This species is highly invasive in moist soils and readily moves as seed imbedded in soil. Footwear, tires, paws, hooves, and treads all can move the species around. It also spreads by flowing water. Five white-haired goldenrod sites have become infested with the species. Three white-fringeless orchid sites are known to be infested with the species. Of these, all five white-haired goldenrod sites and one of the white fringeless orchid sites were checked in FY09. The weed is present in small amounts similar to previous years at the goldenrod sites with the exception of one site with thousands of plants. A noticeable decrease in numbers of plants was seen at goldenrod sites, but influx of seed from above the cliff is keeping it present. The weed is in large, but reduced numbers from 2005 numbers at the two orchid sites. No removal of seed producing plants was undertaken near two white fringeless orchid sites. Removal of non-seedling plants occurred at five goldenrod sites. During FY10, small patches of stiltgrass were removed from areas adjacent to or within white-haired goldenrod populations. This action is follow up to similar actions taken for the last 4-5 years. A decline in the amount of stiltgrass is occurring,

but the effort will continue for several years. In FY11, with the help of volunteers, a large area of stiltgrass was removed from and adjacent to a white-haired goldenrod site. Another site was completely weeded. The site was again weeded in FY12. There was a noticeable decrease in extent between the two years, but the species is likely to persist for a period of time.

During FY11, surveys of a wildfire area in the Red River Gorge, which burned hot enough to kill large areas of canopy and understory plants, revealed a serious infestation of princesstree (*Paulownia tomentosa*), coltsfoot, Chinese silverplume, and prickly sowthistle (*Sonchus asper*). Because the area is open and moist (lack of much vegetation to pump water to the atmosphere), these species, all windblown, have an ideal seedbed. Princesstree individuals were up to 6 ft. tall in less than a full growing season. Some coltsfoot plants were more than 2 ft. in diameter. A concerted effort was made to survey the area, but is only about 50% complete. While some areas of infestation were pulled by hand, much is left to remove. Additional survey and removal work occurred in FY12. Herbaceous and woody stems are beginning to crowd out coltsfoot, but princesstree is staying ahead of native vegetation. Many stems are over 10 ft. tall and beyond pulling. A number of stems of fuzzy-pride-of-Rochester (*Deutzia scabra*) were also found and removed. This species is well established at nearby Natural Bridge State Resort Park and presumably has spread from there. Additional survey will occur in FY13.

Forest wide, numerous other non-native invasive species (NNIS) are known to be present: musk thistle (*Carduus nutans*), crown vetch (*Coronilla varia*), sericea lespedeza (*Lespedeza cuneata*), tree-of-heaven (*Ailanthus altissima*), princesstree (*Paulownia tomentosa*), Asiatic bittersweet (*Celastrus orbiculatus*), sweet clovers (*Melilotus alba, officinalis*), autumn olive (*Elaeagnus umbellata*), Chinese silver plume (*Miscanthus sinensis*), bush honeysuckle (*Lonicera maakii*), Japanese bamboo (*Polygonum cuspidatum*), air potato (*Dioscorea polystachya*), mimosa (*Albizia julibrissin*), kudzu (*Pueraria montana*), Japanese honeysuckle (*Lonicera japonica*), privet (*Ligustrum sinense, vulgare*), Oriental smartweed (*Polygonum caespitosum*), coltsfoot (*Tussilago farfara*), and multiflora rose (*Rosa multiflora*).

In 2009, a population of Japanese meadowsweet (*Spiraea japonica*) was found on the Cumberland Ranger District and represents a new species to consider in planning and a population of sweet autumn virginibower (*Clematis terniflora*) was found on the Stearns Ranger District. These represent two new species to consider in planning. During 2010, Queen Anne's lace (*Daucus carota*) and black medic (*Medicago lupulina*) were found to be widespread and pervasive on roadsides. Surveys during 2012 indicated both of these species were increasing their footprint on the ground.

Of these, mimosa, privet and tree-of-heaven appear to be increasing at the south end of the Forest, based on observations of numbers and size of populations. Limited hard data was collected in 2008 on these species. Additionally, hairy joint grass (*Arthraxon hispidus*) was found in abundance in some areas of the Stearns Ranger District. During 2010, this aggressive grass was also located on the Cumberland and Redbird Ranger Districts in small populations. Asiatic bittersweet, Chinese silver plume, bush honeysuckle and autumn olive appear to be on the increase at the north end of the forest, based on observations of numbers and size of populations. Limited hard data was collected in 2009 for some of these species. Some additional sampling occurred in FY12 on the Cumberland and London Ranger Districts.

Location data for Asiatic bittersweet, Chinese silver plume, autumn olive, crown vetch, multiflora rose, stiltgrass, and coltsfoot were taken in 2006 along Tunnel Ridge Road and portions of Skybridge Road and Rock Bridge Road within the Red River Gorge. Additional data was collected in 2009 behind the gated road to Auxier Point. Chinese Silverplume was found along user defined trails. These will be used to track success at removal of these plants.

A volunteer weed pull day was scheduled for Tunnel Ridge Road in FY09, but was rained out in an unusually heavy rain event. The same event in FY10 had low turnout, but a large number of clumps of silver plume were removed along a 0.75 mile stretch of the road. In FY11, a group of volunteers and seasonal employees removed silver plume and some autumn olive along a 0.75 mile stretch of road. Volunteers on two different days worked to remove silver

plume and some autumn olive and mimosa along approximately 2.5 miles of road. Most of the plants removed during FY11 did not come back. Those that did grew back from pieces of rhizome left in the ground.

Two researchers with USDA Agricultural Research Service began work on the forest in 2009 looking at a large population of Chinese silverplume of off Tunnel Ridge Road to understand why this species is so invasive in the United States, but is an endangered species in Japan. Initial research indicates that the highest density of stems seen in populations of the grass is on the Forest and surrounding lands. The anticipation is that something will be learned about one or more species to improve the ability of managers to control or eradicate one or more NNIPS. To date, the researchers have learned that the population produces viable seed, that it has great variability in the phenotypes expressed, and that the density of the population is the greatest they have seen over several states. One of the researchers removed about 80% of the plants that were recorded along Tunnel Ridge Road to use in his experimental work. The area will be monitored for return of the plant. In 2010, the plants removed in 2009 did not appear to come back. One of the researchers continues work on the species and has indicated a desire to continue work in 2011. Some work was continued into 2012 and another researcher has expressed interest in working on silver plume in 2013.

A weed survey of Clifty Wilderness and Beaver Creek Wilderness were continued in FY09. Data collected will be used to track the movement of weeds in and around the area and serve as the basis for developing eradication/control projects. The Beaver Creek Wilderness survey was completed in FY09 and Clifty Wilderness survey was finished in FY10.

A roadside sampling for nonnative invasive plant species was undertaken in 2010 and 2011. Invasive plant species were sampled on both sides of the road every 0.5 mi along a number of roads on each of the four districts. From this data, an estimate of infestation levels for a number of species is being developed. Table 6-1 and Table 6-2 below show data worked up for road samples on the Redbird Ranger District from FY10 data. Two hundred feet each side of the road for 30 feet width was sampled

(inventoried) every half mile along the road for NNIPS. Roads sampled are listed in Table 6-1.

**Table 6-1 Roads Sampled for Non-native Invasive Plant Species with Total Miles, Area and Sampled Area, FY12 M&E Report, DBNF**

Road	Total Length (Miles)	Total # Samples Along Road	Area 30ft Each Side of Road (Acres)	Total Area Inventoried (Acres)	% Roadside Area Inventoried
FS 1501	5.76	12	41.89	3.31	7.9
FS 1505	2.02	6	14.69	1.65	11.23
FS 1533	7.16	12	52.07	3.31	6.36
FS 1600	8.95	15	65.09	4.13	6.35
FS 1604	7.13	14	51.85	3.86	7.44
FS 1696	5.12	8	37.24	2.2	5.91
FS 1736	5.32	9	38.69	2.48	6.41
FS 1736B	3.36	2	24.44	0.55	2.25
FS 1736E	0.67	1	4.87	0.28	5.75
<b>Total</b>	<b>45.49</b>	<b>79</b>	<b>330.83</b>	<b>21.77</b>	<b>6.58 (avg)</b>

**Table 6-2 List of Non-native Invasive Plant Species Known from Road Sampling on the Redbird District, FY12 M&E Report, DBNF**

