Appendix A. 2006 M&E Report for Management Indicators

Introduction

As part of the 1996 revision of the Land and Resource Management Plan for National Forests and Grasslands in Texas, management indicators were selected to help indicate the effects of management on biological resources. These indicators include major vegetation communities, habitat elements, species assemblages/ guilds, and individual species. This report documents results of monitoring and evaluating trends of these indicators. This analysis of management indicators represents a broad evaluation of biological resources and effects of management at the level of the entire NFGT administrative unit. It is designed to guide decisions about the need to change management direction at this broad level, while providing useful context for project development and effects analysis.

Selection of Management Indicators

The goal in selecting management indicators for the 1996 Land and Resource Management Plan (hereafter, the *Plan*) was to compile a set of indicators that would provide meaningful information on effects of management on major components of biological resources on the National Forests and Grasslands in Texas (NFGT). Comprehensive lists of vegetation communities, habitat elements, species assemblages/guilds, and individual species were considered. The U.S. Forest Service Ecological Classification System and Plant Community Characterization were used to identify habitats and communities for consideration. As a result of this process, 18 wildlife species, 8 fish species, 2 guilds, 9 communities, and 1 habitat element (Table 1; see also, *Plan* EIS, page 103, and *Plan*, pages 306-307) were selected as management indicators. Indicators were linked with seral stage habitats and vegetation groups to show their association with broad categories of habitat.

A subset of the selected management indicators is "management indicator species," as described in National Forest Management Act (NFMA) regulations (36 CFR 219.19). According to these regulations, management indicator species are to be selected "because their population changes are believed to indicate the effects of management activities" (36 CFR 219 (a)(1)). They are to be used during planning to help compare effects of alternatives (36 CFR 219.19(a)(2)), to set Forest *Plan* objectives for the wildlife and fish resource (36 CFR 219.12(k)(4)), and as a focus for monitoring (36 CFR 219.19(a)(6)). Where appropriate, management indicator species represent the following groups of species (36 CFR 219 (a)(1)):

Threatened and endangered species on State and Federal lists,

1. Species with special habitat needs,
2. Species commonly hunted, fished, or trapped,
3. Non-game species of special interest, and
4. Species selected to indicate effects on a group of species associated with selected biological communities or water quality.

Of the selected indicators, only the indicators that are individual species are "management indicator species" subject to requirements of NFMA regulations at 36 CFR 219.19, with one exception: the "guild" of neotropical migrants (as identified in the *Plan*, page 306). Although "guilds" are not normally considered as species for the purposes of management indicator species requirements, in this case the neotropical migrant "guild" was chosen and monitoring and evaluation occurs through looking at populations of three individual species, specifically yellow-throated vireo, wood thrush, and Acadian flycatcher. Therefore, the NFMA regulation requirements for management indicator species apply to these three species. In contrast, the stonefly guild is monitored and evaluated as a group (without considering population trends of individual species); therefore, the NFMA regulation requirements for management indicator species do not apply to the stonefly guild.

Management indicator species are but one type of indicator used to develop management strategies and monitoring programs designed to meet NFMA requirements related to diversity of plant and animal communities and management of biological resources. Other management indicators important to monitoring effects of *Plan* implementation on biological resources of NFGT include monitoring of:

- Forest-wide levels of four broad seral stages reflecting forest structure in age-classes: (1) 0-20 years, (2) 20-50 years, (3) 50-90 years, and (4) 90+ years,
- Nine key ecological communities, including maintenance of the appropriate prescribed fire regime: (1) Longleaf Pine Woodlands and Savannahs, (2) Longleaf Pine Barrens, (3) Herbaceous Wetlands, (4) Bay Shrub Wetlands, (5) Dry Xeric Oak-Pine Forests, (6) Mesic Oak-Pine Forests, (7) Mesic Hardwood Forests, (8) Tallgrass Prairie, and (9) Bottomland Streamsides,
- Two broad aquatic habitats: (1) Ponds and Reservoirs, and (2) Rivers and Streams, and
- One key habitat element: Snags.

In this report, indicator trends were evaluated in relation to *Plan* requirements and achievement of desired outcomes described in the *Plan*. Desired outcomes include availability of wildlife resources for public use and persistence of communities and species within the planning area. Where data are inconclusive or suggest communities or species are declining to a point that desired outcomes are not likely to be achieved, specific recommendations are made for modifying management or monitoring approaches.