NRCS Code	Scientific Name	Common Name	Priority Rank	# of Distinct Patches	# of Sample Points with Species	Frequency of Occurrence
AIAL	<i>Ailanthus altissima</i>	Tree of heaven	1	10	7	0.09
ALJU	<i>Albizia julibrissin</i>	Silktree	2	2	2	0.03
ARH13	<i>Arthraxon hispidus</i>	Small carpgrass	1	13	10	0.13
DACA6	<i>Daucus carota</i>	Queen Anne's lace	3	52	33	0.42
ELUM	<i>Elaeagnus umbellata</i>	Autumn olive	1	50	31	0.39
KUST	<i>Kummerowia stipulacea</i>	Korean clover	2	20	15	0.19
LEBI2	<i>Lespedeza bicolor</i>	Shrub lespedeza	2	10	10	0.13
LECU	<i>Lespedeza cuneata</i>	Sericea lespedeza	2	33	20	0.25
LEVU	<i>Leucanthemum vulgare</i>	Oxeye daisy	3	54	36	0.46
LIVU	<i>Ligustrum vulgare</i>	European privet	1	2	2	0.03
LOJA	<i>Lonicera japonica</i>	Japanese honeysuckle	1	31	21	0.27
MEOF	<i>Melilotus officinalis</i>	Yellow sweetclover	2	7	7	0.09
MIVI	<i>Microstegium vimineum</i>	Nepalese browntop	1	148	77	0.97
MOD14	<i>Mosla dianthera</i>	Miniature beefsteakplant	2	17	10	0.13
PATO2	<i>Paulownia tomentosa</i>	Princesstree	1	4	4	0.05
PEFR4	<i>Perilla frutescens</i>	Beefsteakplant	2	68	39	0.49
PLLA	<i>Plantago lanceolata</i>	Narrowleaf plantain	3	23	16	0.2

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NRCS Code	Scientific Name	Common Name	Priority Rank	# of Distinct Patches	# of Sample Points with Species	Frequency of Occurrence
POCA49	<i>Polygonum caespitosum</i>	Oriental ladythumb	2	77	48	0.61
POCU6	<i>Polygonum cuspidatum</i>	Japanese knotweed	1	1	1	0.01
ROMU	<i>Rosa multiflora</i>	Multiflora rose	1	43	31	0.39
SEFA	<i>Setaria faberi</i>	Japanese bristlegrass	3	1	1	0.01
SEVA4	<i>Securigera varia</i>	Crownvetch	1	23	14	0.18
SPJA	<i>Spiraea japonica</i>	Japanese meadowsweet	1	3	2	0.03
TAOF	<i>Taraxacum officinale</i>	Common dandelion	3	80	49	0.62
TUFA	<i>Tussilago farfara</i>	Coltsfoot	2	72	48	0.61

Sampling data were used to estimate a total infestation (see Table 6-1) for the road system sampled (see Table 6-2) for each species detected. Species with just a few occurrences, such as Japanese knotweed or Japanese bristlegrass, are mostly likely over represented in the figures of the last column. A few species stand out for one or more reasons. Nepalese browntop is estimated to occupy about one-third of the 30 ft. corridor on either side of the sampled roads, most likely in the band between road and forest. Individual patches are also large. Japanese knotweed was found in a single large (2.3-acre) patch. This reflects the nature of the species to crowd out other plants and form a monoculture. Oriental Ladythumb, Beefsteakplant, common dandelion, coltsfoot and Queen Anne's lace all have estimated infestation totals of more than 20 acres. These species are also in the top 10 most frequently encountered species. All do well in the disturbed, open road corridors. Small carpgrass is of concern as it was not known from the Redbird Ranger District until this survey. It rapidly forms large patches elsewhere on the Forest, often excluding browntop and is expected to do so on the Redbird Ranger District as well. It is spread by water, soil movement and mowing. Japanese meadowsweet also was not known from the district until this survey. It does not spread rapidly, but can form large thickets. Miniature Beefsteakplant was known from the district, but this survey indicates it is more widespread than previously thought. As it is easily spread in water, soil and by mowing, it is likely to increase its abundance.

A more intensive survey for nonnative invasive plant species was undertaken on much of the trail system around Cave Run Lake. Most of the trail system was completely surveyed. Numerous populations of nonnative invasive plant species were documented.

Five hundred eighty acres of roadside weeds were treated with glyphosate or triclopyr on the Cumberland Ranger District (most) and Stearns Ranger District in FY10. Another 194 acres were treated by mowing, plowing and planting, hand pulling, or digging plants out with heavy equipment. Most of this was accomplished on the Cumberland Ranger District. In FY11, 280 acres of roadside weeds were treated with glyphosate or triclopyr on the Cumberland Ranger District. A few additional acres were hand pulled or dug out during stream restoration work. A forest-wide environmental assessment for the treatment of non-native invasive plants has been developed and analysis is underway. In FY12, 200 acres of roadside weeds were treated with glyphosate or triclopyr on the Cumberland Ranger District, and two acres of garlic mustard were pulled.

Threatened white-haired goldenrod sites have been weeded yearly for 5-6 years. It appears that removing NNIPS before they can set seed has prevented an increase in the number of plants at each site. Plants encountered now are presumed to have come from seed in the soil seed bank which is known to persist for up to 7 years for this species. The orchid sites were weeded in FY05 and the population of the Japanese stiltgrass has decreased some as a result. Weeding needs to continue, but will be a continual process without intervention regarding

the illegal use of a fireline by off-highway vehicle (OHV) traffic. This is bringing seed from adjacent private land.

In FY10, both mimosa, and tree-of-heaven were seen in numbers similar to those in FY09 and previous years. Privet appears to be increasing at the south end of the Forest, mostly on private land adjacent to NFS lands. Nonetheless, it is spreading to NFS lands. Asiatic bittersweet was found a couple of times in 2010 where it had not been seen before; these are presumed to be new infestations. Chinese silver plume is occurring along trails and roads as small two or three stemmed plants. These are new infestations, not more than 2-3 years old, so it is spreading along disturbed areas. A survey in the vicinity of Auxier Ridge turned up numerous established plants along user created trails, again an indication it is spreading along trails. A number of spot checks in 2011 and 2012 suggest that the small scattered clumps are not producing fertile seed. However, the 1-acre infestation in a wildlife opening off of Tunnel Ridge Road, and populations along KY-15 are producing fertile seed. Both bush honeysuckle and autumn olive are appearing along roadsides and trails as small 2-3 year old plants, indications of new infestations. The discovery of fussy-pride-of-Rochester in the Red River Gorge in remote area indicates that that species is now beginning to spread.

The infestation of princesstree and coltsfoot, particular in a severely burned area of the Red River Gorge, has alerted us to the invasive potential these species have. Effort is being made to identify locations of princesstree with the goal of removing seed sources.

Insufficient data exist to determine trends at this point in time.

Nonnative invasive plant species were mapped around and in most of Clifty Wilderness between 2007 and 2009. A small amount of work was completed in 2010 to finish the inventory. The inventory indicates that NNIPS are far more prevalent on the perimeter of Clifty than within it. Nonetheless, NNIPS were found along trails and streams in many locations. Japanese stiltgrass is the biggest problem as it is shade tolerant and is easily spread by animals, people, and water. Also found were multiflora rose and autumn olive. The data from Beaver Creek Wilderness indicates that numerous infestations of multiflora rose and autumn olive are present in the interior of the wilderness, mostly in areas associated with past mining activities. Japanese stiltgrass is also widespread in and around the wilderness.

As part of treatment efforts, treated populations were monitored for efficacy of treatment. Four hundred eighty-four acres were checked on the Cumberland Ranger District. Results were positive with little need to retreat. Forty-six acres were monitored on the London Ranger District. Results were positive with little need to retreat.

Road sampling is providing us with an idea of the extent of NNIP species present along roads within the Forest proclamation boundary. It has also shown that such sampling can detect some new infestations although many have probably been missed. Additional road sampling occurred in FY12. Results will be used to help quantify NNIP species extent and density.

**Table 6-3 Infestation Patch Size, Total Infestation and Estimated Infestation by Species, FY12 M&E Report, DBNF**

Common name	Average Size Patch (Ac.)	Average Size Patch (Sq. Ft.)	Infestation (Ac.)	Infestation (Sq. Ft.)	Estimated Infestation (Ac)
Tree of heaven	0.009 ± 0.009	401 ± 377	0.0921	4,011	1.43 ± 0.26
Silktree	0.005 ± 0.005	205 ± 197	0.0094	409	0.15 ± 0.04
Small carpgrass	0.014 ± 0.011	590 ± 492	0.1761	7671	2.74 ± 0.47
Queen Anne's lace	0.026 ± 0.024	1,120 ± 1,034	1.3372	58,249	20.83 ± 2.48
Autumn olive	0.022 ± 0.037	942 ± 1633	1.0816	47,113	16.85 ± 2.07
Korean clover	0.021 ± 0.02	927 ± 888	0.4254	18,531	6.63 ± 1.23
Shrub lespedeza	0.008 ± 0.012	351 ± 502	0.0805	3,506	1.25 ± 14.5

Common name	Average Size Patch (Ac.)	Average Size Patch (Sq. Ft.)	Infestation (Ac.)	Infestation (Sq. Ft.)	Estimated Infestation (Ac)
Sericea lespedeza	0.028 ± 0.032	1,229 ± 1,407	0.9312	40,563	14.5 ± 2
Oxeye daisy	0.018 ± 0.016	778 ± 689	0.9644	42,008	15.02 ± 1.92
European privet	0.007 ± 0.006	297 ± 265	0.0136	593	0.21 ± 0.05
Japanese honeysuckle	0.035 ± 0.034	1,538 ± 1,475	1.1651	50,752	17.9 ± 2.41
Yellow sweetclover	0.01 ± 0.011	427 ± 493	0.0686	2,989	1.07 ± 0.18
Nepalese browntop	0.05 ± 0.034	2,168 ± 1,474	7.3644	320,798	114.71 ± 8.85
Miniature beefsteakplant	0.03 ± 0.03	1,291 ± 1,314	0.5037	21,940	7.85 ± 2.64
Princesstree	0.009 ± 0.005	400 ± 236	0.0367	1,598	0.57 ± 0.09
Beefsteakplant	0.025 ± 0.026	1,069 ± 1,122	1.668	72,660	25.98 ± 2.97
Narrowleaf plantain	0.016 ± 0.018	716 ± 769	0.3783	16,479	5.89 ± 0.78
Oriental ladythumb	0.025 ± 0.032	1,101 ± 1,401	1.9454	84,744	30.3 ± 3.11
Japanese knotweed	2.245	97,810	2.2454	97,810	34.98 ± 9.47
Multiflora rose	0.013 ± 0.015	568 ± 663	0.5611	24,440	8.74 ± 1.08
Japanese bristlegrass	0.004	161	0.0037	161	0.74 ± 0.2
Crownvetch	0.02 ± 0.021	853 ± 911	0.4503	19,613	6.33 ± 1.96
Japanese meadowsweet	0.056 ± 0.016	2,442 ± 694	0.1682	7327	2.62 ± 0.88
Common dandelion	0.02 ± 0.017	887 ± 733	1.6289	70,957	25.37 ± 3.66
Coltsfoot	0.021 ± 0.021	928 ± 922	1.5345	66,846	23.9 ± 3.4

## 7. What are the status and trends of federally listed species and species with viability concerns on the forest?

By virtue of the fact that a species is federally listed under the Endangered Species Act gives the forest reason to be concerned for its viability. Most listed species are far ranging and thus it is difficult to draw a cause and effect relationship to management actions. One species, the white haired goldenrod (*Solidago albopilosa*), is endemic to the Daniel Boone National Forest solely. Joint efforts are underway to de-list this species due to favorable management activities promoting recovery of the species. One species, sheepnose (*Plethobasus cyphus*), was newly listed in FY12. The Cumberland rosemary (*Conradina verticillata*) and American chaffseed

(*Schwalbea americana*) have been removed from the threatened, proposed and endangered species for the Forest because no extant populations are believed to exist on the Forest. According to Kentucky State Nature Preserve Commission (KSNPC) records, the Cumberland rosemary does not occur on Forest. Additionally, Forest Biologist David Taylor, in coordination with KDNPC, determined no suitable habitat for the Cumberland rosemary occurs on the Forest. American chaffseed historically occurred on Forest, though it has not been observed since 1935. Its habitat is predominately pine / pine-oak mixed forest on thin soils over sandstone.

Multiple survey efforts have been conducted in the past 10 years by the Forest and KSNPC staff with zero American chaffseed found on Forest. One historic location was on Big South Fork National Recreation Area just south of the Forest boundary; however that habitat is no

longer present / suitable due to habitat changes including infestations by southern pine beetles and other nonnative invasive species. Table 7-1 summarizes the status and trend of species that are federally listed under the Endangered Species Act.

**Table 7-1 Status and Trend of Federally Listed Species and Critical Habitat, FY12 M&E Report, DBNF**

Species	Stable	Increasing	Decreasing	Unknown
Blackside Dace	x			
Cumberland Darter			x	
Duskytail Darter				x
Palezone Shiner				x
Cumberland Sandwort	x			
Running Buffalo Clover				x
Virginia Spiraea				x
White-Haired Goldenrod		x		
Gray Bat				x
Indiana Bat		x		
Virginia Big-eared Bat				x
Cumberland Bean Pearlymussel	x			
Cumberland Elktoe				x
Cumberlandian Combshell				x
Fanshell				x
Little-wing Pearlymussel				x
Northern Riffleshell				x
Oyster Mussel				x
Pink Mucket Pearlymussel				x
Little-wing Pearlymussel				x
Northern Riffleshell				x
Oyster Mussel				x
Pink Mucket Pearlymussel				x
Sheepnose				x
Snuffbox			x	
Tan Riffleshell				x

**Birds** - Breeding bird surveys were conducted in 2004, 2005, 2006, 2008, 2009, 2010, 2011, 2012. The surveys are part of a region-wide program of monitoring avian population trends and annual abundance of birds in the Southern

Region, which includes 10 physiographic areas and for 14 national forests in the southeastern United States. Periodically, the data is analyzed and published. The last published report was in 2004. The Southern Region has not announced

when the next analysis will occur and which datasets will be used.

**Plants** – Goal 1.C-Goal 2 of the Forest Plan has set a goal to recover **white-haired goldenrod**. Approximately 90% of the known populations are on NFS lands within the boundary of the Forest. This allows for a good chance of success with recovery as sufficient populations and habitat are probably on federal land. Willing private landowners may also contribute to recovery efforts.

In 2011, one confirmed and one suspected individual of white-haired goldenrod were found outside of rockhouse habitat on sandy soil in a severely burned area (escaped campfire) of the Red River Gorge. The fire eliminated most of the overstory, shrub and herbaceous layers in the area and the goldenrod plants were thriving in a competition free area. They will be monitored for long-term survival.

As of 2011, recent data suggests that recovery of white-haired goldenrod is possible over the next 10 years or less but some sites need to be better insulated from recreational pressure to allow more area for recovery of the species. Simple chicken wire fences and signs have proven successful in keeping people out of white-haired goldenrod habitat and will probably be employed at a few more sites. Seedlings of white-haired goldenrod have established in many fenced areas and in a few cases, established crowns appear to have recovered from trampling. The Forest's management of cliff zones including the regulation of camping in areas white-haired goldenrod may inhabit has improved the outlook for the species.

Forest personnel have worked with U.S. Fish & Wildlife Service (USFWS) and KSNPC to set up monitoring and a review process to determine what is needed for delisting and what progress is being made. KSNPC, with Endangered Species Act Section 6 funding, has taken the lead for monitoring to determine the condition of all sites.

The Forest has taken the lead to watch sites for recreation damage and invasive species, responding appropriately with fencing, signing, public education, and weeding to correct or prevent threats. Continued monitoring of white-haired goldenrod sites by KSNPC and Forest personnel has allowed for the creation of a multi-

year data set which can be used as baseline data. This data also allows for the setting of priorities and goals for specific actions to enhance sites. It is anticipated that work will begin on a delisting package in FY13.

A single population of **Cumberland sandwort** (*Arenaria cumberlandensis*) was found on the Forest in 1986. It has never been relocated. In 2005, the Center for Research of Endangered Wildlife housed at the Cincinnati Zoological and Botanical Garden, needed a place to try outplanting tissue-cultured Cumberland sandworts as part of a test to see if tissue culture was a viable means of increasing plants for conservation of the species. Working with USFWS, the Forest located a place to try the planting. Plants from several genetic lines were intentionally mixed up in various areas of microhabitat.

The small population of Cumberland sandwort planted on the forest in 2005 was monitored in 2006. A few plants had died over winter, but several were in flower and growing vigorously. A few additional plants died over winter 2006-07, but in July 2007, flowering plants and seedlings from planted plants were found. More plants died over winter 2007-2008, but additional seedlings were found in summer 2008. In summer 2009, a large number of new plants were found, so many that determining which were new plants and which were original plants was not possible. Plants have been flowering and seeding since 2006. All plants planted in 2005 had come from tissue culture stock grown at the Center for Research of Endangered Wildlife. As of 2011, 12 original surviving plants, 31 supplemental plants and over 200 seedling plants are now at the site. As of 2012, 11 original surviving plants, 12 supplemental plants and 164 seedlings were present at the site.

It appears that tissue cultured Cumberland sandwort stock could be used to supplement existing populations or establish new ones. A paper was published in FY12 describing the results of the study. Because some difference in the response of genetic lines (some consistently weak and others consistently strong), there is some concern that genetic diversity might be skewed towards the strong genetic lines. Tissue samples were collected in FY12 for a genetic survey.

The largest population of **Virginia spiraea** (*Spiraea virginiana*) on the Forest was surveyed in 2007 with KSNPC. Numerous previously known locations were located. Plants were generally healthy and some were in flower. Habitat for Virginia spiraea appeared stable and generally in good condition, and the population appeared stable as well. A second population was checked in 2006. One site was not found, but another was. Habitat was not in the best condition and this site appears less stable.

Virginia spiraea appears stable in some areas, but not stable in others. Its habitat, riverine cobble bars is by nature unstable and this probably affects the plant's ability to maintain itself in various locations. Populations on the forest appear to be stable, possibly leaning toward decreasing.