Table 1. Management Indicators by Seral Stage Habitats and Vegetation Groups

Seral Stage Habitats and Vegetation Groups	Management Indicators
Forest/Grassland Early Succession 0 – 20 years	Eastern Wild Turkey Whitetail Deer Yellow Breasted Chat Snags
Forest/Grassland Mid Succession 20 –50 years	Eastern Wild Turkey Whitetail Deer

Seral Stage Habitats and Vegetation Groups	Management Indicators
	Yellow Breasted Chat Pileated Woodpecker Gray/Fox Squirrel Snags
Forest/Grassland Late Succession 50 –90 years	Eastern Wild Turkey Whitetail Deer Yellow Breasted Chat Pileated Woodpecker Gray/Fox Squirrel Snags
Forest/Grassland Old Growth 90+ years	Eastern Wild Turkey Whitetail Deer Pileated Woodpecker Gray/Fox Squirrel Snags
Longleaf Pine Woodlands and Savannahs	Red-cockaded Woodpecker Slender Gay Feather Incised Groovebur Scarlet Catchfly Longleaf – Bluestem Series
Longleaf Pine Barrens	Navasota Ladies'-Tresses Little Bluestem–Rayless Goldenrod Series
Herbaceous Wetlands	Yellow Fringeless Orchid Spagnum–Beakrush Series
Bay–Shrub Wetlands	Nodding Nixie Texas Bartonia Sweetbay–Magnolia Series
Dry–Xeric–Oak Pine Forests	Red-cockaded Woodpecker Louisiana Squarehead Shortleaf-Oak Forest
Mesic Oak-Pine Forest	Red-cockaded Woodpecker Loblolly-Oak Forest
Mesic Hardwood Forests	Southern Ladyslipper Beech-White Oak Series
Tallgrass Prairie	Northern Bobwhite Quail Little Bluestem-Indiangrass
Bottomlands Streamsides	Neotropical Migrants- (Yellow-throated Vireo, Wood Thrush, Acadian Flycatcher) Neches River Rosemallow Bottomland Hardwood
Aquatic – Ponds and Reservoirs	Largemouth Bass Redeared Sunfish Bluegill Sunfish

Seral Stage Habitats and Vegetation Groups	Management Indicators
	Channel Catfish
Aquatic - Rivers and Streams	Paddlefish Sabine shiner Dusky Darter Scaly Sand Darter Stonefly Guild

Trends in Seral Stage Habitats and Vegetation Groups

Methods

The NFGT is comprised of 637,475 acres in four national forests and 38,100 acres in two national grasslands. An abundance of monitoring of seral stage habitats and vegetation groups occurs over time through rotating periodic inventories of NFGT acreage. Vegetation cover types and age classes were inventoried on 19,515 acres in fiscal year 2005.

Vegetation inventory data are maintained in corporate agency databases. Like other national forests in the Southern Region, the NFGT has converted all vegetation data to the FSVeg database. During the 2004-2005 conversion, a forest-wide vegetation status report for 2005 could not be generated. Therefore, both 2005 & 2006 will be included in this FY 2006 Monitoring Report.

Vegetation inventory databases track changes in vegetation age-classes and cover types over time. Changes in acreage by age-class are translated into changes in availability of seral stage habitats. Changes in cover types reflect changes in availability of major vegetation groups. These changes may occur as a result of management, such as in restoring longleaf pine forest to appropriate sites, or when lack of disturbance results in successional change to a different vegetation type. Together, these changes in acreage reflect the availability of major habitats on NFGT.

Results

Table 2 below shows the steady increase in very late seral stage by sixteen percent since 1992. The decrease in the late succession is due primarily to stands growing into the very late stage. The decrease in acreage in the early succession stage is due to a reduction in the number of acres being regenerated.

The FSVeg age-class distribution report for the end of 2006 shows a continuing trend towards an older forest. For instance, the acres in stands over 100 years old have increased from 15,037 acres in 1992 to 55,298 acres in 2006, which is a 268 percent increase. Likewise, the acres in young stands age 0 (currently being regenerated) to 10 years old are just 11 percent of what they were in 1992: 83,612 acres in 1992 to just 9,218 acres in 2006.

Table 2. Seral Stage Habitat Trends for NFGT

Seral	Age	1992	2002	2003	2004	2006	Trend
Early Succession	0-20 years	22 %	14 %	14 %	13 %	11 %	-11 %
Mid Succession	21-50 years	11 %	15 %	15 %	15 %	17 %	+6 %
Late Succession	51-90 years	61 %	55 %	54 %	53 %	50 %	-11 %
Very Late Succession	91+ years	6 %	16 %	17 %	18 %	22 %	+16 %

Major forest vegetation groups have remained fairly stable over the life of the *Plan*; however, a very slight shift from oak-pine forests to hardwood forests is evident (Table 3).

Table 3. Major Forest Vegetation Group Trends for NFGT

Forest Type Group	*1992*	*2002*	*2003*	*2004*	*2006*	*Trend*
Longleaf Pine Woodlands	5.6%	5.7%	5.7%	5.7%	5.2%	-0.4 %
Dry-XericOak PineForests	25.8%	25.1%	25.1%	25.1%	25.2%	-.6 %
Mesic Oak-Pine Forests	58.6%	58.3%	58.3%	58.4%	58.6%	No Change
Mesic Hardwood Forests	2.9%	3.9%	3.9%	3.9%	3.9%	+1.0 %
Bay-Shrub Wetlands	0.4%	0.4%	0.4%	0.4%	0.4%	No Change
Bottomland/Streamside Forest	6.7%	6.6%	6.6%	6.5%	6.7%	No Change

The dry-xeric oak pine forests are composed primarily of shortleaf pine stands and shortleaf pine-oak stands. While this group shows an overall decline of 0.6 percent since 1992, there has been a slight increase in the past two years. The longleaf pine woodlands show a decrease of 0.4 percent since 1992; however, if stands currently being regenerated to longleaf pine were added, this forest type group would likely show an increase instead

of a decrease. This is due to the database not including stands where the age year has not been set; this is normally not done until the stands are certified as regenerated.

Evaluation
The *Plan* sets short-term and long-term objectives for a decrease of early and late succession habitats and an increase in mid-succession and old-growth habitats (page 307). Trends in seral stage acreage indicate movement toward these objectives. These trends are the expected result of moving from a predominately late-successional forest towards a forest with a more balanced age-class distribution. Continued movement toward this desired balance in age classes is dependent on regular regeneration of a relatively small proportion of forests through natural disturbances or management action. These results do not indicate a need to change monitoring or management at this time.

Although conversion of forest types (as called for in the *Plan*) is occurring, successional change in forest types is slow. The slight shift from oak-pine to hardwood forests could be evidence of successional change due to lack of prescribed burning in these forests over the 12-year period; however, it is more likely due to more precise inventory of hardwood stands over recent years. Increases in acres treated with prescribed fire in 2004 (127,211 acres),2005 (100,790 acres), and 2006 (96,684 acres) most certainly improved the condition and sustainability of longleaf pine woodland and dry-xeric oak pine forests, which need frequent burning to promote the open canopy and grass/forb ground cover characteristics of these habitats, as well as regeneration of diagnostic tree species. These results do not indicate a need to change monitoring or management at this time.

To ensure continuity of data on habitat conditions during the transition from CISC to FSVeg, training on the FSVeg database is needed for employees during the next year. Reporting capabilities within FSVeg must be established. Ultimately, new strategies for using remotely-sensed images are needed to ensure timely and cost-effective updates of forest-wide vegetation condition.

Trends in Management Indicators

Monitoring of Management Indicator Species

Plants
Selected botanical surveys and investigations have been conducted on NFGT in recent years. The August 1995 contract with Sam Houston State University to conduct botanical field surveys on 5,851 acres of the Davy Crockett and Sabine NFs was completed by April 1996. This survey documented the locations of five sensitive plant species on the Sabine NF, and developed a baseline inventory for the Davy Crockett and Sabine NFs.

Additional botanical surveys were conducted in 1994, 1995 and 1996 through Challenge Cost-Share (CCS) Agreements. Over 14,000 acres were surveyed on the Angelina and Sabine NFs, and numerous management indicator species and sensitive species locations were documented. Extensive botanical surveys were also conducted on the north Sabine and Angelina NFs after the 1998 storm blowdown event.

In the past three (3) years, increased emphasis has been directed at evaluating previous known plant sites, verifying location, documenting and evaluating status, and identifying protection and management needs. In addition, surveys in potential habitat have found a number of new locations for R8 Threatened, Endangered, and Sensitive Species and management indicator species. All new and relocated occurrences have been inventoried using a GPS for precise coordinates and added to the corporate database.