Three **white fringeless orchid** (*Platanthera integrilabia*) sites were checked for condition of plants and sites. All sites were moist and plants were present, many in flower. A report in August 2006 from the public indicated a power line site in London had produced 100 flowering stems- the most in several years. In August 2007, 102 flowering stems and another 89 in bud were counted. In August 2008, about 110 flowering stems were seen. In August 2009, about 100 stems were found, but others had been eaten off by deer. In 2011, two sites, including the power line site were checked. Flowering was minimal, but plants were present and appeared healthy. Two sites were checked in FY12. Plants appeared healthy and many were going to flower.

White fringeless orchid continues to maintain itself on the Forest, but several sites are under threat from nonnative invasive plants (e.g. *Microstegium*) or from habitat changes related to hydrology. Attempts to restore hydrologic conditions have started, but are yet unproven. Improvement has been seen, but much is still needed. While the weeding of sites is helpful, it needs to be expanded.

An additional Forest population of **rattlesnake master** (*Eryngium yuccifolium*), a conservation

species, was discovered in 2008, constituting the fourth known population on the Forest. None of the known populations are large, but the smallest has five plants. The species is a prairie/woodland/savanna species that should fare better once woodland and savanna habitat on the Forest is established and in the maintenance phase. It is expected that species such as rattlesnake master, which are tied to a more open habitat and fire, will become more plentiful as woodland and savanna habitat are restored.

**Mammals** – The Forest, in collaboration with USFWS and KDFWR, conduct biannual population census for hibernating bats at significant bats caves. Data is retained by the KDFWR. Table 7-2 shows population estimates from the USFWS for the **Indiana bat** (*Myotis sodalis*). Kentucky populations have increased 22.7% from 2009 to 2011. Range-wide, populations have increased 2.2% from 2009 to 2011. New population estimates are scheduled to be released in 2013.

As of 2012, white nose syndrome, a fungus linked to the deaths of thousands of bats in the northeast United States and spreading south, had not been detected on the forest. It had been detected in western Kentucky and counties in Tennessee, Virginia and West Virginia not far from Kentucky

**Mussels** - Snuffbox (*Epioblasma triquetra*) was proposed for listing on November 2, 2010 and was listed as endangered on February 14, 2012. Sheepnose (*Plethobasus cyphus*) was proposed for listing on January 19, 2011 and was listed as endangered on March 13, 2012.

**Fish** - Critical habitat for the Cumberland darter (*Etheostoma susanae*) was proposed on October 12, 2011 and the final designation is occurred on October 16, 2012. Propagation efforts have resulted in Cumberland darter releases within historically inhabited streams. Populations are being monitored cooperatively through a joint effort among the USFWS, KDFWR and USFS.

**Table 7-2 Indiana Bat Population Estimates, FY12 M&E Report, DBNF**

Year	Kentucky	Range-wide
2003	49,544	363,608
2005	65,611	425,372
2007	71,250	467,947
2009	57,325	415,512
2010-2011	70,329	424,708

**8. What are the trends for demand species and their use?**

**Game Species** - The Forest provides a large area of public land open to hunting and draws hunters from Kentucky metropolitan centers as well as small towns within and adjacent to the proclamation boundary. Several game species including ruffed grouse, northern bobwhite quail, eastern gray squirrel, wild turkey, elk, and white-tailed deer are hunted on the Forest.

White-tailed deer continues to be a species of demand. While kill has dropped between 2008 and 2011, it rose in 2012. The drop may reflect fewer hunters, which would follow national trends, may reflect fewer successful hunting events, or a combination of both. The increase may be attributable to additional interest or more successful hunting events. Herd numbers are relatively stable or rising and take advantage of numerous management activities carried out yearly by the Forest. Timber harvest provides early successional forest, and opening maintenance provides grassy openings, with

cool and/or warm season grasses. Vernal and permanent ponds provide additional water sources. The interspersed private land within the Forest boundary also provides habitat in the form of pasture, fields and forest, a range of habitat. The harvest levels on the forest are displayed in Table 8-1.

**Fisheries** - The Forest provides habitat for several sport fisheries. The USFWS and KDFWR recognize this and are willing to invest the resources required to supplement fish populations. The tables below reflect this stocking supplement for FY12. The variations in number stocked per individual species result from various management considerations. With current available data, accurate trends per species cannot be determined.

The rainbow and brown trout totals represent totals of individuals stocked by both USFWS and KDFWR (Table 8-2 and Table 8-3).

**Table 8-1 White-tailed Deer Harvest , FY12 M&E Report, DBNF**

License Year	Male	Female	Total
2005	765	654	1419
2006	806	589	1395
2007	785	514	1299
2008	827	580	1407
2009	786	414	1200
2010	680	258	938
2011	810	263	1073
2012	849	331	1182

**Table 8-2 Trout Stocking Summary, FY12 M&E Report, DBNF**

Water Body	Rainbow Trout	Brown Trout	Ranger District
Bark Camp	3,750	500	London
Big Double	750	-	Redbird
Cane Creek	3,750	-	London
Chimney Top Creek	-	500	Cumberland
Craney	1,000	-	Cumberland
East Fork Indian	9,300	400	Cumberland
East Fork Indian / Fishing Derby	1,000	-	Cumberland
Laurel River Lake	64,775	-	London
Little Double / Fishing Derby	1,000	-	Redbird
Middle Fork Red River	3,000	-	Cumberland
Mill Creek Lake	6,000	-	London
Rock Creek	15,600	-	Stearns
Station Camp Creek	1,500	-	London
Sturgeon Creek	1,000	-	London
Swift Camp	1,000	-	Cumberland
Triplet	3,000	-	Cumberland
War Fork	5,550	-	London
War Fork / Fishing Derby	1,000	-	London
<b>TOTAL</b>	<b>122,975</b>	<b>1,400</b>	

**Table 8-3 Fish Stocking Summary, FY12 M&E Report, DBNF**

Water Body	Muskie	Hybrid Striped Bass	Lake Sturgeon	Walleye	Rainbow Trout	District
Cave Run Lake	1,923					Cumberland
Cumberland River			21			London & Stearns
Kentucky River						Cumberland
Lake Cumberland		37,606				London & Stearns
Laurel River Lake		750,000		302,579		London
Mill Creek Lake						London
Red River						Cumberland
Rockcastle River				31 (native)		London
Triplet Creek-N. Fork						London
Buckhorn Lake	300					Redbird
Buckhorn Lake Tailwater					5,000	Redbird
<b>TOTAL</b>	<b>2,223</b>	<b>787,606</b>	<b>21</b>	<b>302,610</b>	<b>5,000</b>	

**Management Indicator Species (MIS)** - Most of the Forest MIS are songbirds. Their presence on the Forest is monitored through annual bird surveys that are part of a larger Forest Service effort in the Southern Region. The data from these surveys is compiled periodically to provide the public and land managers an idea of how species are faring throughout the south. The last report was published in 2004 and included data from 1997-2004. The Southern Region office of the Forest Service has indicated another report will be produced soon. Songbirds were selected as MIS because they are species that are good indicators of the status of forest health and habitat availability.

White-tailed deer, also an MIS is addressed under Monitoring Question #8 above. Pitch pine, one of three native yellow pines on the forest is

also an MIS. Most of the pitch pine on the Forest was killed during the southern pine beetle epidemic in 1999-2001. Live trees are periodically located and seedlings are occasionally found in burned areas.

**Non-timber Forest Products (and firewood)** - The forest issues a variety of permits every fiscal year for non-timber forest products and firewood. Permits for some non-timber forest products such as ginseng are issued every year. Others such as bloodroot appear to have a less stable market or following as permits for them are issued infrequently. The amount of firewood permits issued appears to relate to the condition of the economy and the relative coldness of the winter. Permit information is displayed in Table 8-4 below.

**Table 8-4 Non-Timber Forest Product and Firewood Permits Issued By Fiscal Year, FY122 M&E Report, DBNF**

Product	2005	2006	2007	2008	2009	2010	2011	2012
Free use- Research Collections	5	12	6	14	8	7	6	11
Free use- herbaceous Plants	1	0	0	0	0	0	0	0
Free use- sawdust	0	1	0	1	2	1	0	2
Free use- firewood/hazard tree			6	11	64	17	17	21
Free use- cane	0	0	0	0	0	1	0	0
Free use- black walnuts	0	0	0	0	0	1	0	0
Free-use grapevine	0	0	0	0	0	0	0	3
Mixed Roots	15	3	12	5	5	4	1	3
Bloodroot	2	2	12	2	2	3	3	0
Ginseng	15	23	39	86	47	61	61	53
Black Cohosh	4	0	7	21	18	13	30	14
Goldenseal	5	6	12	29	8	18	13	12
Moss	4	1	1	5	10	6	6	3
Grapevine	6	5	5	6	5	9	2	2
Posts	5	0	0	0	0	1	0	0
Firewood	28	50	114	150	323	379	349	288

Meaningful trends cannot be derived from eight years of data, but there are notable increases and decreases.

Higher energy costs and a sluggish economy probably pushed the number of firewood permits up, but slightly warmer winters may have accounted for the decreases in the last two

years. High ginseng prices and a sluggish economy may be driving the increase in permit sales. In particular, ginseng prices were reported as \$600-\$900 per pound for FY08, but fell in FY09.

A sluggish economy may also have contributed to the increase in goldenseal permits, but may

be due to cyclic demand for some species. The increases in black cohosh permits up until FY12 are tied to increased wholesale demand seen across several mountain forests in the southeast. The reason for the subsequent decrease in FY12 permits is unknown, but may be related to supply and demand.

Variation in market demand may be driving the changes in bloodroot permits. The 80% increase

in grapevine permits between FY09 and FY10 may be related to the sluggish economy in FY10.

The decrease in free use firewood permits from FY09 to FY12 is related to less severe weather than in the previous year and fewer downed trees blocking roads and driveways

**9. Are high quality, nature-based recreation experiences being provided and what are the trends?**

Figure 9-1 Deferred Maintenance for Fiscal Years 2005-2012, FY12 M&E Report, DBNF

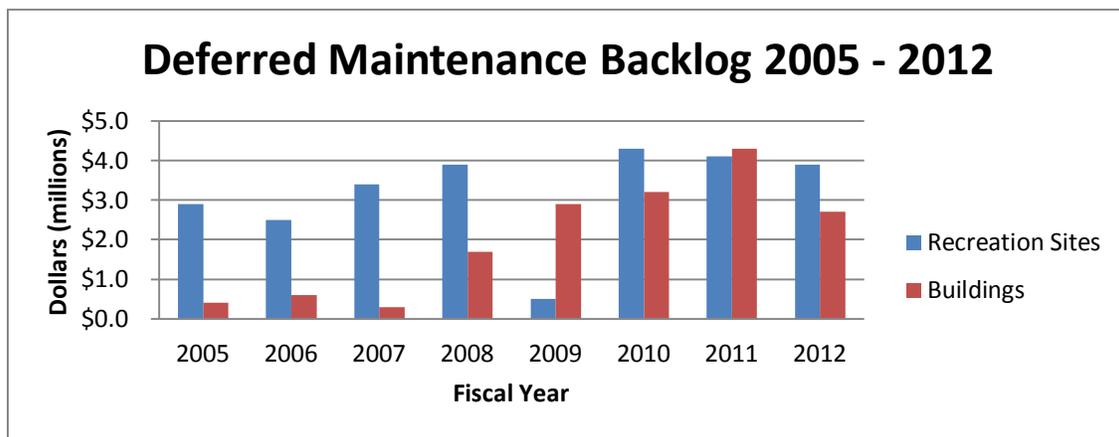


Figure 9-1 illustrates the total forest deferred maintenance backlog for minor constructed features such as camping sites in recreation areas and all forest buildings. Offices are included in the data.

This data was generated from the Infrastructure Corporate Data Warehouse. The data for each facility is updated a minimum of once every five years. Therefore, the data does not actually represent current maintenance needs for many of the facilities and may not be an accurate tool for gauging the quality of the recreation experience.

The condition of infrastructure at approximately 99 of the 140 recreation sites met the agency's minimum level of infrastructure quality in FY12. Twenty six percent of the recreation site capacity was accessible to individuals with disabilities in FY12.

Most of the forest facilities are 30 to 40 years in age and are reaching the end of their service capacity. Therefore, a decline in quality of these facilities is being observed across the Forest.

The Forest reconstructed seven bath houses at Twin Knobs campground in FY12. Minor repairs, such as painting and repairing bulletin boards, were also completed at various sites across the Forest.

**Trails** - The forest manages more than 600 miles of trails. Approximately 121 miles of trail received some level of maintenance in FY12. Six miles were improved and approximately 64 miles were considered to meet the agency's minimum requirements for being managed to standard/

**Visitor Satisfaction** - The forest completed approximately 250 days of National Visitor Use Monitoring surveys across the forest in FY12. The results of this survey will not be available

until FY13. Comments received via email and phone calls indicate concerns with the lack of maps on the new forest website, poor facility

conditions at a few areas on the forest, and OHV size restrictions on motorized trails and difficulty in obtaining fee passes.

## **10. What are the status and trends of recreation use impacts on the environment?**

Illegal activities such as trash dumping, unauthorized OHV use, camping in restricted areas, equestrian use of trails not designated for horses, and non-compliance with fees continues to occur at various locations across the forest. Approximately 260 OHV violations and 229 OHV incidents were recorded by law enforcement officials in 2012. Monitoring has not been completed at a level that would be sufficient for defining trends for each of these activities.

At least 36 user developed campsites that were impacting streams and 13.1 miles of eroding trail were closed or maintained. In 2012, over 90 tons of sediment was prevented from entering the Red River stream network. The project not only reduced erosion in the Red River but also helped stimulate the local economy and provided valuable work experience for college students.

## **11. What is the status and trend of wilderness character?**

Monitoring for this question was not completed in FY12. However, based on staff observations it is believed that recreation use continues to exceed the limits of acceptable change in Clifty Wilderness while use remains low in Beaver Creek.

A project was started in cooperation with the University of Kentucky to monitor soil chemistry as it relates to air quality. Lysimeters, which capture soil water from rainfall, were installed on each of the four districts, including one each in the Clifty and Beaver Creek Wildernesses. This will help determine whether the soil has the capability to neutralize acid deposition.

**Clifty Wilderness** - The Limits of Acceptable Change (LAC) process for the Red River Gorge introduced the concept of zones. Within the Clifty Wilderness pristine zone, backcountry rangers have been working to close and rehabilitate user developed trails. The LAC process established standards in the pristine zone that maximize opportunities for solitude. The results of the LAC process documented that several LAC standards were beyond acceptable limits as identified by the LAC public committee.

In the last couple of years, the Cumberland Ranger District has been implementing some of the items identified within the LAC process document to reduce impacts from recreation use and to improve wilderness character. The backcountry ranger program has been bolstered through the use of Student Conservation Association and volunteer interns; in 2012, a crew of four backcountry ranger interns worked in Clifty Wilderness and other parts of Red River Gorge).

**Beaver Creek Wilderness** - Based on trailhead registration cards and observations by law enforcement and Stearns Ranger District personnel, the Beaver Creek wilderness receives low visitor use. Group size is usually small. Use of the wilderness is seasonal with the most use occurring during the Beaver Creek Wildlife Management Area for the quota deer hunt in November. Hiking use in the wilderness is greatest in the spring during college and high school breaks and on weekends, and during fall on weekends, but even then is still low.

## 12. *What are the status and trend of Wild and Scenic River conditions?*

Forest level monitoring to assess trends of Wild and Scenic River conditions was not completed in FY12. Projects occurring along the river corridor included trash clean-up, closure of user

developed campsites and trails, and planning for watershed restoration activities. None of these projects negatively affect the free flowing conditions of the Red River.

## 13. *Are the scenery and recreation settings changing and why?*

Project level NEPA analysis documents considered maintenance of scenic integrity objectives during the project planning phases.

However, forest level monitoring to analyze whether scenery and recreation settings are changing was not completed in FY12.

## 14. *Are heritage sites being protected?*

**National Register of Historic Places** – As a result of projects requiring survey, 694.66 acres were examined in 15 cultural resource reports. This work occurred in eight counties within the Forest. Most of the surveys occurred in Leslie and Rowan Counties, with the greatest number of new sites found in Leslie County. Even though only 1.73 acres was surveyed in Jackson County, one new site was also recorded there. Low site densities have been previously noted in Rowan County; however, the 2012 annual result suggests archaeological surveys conducted in Jackson and Leslie Counties should expect rather high levels of new site discovery.

A total of 14 sites were re-visited or recorded during survey work. Of these, four are eligible for the National Register and 10 were not eligible for the National Register

**Heritage Protection** – In FY12, 137 sites were monitored and condition assessments completed. The majority of these sites (125) were monitored because they are Priority Heritage Assets in the Red River Gorge (101 sites) in heavily used recreational areas. The higher numbers in the Red River Gorge are due

to the fact that sites in climbing and recreation areas are generally more susceptible to adverse effects from visitor use. Regular assessments at sensitive locations provide the opportunity to monitor the effectiveness of the fences and signage. Fencing and signage at sites has helped to reduce the occurrence of additional site damage. However, looting and damage has not stopped; observations in 2012 suggest that damage in the Red River Gorge is generally caused by camping while looting is moving to more remotely located shelters where there is less chance of being observed.

Additional work performed in compliance with Forest needs include enforcement (law enforcement citations and site remediation), and public education with both professional and public groups (e.g. Living Archaeology Weekend, Kentucky Archaeological State Conference, boy scouts, girl scouts).