In 1996, a CCS Agreement was coordinated with the Stephen F. Austin State University (SFASU) College of Forestry to map and evaluate all vegetative communities within the Upland Island Wilderness and the Turkey Hill Wilderness on the Angelina NF, and to provide Geographic Information System (GIS) maps of the findings.

A CCS project with The Nature Conservancy was initiated in 1997 to determine the status and extent of forest communities in which American Beech is present in the overstory. The Ecological Classification System landscape model and the GIS and CISC databases were utilized to select 38 potential Beech sites on the northern Sabine NF for field survey. Community maps and element occurrence data forms for each site were utilized to incorporate the results of this study into the GIS and CISC databases for the Sabine NF. An expanded and updated version of the ECS is near completion and will be used to improve delineation of ecological units on the NFGT for project panning and evaluation.

Birds

Where birds are used as management indicator species, monitoring and evaluation are based on point count data collected by the Forest Service across the National Forests in Texas. These data are presented graphically and interpreted in light of analysis in progress by Forest Service scientists of the Northern Research Station (LaSorte et. al, 2005). National forest trend estimates are evaluated in part by comparison with trends estimated from Breeding Bird Survey (BBS) data from surveys across the larger regions in which National Forests in Texas occur. This comparison helps identify the relative effect of national forest conditions on population trends. If trends on national forests and the larger regions in which they occur are similar, evidence suggests that population trends are driven by forces larger than just national forest management. Differences in trends suggest national forest conditions are influencing populations. All analysis of BBS data was conducted on the BBS website (Sauer et al. 2005) using the Regional Trend Analysis feature, selecting only data for 1998 through 2005 to correspond to the time period of national forest data. Trend estimates were calculated using the "Estimating Equations" method for the entire State of Texas, and for the Upper Gulf Coastal Plain Ecological Region.

The following report summarizes information regarding status and trends of Forest-wide Management Indicators (MI) that reflect the effects of management on fish and wildlife resources and diversity of plant and animal communities. Species specific surveys were planned throughout the 2006 field season for the majority of the species listed as management indicator species. In addition, observations of management indicator species

or their sign were recorded opportunistically during field reviews and work associated with project planning.

Successional Species

Eastern Wild Turkey (*Meleagris gallopavo*)
Background
The Eastern wild turkey was chosen as a management indicator due to its status as a popular demand species. This bird historically occupied 30 million acres in eastern Texas. As a result of unregulated hunting and the loss of habitat, this species was virtually eliminated by 1900. Restocking efforts of Rio Grande, Florida, and pen-raised turkeys from 1924-1978 were unsuccessful. Restocking of Eastern wild turkeys began in 1979, but most restocking efforts have occurred since 1987. Due to these efforts, turkey populations in the Angelina, Sabine, Davy Crockett, and Sam Houston NFs have risen to such sufficient levels that TPWD now allows hunting of this species. Restocking and state agency population management efforts, including appropriate hunting regulations, are assuring the viability of this species rangewide. Rangewide this species is considered secure with a Global Status of G5-Secure and S5B-Secure for the State of Texas (NatureServe, 2006.) Optimum wild turkey habitat has been described as a variety of forest stands of mature hardwoods with abundant oaks for fall acorn crops, with open understories interspersed with openings in close proximity to water and remote from human disturbance (Dickson 2001). Early seral habitat availability is critical to the spring brood success providing appropriate forage such as green grass and forbs, seeds, soft mast, and insects and other invertebrates for the young turkey poults. Mid-seral habitat, particularly edges, provides the dense ground cover preferred for nesting. Open mature and old-growth forest habitat with a frequent burn program provide roosting habitat, as well as winter forage (acorns, dogwood and blackgum fruit).