Also in FY12 one historic structure, the Redbird Ranger District office was renovated and restored in Peabody, Kentucky.

**15. Are watersheds maintained, and where necessary restored, to provide resilient and stable conditions to support the quality and quantity of water necessary to protect ecological functions and support intended beneficial uses?**

**Stream Stability** - In 2012 monitoring continued across the Forest. During a several week period, stream substrate was sampled at 14 random sites in the Upper Cumberland, Kentucky and Licking basins at the same time that information was collected for Monitoring Question 5 – Task 17 and Monitoring 5 – Task 18. The random sites were located on wadeable streams that drained more than 5 square miles. The data was collected, and compiled by crews from the Center for Aquatic Technology Transfer, a Forest Service research project that is based in Blacksburg, VA. The data from these sites will be used as representative sites that project watersheds can be compared.

**Watershed Condition** – During 2011 and 2012 water samples were taken at 36 sites in the Red Bird River watershed in the Kentucky basin. All the sites were associated with the Red Bird River Collaborative project on the Redbird Ranger District. Results of the water quality monitoring showed the impacts to the Red Bird River from high conductivity and E. coli levels.

In 2011 and 2012 the Red River in the Cumberland Ranger District was monitored for water quality. The early results show impacts from E. coli.

**State Best Management Practices (BMPs) and Forest Standards** - Specific information related to Kentucky BMPs and Forest Plan Standards were monitored on trail work and campsite closures in the Red River Gorge during 2012. This included an informal review by the Soil Scientist, Hydrologist, Red River Gorge

Manager, and the Kentucky Division of Water. Work was completed through a Division of Water non-point source 319(h) grant on or near the Swift Camp, Rough, and Martins Fork trails. All standards and BMPs were being met and appeared to be effective at reducing sediment into the Red River watershed.

Temporary roads associated with timber sale contracts have been re-vegetated within the proper timeframe and verified through inspections conducted by the Forest engineers.

**Environmental Flows** are the amount of water in streams and groundwater needed to maintain resilient and stable conditions necessary to protect ecological functions and support intended beneficial uses. In 2012 a dye tracing/karst project was conducted in the Crooked Creek watershed of Rockcastle County. A commercial water bottling plant and many of the residents are dependent on karst springs for their water. The sources areas for many of these springs are unknown. The purpose of this study was to identify some of these source areas and insure that Forest Service activities do not adversely impact water quality. The project was completed in conjunction with Morehead State University, Kentucky Division of Water, and the Kentucky Geological Survey. Due to the source areas for several of the springs and karst sensitivity, a proposed vegetation management project was altered.

**16. What are the conditions and trends of riparian area, wetland and floodplain functions and values?**

**Management strategy consistencies with riparian guidance** - Several documents were reviewed during 2012 and all of the documents were in compliance the 1-E Riparian Corridor Prescription Area standards. The timber marking

on the Upper Rock Creek and Elk timber sale environmental assessments were also evaluated on the ground and several improvements were suggested.

**Riparian and Wetland Projects** - Stream restoration occurred in Elisha Creek (Kentucky Basin) during 2012. Riparian values and bank stability have improved in this watershed.

Several constructed wetlands were refurbished on the Cumberland Ranger District during 2010, 2011, and 2012. Dams were lowered and the wetlands reconstructed to better fit natural flooding conditions. After reconstruction the wetlands were field monitored and improvements were made.

**Riparian Soils** - In 2012 riparian soils were monitored on both recreation and timber projects. In the Red River Gorge heavy dispersed recreation has impacted soils adjacent to many of the streams. Sprawling user

developed campsites and trails have compacted and eroded soils in riparian areas. As part of a multi-year Kentucky Division of Water non-point source 319(h) grant 30 user developed campsites were closed. Many of the sites were seeded and trees were planted in an effort to reduce erosion and eventually reduce compaction. The results of these projects were monitored on several occasions and they appear to be effective at improving riparian soils.

The Elk and Wind Cave timber sales were monitored in 2012. The Forest Plan requires Riparian Corridor Prescription Areas in vegetation management units. On both sales the Forest Plan standards in the Riparian Corridor prescription area were properly implemented and the soils were not eroding.

**17. How do actual outputs and services compare with projected?**

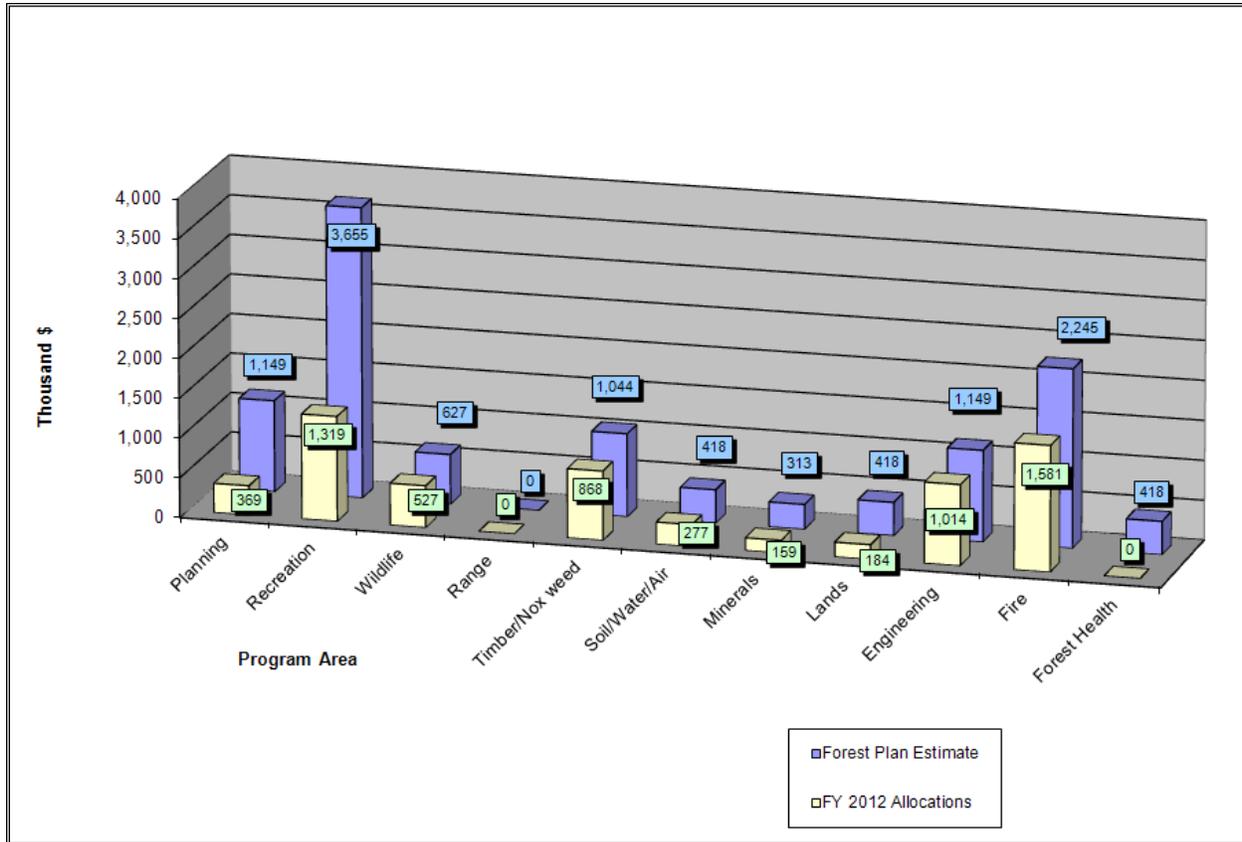
On average, the budget allocation to the Forest was approximately 70% of the Forest Plan estimate. Over the past five years, traditional federal allocations averaged approximately \$7.9 million annually, which was about 69% of Forest Plan estimates. Some resource areas received full funding (such as vegetation and facilities),

while others were funded substantially less than Forest Plan Estimates (such as planning, recreation, and forest health) Budget allocations are summarized in Table 17-1 and Figure 17-1. Accomplishments are summarized in Table 17-2.