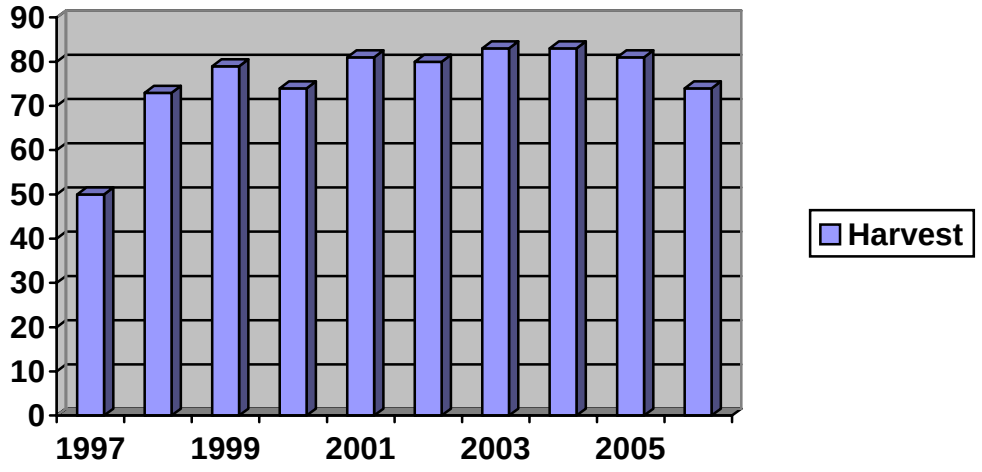
Selection
Eastern wild turkey was selected as a management indicator species because it is a demand/game species of high economic importance. This species utilizes a wide range of habitat types, including grass/forb-dominated openings interspersed with mast producing hardwoods or open pine woodlands making it suitable as a management indicator species associated with early, mid and late-successional forests, as well as old growth.

Monitoring Methods
This species has been and continues to be monitored through combinations of survey techniques, including gobbler call counts and gathering harvest levels data. Surveys are conducted by both TPWD and USFS personnel and are analyzed by TPWD. Information is then provided to the USFS in the form of annual reports, although TPWD discontinued their support of turkey brood surveys in 2005. Other procedures are being evaluated and will be used to assess brood survival in future years.

Results

Annual surveys and harvest data (Figure 1) suggest that Eastern wild turkey populations are stable and that viability is not an issue on NFGT. Numbers appear to be sufficient to support current hunting demand.

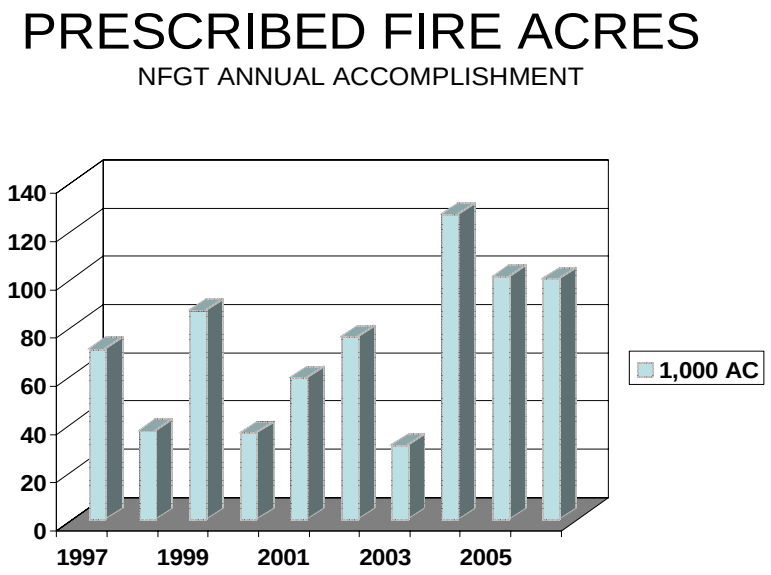
Figure 1. Spring Turkey Harvest in Angelina, Houston, Jasper, Nacogdoches, Newton, Sabine, San Augustine, Shelby, San Jacinto, Trinity, Montgomery and Walker Counties (National Forest Counties) from 1997-2006.



Evaluation

The *Plan* refers to number of suitable acres for Eastern wild turkey in all seral stages. The *Plan* projected that habitat acreage reductions would occur in the early and late-succession stages, and increases would occur in the mid-succession and old-growth stages. The current trend from 1992-2006 indicates a net increase of 6 percent in mid-succession and 11 and 16 percent in late and very late successional stages, forest-wide (Table 2). Even though critical early seral habitat is decreasing, the increases in old-growth areas provide large roosting trees and acorn crops, while the increased prescribed burn regime increases the herbaceous plant community within the grass/forb understory category. Because of prescribed fire treatments, habitat conditions for wild turkeys continue to improve. Three consecutive years of near 100,000 acres or more of prescribed fire (Figure 2.) on the NFGT, have ensured adequate nesting, brood and adult turkey foraging habitat. TPWD has initiated a study on the Angelina NF to investigate further the direct and positive relationship of fire, reproductive success and human impacts to the existing Eastern wild turkey population.