**Table 17-1 Budget Allocations, Thousand Dollars, Base Year 2000, Using a 3% Discount Rate, FY12 M&E Report, DBNF**

Program Area	Forest Plan Estimate	FY12	% of Estimate
Planning	1,149	369	32%
Recreation	3,655	1,319	36%
Wildlife	627	527	84%
Range	0	0	0%
Timber	1,044	868	83%
Soil/Water/Air	418	277	66%
Minerals	313	159	51%
Lands	418	184	44%
Engineering	1,149	1,014	88%
Fire	2,245	1,581	70%
Forest Health	418	0	0%
<b>TOTAL</b>	<b>11,436</b>	<b>6,299</b>	<b>55%</b>

**Figure 17-1 Budget Allocations, Thousand Dollars, Base Year 2000, Using a 3% Discount Rate, M&E Report FY12, DBNF**



**Table 17-2 Accomplishments Compared to Forest Plan Estimates (Forest Plan Table C – 2.b.), M&E Report FY12, DBNF**

Activity	Source	Unit of measure	Forest Plan 10-Year Objective	Forest Plan Annual Objective	FY12
Total Timber Sales (sold)	Spectrum est.	MMCF	22.9	2.29	0.92
Regeneration Harvest Area <sup>15</sup>	1.K.1.A., 3.H.1.A.	Acres	18,750	1,553	821
Reforestation-Yellow Pine (all)	1.K.2.E.	Acres	8,200	822	0
Wooded Grassland Established-Pine	1.K.2.B.	Acres	100	10	0
Wooded Grassland Established-Hdwd.	1.K.2.E.	Acres	660	66	0
Woodland Established-Pine	1.K.2.C.	Acres	100	10	0
Woodland Established-	1.K.2.F.	Acres	6,140	614	56

<sup>15</sup> Includes 1.K harvest (cliff/bat/rip/0-10 bug removed) and grouse areas (3.H = 8,744 ac., with cliff/bat/riparian removed).

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Activity	Source	Unit of measure	Forest Plan 10-Year Objective	Forest Plan Annual Objective	FY12
Hardwood					
Thinning-Forest (60BA) <sup>16</sup>	1.K.1.D.	Acres	5%	900	100
Thinning Overstocked Forest		Acres	10,000	0 to 1,000	2,087
Pitch Pine Restoration	1.1.D.	Acres	3,000	300	0
Upland White Pine Plantations-Conversion		Acres	n/a		0
Total Prescribed Burn Acres	EIS, Table 3-15	Acres	379,000	39,000 to 43,000	10,979
Maintain Openings (1600 ac./3years)	1K.1.B	Acres	1,600	533	1,070
Upland/ridge water sources within 5 miles of significant Indiana bat hibernacula	1.2.B.	structures	1 per ½ mi.	n/a	0
Open Canopy Developed (uneven-aged)	1.E.2.C.	Acres	1,075[1%]	107	0
Fixed Shrub Openings	1.E.2.B	Acres	1,075[1%]	107	0
Canebrakes Developed	1.E.2.D.	Acres	1,075[1%]	107	0
Canebrakes Maintenance		Acres			0
Watershed Improvement	1.E.3.A.,3.B.	Acres	760	120	688
Non-motorized Trails Established		Miles	20	2	0
Trails Maintained (BMPs) <sup>17</sup>	12.1.B	Miles	685	137	126
Inventory user-developed trails	12.1.C	%	100%	20%	0
Address user-developed trails	12.1.C	%	100%	20%	11.5
OHV trails (constructed)	EIS, Table 3-4	Miles	60	6	0
Construct	Estimate	Miles	20	2	0
Repair or decommission	12.0.A.	Miles	150	15	21
Forest Inventory	1G.2A & ch.5,#2	Acres	663,682	66,400	74,824
Assess Rare Communities	1.G.2.A.	Acres	~1,200	120	110
Assess Designated O.G. Areas	EIS, Table 3-29	Acres	15,331	1,533	500
Assess Possible O.G. Areas	Preliminary Inv.	Acres	18,033	1,800	0
Heritage Inventory	6.3.A	Acres	50,000	5,000	694
Heritage Site Evaluation	6.4.A.	Sites	100	10	14

<sup>16</sup> 5% of area thinned to 60BA [cliff/bat/rip/0-10 bug removed].

<sup>17</sup> Maintain trails to BMPs, 20% per year.

Activity	Source	Unit of measure	Forest Plan 10-Year Objective	Forest Plan Annual Objective	FY12
Acquisition (10 yr. historic mean)	13.2.A.	Acres	29,000	2,900	0

**18. Are silvicultural requirements of the Forest Plan being met?**

**Reforestation** - The Forest Plan provides for reasonable assurance that lands can be adequately restocked within 5 years after final regeneration harvest.

The Forest Activity Tracking System (FACTS) Reforestation Needs Report now shows 1,402 acres of reforestation needs at the end of FY12. Of this, 526 acres are due to final harvest, 108 acres due to insect/disease mortality, 621 acres due to weather events (ice storm, wind). These areas are expected to naturally regenerate, or will be site prepped, and some planting may occur. There are no pending reforestation needs created from final harvests that occurred beyond five years ago (prior to FY07).

**Land Suitability** - With the exception of a small amount of timber salvaged from roadsides and administrative sites, trees that were harvested from the Forest prior to the revision of the Forest Plan were cut from lands where timber production was the primary objective. The 2004 Forest Plan has placed the primary emphasis on the sustainable management of ecosystems. Trees cut following that revision of the Forest Plan have been harvested from lands where timber production is a secondary objective.

Only minor (< 1%) adjustments in land suitability classification may have been made during the year based on field judgments concerning

accessibility and operability, and changes in stand boundaries during inventory work.

**Harvest Unit Size** – The maximum allowable size of the temporary opening created by even-aged or two-aged regeneration treatments is 40 acres. Thinning, intermediate salvage, or uneven-aged regeneration may be any size.

FY12 timber sales accomplishments included 46 sale units covering 839 acres, which average 18.2 acres per unit. Seven of these units were regeneration harvests, all of which were shelterwood seed cuts designed to produce a two-aged condition. The largest of these harvest units was 40 acres.

**Forest Plan Consistency** - The Forest Planner reviews all scoping notices prior to going to the public, all NEPA documents prepared for Forest Supervisor approval, and other NEPA documents upon request. Forest Staff Officers and resource specialists review the same NEPA documents within their area of responsibility and expertise.

For documents containing planned harvests and other silvicultural practices, all that were finalized for public inspection were consistent with direction contained in the Forest Plan and were appropriate for meeting resource management objectives.

**19. Are Forest Plan objectives and standards being applied and accomplishing their intended purpose?**

**Implement Objectives and Standards** - The Forest Planner reviews all scoping notices prior to going to the public, all NEPA documents prepared for Forest Supervisor approval, and other NEPA documents upon request. Forest Staff Officers and resource specialists review

the same NEPA documents within their area of responsibility and expertise. Prior to being finalized, NEPA documents consistently include forest plan standards as part of project design criteria. Forest Plan standards and Best Management Practice criteria are included as a

requirement of project implementation where appropriate and applicable. All indications are that these standards are effective in accomplishing intended resource protection.

***Vegetation Desired Conditions*** - An Integrated Resource Management Strategy is used to assess resource management needs consistent with Forest Plan Goals and Objectives. Project development and planning incorporates purpose and needs from the Forest Plan that manages vegetation to provide specific habitat needs. The Forest Planner routinely reviews project documents for consistency with Forest Plan direction. All project decisions were consistent with Forest Plan direction.

***Nearby and external applicants*** - Applications to develop power line corridors and coal resources continue. The energy market continues to experience requests to develop outstanding and reserved mineral rights (e.g. oil, natural gas, coal), and federal resources such as coal.

***Land Management Planning*** - A 5-year review of the Forest Plan was completed at the end of FY09. Based on that review, the Forest Supervisor determined there are no recommended changes to the Forest Plan at

that time warranting immediate action on December 30, 2010. The Forest Plan is sufficient to continue to guide land and resource management of the Daniel Boone National Forest for the foreseeable future.

On April 9, 2012, a new National Forest System land management planning rule was published in the Federal Register, effective on that date (36 CFR 219). The new planning rule provides a process for planning that is adaptive and science-based, engages the public, and is designed to be efficient, effective, and within the Agency's ability to implement. It was also developed to ensure that plans are consistent with and complement existing, related Agency policies that guide management of resources on the National Forest System, such as the Climate Change Scorecard, the Watershed Condition Framework, and the Sustainable Recreation Framework.

The 2004 Forest Plan for the Daniel Boone National Forest, developed under the provisions of a prior (1982) planning regulation, is not due for revision until approximately 2017. While this change in the §219 regulations will not have a significant effect on the overall Forest Plan, it will require a revision of the monitoring process for the Forest Plan in the coming years.

## APPENDICES

### Appendix A: Forest Plan Amendments

*Table A.1. Forest Plan Amendments, FY10-11 M&E Report, DBNF*

Amendment No.	Date	Responsible Official	Amendment Description
1	8/26/2008	Forest Supervisor Jerome E. Perez	Establish a 9,867-acre Ruffed Grouse Emphasis Prescription Area 3.H.1. on the Redbird Ranger District
2	4/02/2012	Forest Supervisor Frank Beum	Add a new location to the Developed Recreation Area Prescription Area (3.A) on the Stearns Ranger District

### Appendix B: Research Activities

- Arthur, Mary, Claudia Cotton, University of Kentucky. Monitoring of vegetative response in relation to wildfire severity.
- Braccia, Amy, Eastern Kentucky University is working with Graduate Student Nick Revetta to monitor continue the monitoring of invertebrate response to stream restoration in Slabcamp Creek and White Pine Branch on the Cumberland Ranger District.
- Carter, Emily. Southern Research Station. Thompson, Jason. Southern Research Station. Schweitzer, Callie. Southern Research Station. Operational dimensions of applied silviculture including soil disturbance characterization and change.
- Copperhead Consulting. Telemetry study to determine seasonal movements and maternity colony locations within the isolated Kentucky sub-population of the endangered Virginia big-eared bat
- Day, C. Andrew, University of Louisville. Began a project to reconstruct the hydroclimatology of the Red River Gorge using tree ring data.
- Day, C. Andrew and Jeremiah J. Nieves, University of Louisville. Research to determine the microclimate of white-haired goldenrod habitat
- Dillard, Jacqueline, University of Kentucky. Researching genetic structure and the nature of parental care of Bess Beetles (Coleoptera:Passalidae) using populations on the forest.
- Keyser, Pat. University of Tennessee at Knoxville is researching the establishment and maintenance of oak woodland structured forests on the Stearns Ranger District.
- Loeb, Susan. Southern Research Station. Elliott, Charles. Eastern Kentucky University. Schweitzer, Callie. Southern Research Station. Effects of Silviculture on Bat Community Diversity.
- Parola, Art, University of Louisville is monitoring groundwater response to riparian restoration activities at Slabcamp Creek and Stonecoal Branch on the Cumberland Ranger District.
- Richter, Stephen, Eastern Kentucky University, is working with Graduate Students to monitor amphibian colonization of wetlands constructed on ridge tops on the Cumberland Ranger District.
- Sanderson, Tyler, Chris Barton, Claudia Cotton, University of Kentucky. Ongoing monitoring of the effects of atmospheric deposition on forest productivity.
- Schweitzer, Callie. Southern Research Station. Assessing regeneration response to silviculture treatments implemented to improve forest health, including thinning, prescribed burning, shelterwood treatments.

- Schweitzer, Callie. Southern Research Station, and Gottschalk, Kurt, Northern Research Station. Stringer, Jeff. University of Kentucky. Assessing diversity, biomass and growth, and health of canopy-level trees in response to treatments to improve forest health.
- Schweitzer, Callie. Southern Research Station. Clark, Stacy. Southern Research Station. Pinchot, Leila. The Pinchot Institute for Conservation. Schlarbaum, Scott. University of Tennessee. Impact of Silvicultural Treatment on American Chestnut Growth and Survival.
- Schweitzer, Callie. Southern Research Station. Buckley, David. University of Tennessee. Henning, Jason. University of Tennessee. Understory Microsites Resulting From a Range of Silvicultural Treatments on Dry-xeric and Dry-mesic Oak Forest Sites on the Cumberland Plateau and Comparisons between the airborne and terrestrial lidar as well as the potential to scale leaf area and light measurements across the environment.
- Smith, Bruce, Smithsonian Institute: Ancient DNA study of *Iva Annuia* Achenes from 15Le50 (Cold Oak Rockshelter) and 15Po322 (Courthouse Rockshelter).
- Smith, Jonathan. Volunteer, is monitoring moth and beetle diversity in wet-meadow wetlands and hemlock stands on the Cumberland Ranger District.
- Walsh, Brian, University of Wisconsin-Madison, Madison, WI; Study of Ancient DNA from chenopodium seeds from Cloudsplitter Rockshelter (15MF36).
- USDA Forest Service; Southern Research Station; Center for Aquatic Technology Transfer; Blacksburg, VA; Fish Movement Study in Relation to Aquatic Passage Barrier.
- USDA Forest Service; Southern Research Station; Center for Aquatic Technology Transfer; Blacksburg, VA; Fish Genetic Study in Relation to Aquatic Passage Barrier.

**Appendix C: Daniel Boone National Forest land by District and by County**

**Table C-2 National Forest System Land Status (acres) as of September 30, 2012, FY12 M&E Report, DBNF**

COUNTY	Cumberland	London	Stearns	Redbird	TOTAL
Bath	19,386				19,386
Clay				77,947	77,947
Estill	2,265	3,333			5,598
Harlan				803	803
Jackson		59,603			59,603
Knox				74	74
Laurel		64,985			64,985
Lee	5,822	2,765			8,587
Leslie				52,142	52,142
McCreary			142,671		142,671
Menifee	46,862				46,862
Morgan	13,090				13,090
Owsley		3,848		12,723	16,571

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COUNTY	Cumberland	London	Stearns	Redbird	TOTAL
Perry				2,151	2,151
Powell	15,974				15,974
Pulaski		23,454	14,840		38,294
Rockcastle		16,817			16,817
Rowan	62,650				62,650
Wayne			1,174		1,174
Whitley		34,018	12,500		46,518
Wolfe	16,650				16,650
<b>TOTAL</b>	<b>182,699</b>	<b>208,823</b>	<b>171,185</b>	<b>145,840</b>	<b>708,547</b>

## Appendix D: Payments to States and Counties

*Table D-1 Payment to States and Counties, FY12 M&E Report, DBNF, (unadjusted dollars) (dollars are rounded to whole dollars)*

County	FY12
Bath	20,394
Clay	39,628
Estill	4,938
Harlan	7,561
Jackson	25,788
Knox	0
Laurel	92,085
Lee	8,142
Leslie	64,568
McCreary	131,908
Menifee	15,915
Morgan	29,959
Owsley	16,631
Perry	9,259
Powell	15,695
Pulaski	115,902
Rockcastle	15,379
Rowan	57,945
Wayne	69,714
Whitley	47,332

County	FY12
Wolfe	12,414
<b>TOTAL</b>	<b>801,157</b>

## Appendix E: Forest Plan Implementation using an Integrated Resource Management Strategy (IRMS)

A strategy was developed in May 2006. Additional information and a copy of the Integrated Resource Management Strategy (Strategy) can be found on the Daniel Boone National Forest web site at [http://www.fs.usda.gov/detail/dbnf/landmanagement/planning/?cid=fsbdev3\\_032594](http://www.fs.usda.gov/detail/dbnf/landmanagement/planning/?cid=fsbdev3_032594)

Thirty-three landscape areas were identified and a rotation schedule developed that evaluates each area every 11 to 12 years. It is not the intent of the Strategy that all projects are a result of a landscape analysis. Routine activities and unforeseen circumstances can lead to proposing activities at any time.

**Table E-1 IRMS Resource Inventory**

Fiscal Year	ID #	Landscape Area	Ranger District
2012	3	Blackwater	Cumberland
2012		Pine Creek	London
2012	14	Beaver Creek	Stearns
2012	19	Buckhorn	Redbird
2012	20	Goose Creek	Redbird

**Table E-2 IRMS Resource Condition Assessment**

Fiscal Year	Landscape Area	Ranger District
2012	Red River	Cumberland
2012	Red Bird	Redbird

## Appendix F: Management Reviews

No management reviews occurred in FY12.

## Appendix G: Appeals and Litigation Activity

**Appeals Activity in FY12 – None.**

**New Cases in FY12 - None.**

**Litigation Activity in FY12 – None.**

**Appendix H: Abbreviations and Acronyms**

ABBREVIATION	DEFINITION
BMP	Best Management Practice
CASTNET	Clean Air Status and Trends Network
CATT	Center for Aquatic Technology Transfer
DBNF/FOREST	Daniel Boone National Forest
DEIS	Draft Environmental Impact Statement
EAB	Emerald Ash Borer
EPA	Environmental Protection Act
FACTS	Forest Activity Tracking System
FEIS	Final Environmental Impact Statement
FOG	Future Old-Growth
Forest Plan	<i>2004 Land &amp; Resource Management Plan for the Daniel Boone National Forest</i>
FY	Fiscal Year
GIS	Geographic Information System
HWA	Hemlock Woolly Adelgid
KDFWR	Kentucky Department of Fish & Wildlife Resources
KSNPC	Kentucky State Nature Preserve Commission
LAC	Limits of Acceptable Change
MIS	Management Indicator Species
NAAQS	National Ambient Air Quality Standard
NADP	National Atmospheric Deposition Program
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
OHV	Off-Highway Vehicle
PM	Particulate Matter
POG	Potential Old-Growth
PPM	Parts per million
RNA	Resource Natural Area
RPA	Resource Protection Act
SPB	South Pine Beetle
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFWS	United States Fish & Wildlife Service

**Appendix I: Report Preparers**

*Table G.1. Report Preparers, FY12 M&E Report, DBNF*

<b>Resource Specialist</b>	<b>Expertise</b>
Adams, Wayna	Archaeology
Davis, Patti	Geology
Cotton, Claudia	Soil Science
Gandy, Mitch	Fire and Fuels
Kilpatrick, Sandra	Biology
Jones, Bill	Forest Health
Martin, Pam	Fisheries Biology
Robinson, Elizabeth	Planning
Stratton, Daniel	Air Quality
Taylor, David	Botany
Vaughan, Lin	Engineering
Walker, Jon	Hydrology
Williamson, Myra	Recreation