Figure 2. Annual Prescribed Fire Accomplishment on NFGT



Turkey populations on the NFGT have an uneven distribution across the landscape, with the highest densities concentrated currently in the most suitable habitat. For various reasons, improvements in habitat across the NFGT may not result in simultaneous and proportional increases in turkey populations. One reason being turkeys are a game species and a portion of the population is removed each year during hunting season.

Annual variations in productivity and survival are also influenced by weather, disease and predation. The State of Texas has experienced varying degrees of drought from moderate to severe during the last five years, which can detrimentally influence wildlife habitat and populations to a great degree. It is expected that there will be increases in turkey numbers which will follow in the next three-to-five years as a result of the increased prescribed burning and habitat improvements that occurred during 2005-2006.

Need for Change

Populations of Eastern wild turkey continue to appear stable in the eleven (11) counties which contain national forest land. Hunter harvest data provides an index to both recreational demand and population status. Population numbers of turkey should continue to be tracked through hunter harvest and population indices. Annual brood surveys will not be continued by TPWD, but other survey techniques (photo points, hunter sight records, etc.) are being explored. If the alternate techniques provide sufficient population information, these newer survey techniques will be implemented on a larger scale.

Whitetail Deer *(Odocoileus virginianus)*

Background

Historically, the white-tailed deer populations have expanded and been reduced due to the influences of human intervention. Currently, it is the single-most important species economically and ecologically in the south. Current annual harvest in this region exceeds two million animals. Ecologically, the white-tailed deer is considered a 'keystone' species because habitat conditions for numerous other wildlife species are affected indirectly by deer herbivory or through habitat enhancement/manipulations for quality and quantity (Dickson 2001). Historical restocking programs and state agency population management efforts, including appropriate hunting regulations, ensure that population viability for this species is no longer an issue, in east Texas or on the NFGT. Rangewide, this species is considered secure with a Global Status of G5 (NatureServe 2006).

Selection

The white-tailed deer was selected as a management indicator species in the *Plan* as a demand species associated with grass/forb and brushy habitats, interspersed hardwoods, and associated edges which covers the four forest/grassland seral stage habitats listed in the *Plan*: early, mid, and late succession and old growth.

Monitoring Methods

Deer populations are monitored using annual deer spot-light surveys which are actual counts of deer along established routes, as well as harvest data provided by the TPWD. New techniques of assessing deer populations in Texas are being considered, as the traditional methods have not proven to be cost-effective or consistent.

Results

Figure 3 shows trends of estimated white-tailed deer population size in specific ecological regions. The information used is extrapolated from the annual deer spotlight counts and used by TPWD to develop annual harvest recommendations; however, data collected during FY 05 was not yet analyzed and was not available for this report. Trends for all ecological regions surrounding the NFGT indicate a stable to increasing population. These estimates parallel hunter use and harvest increases on the NFGT units.

Acres of habitat in 1996 were estimated to total 315,000 acres across all seral stages combined, and the *Plan*'s short-term objective is to have 300,000 acres. The *Plan* projected that the proportions of habitat (available age classes) would occur with fewer available acres in the early and late-succession stages; more acreage would occur in the mid-succession and old-growth stages. The current trend from 1992-2004, indicates a net increase of 4 percent in mid-succession and 12 percent in old-growth stages forest-wide (Table 2). Even though critical early seral habitat is decreasing, the increases in old-growth areas and the increased prescribed burn regime provide open woods habitat and acorn crops with the grass/forb understory.

Figure 3. Trends in Estimated Whitetail Deer Populations in Ecological Regions Containing USFS Lands.

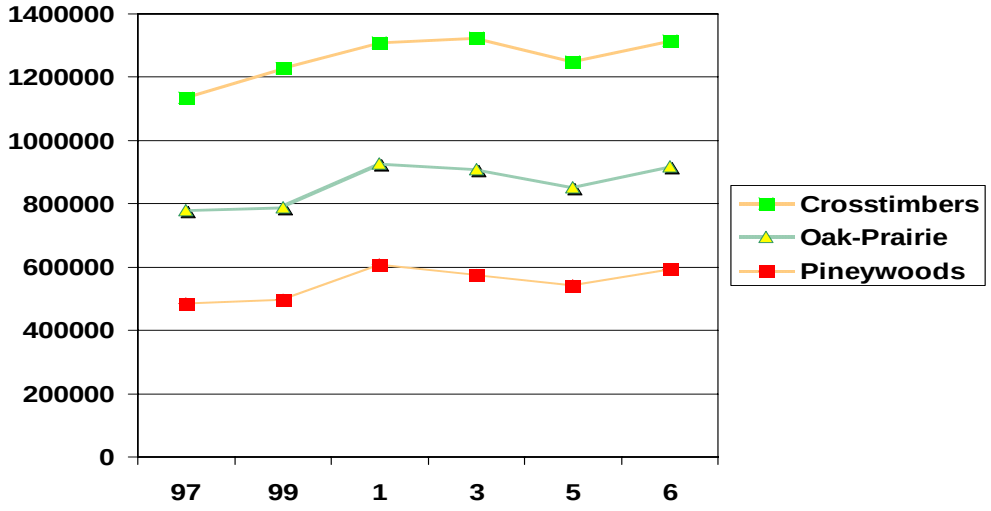
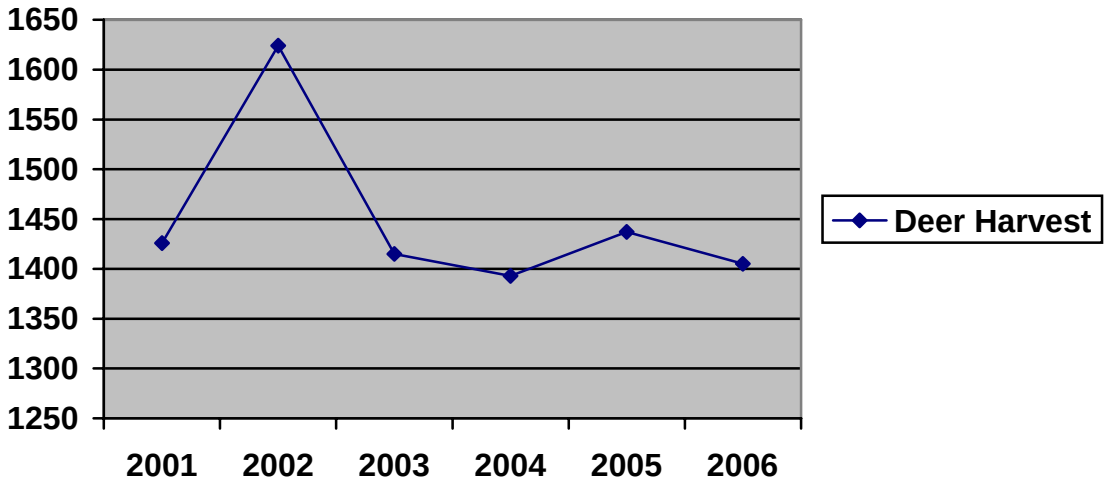


Figure 3 includes the estimated white-tailed deer population size in the Pineywoods Ecological Region. All the National Forests of Texas are included within this region. The ecological region trend is based on a larger sample size, and provides context for national forest trends. Data are extrapolated from annual deer spotlight counts on approximately 83 transects, 1,211 total miles of transect and over 35,000 acres are sampled. The LBJ Grasslands falls within the Crosstimbers Ecological Region and the Caddo Grasslands is in the Oak Woods & Prairies Ecological Region. Population data and trend information is likewise collected via spotlight surveys and extrapolated for the each region, as described for the Pineywoods.

Harvest of white-tailed deer also provides good indication of both deer herd numbers and recreational use by hunters. Harvest is directly estimated on NFGT Wildlife Management Areas (WMA), which make up approximately 249,000 acres. The harvest estimate (Figure 4) is derived via a combination of deer check stations and post-season hunter harvest surveys for the previous five (5) years. All NFGT Districts have portions of the district within a WMA; this ranges from 14,600 acres on the Davy Crockett to the entire Sam Houston NF (163,037 acres) which is all WMA.

Figure 4. Estimated White tailed Deer Harvest on NFGT WMAs



Evaluation

White-tailed deer respond to adequate supplies of browse and escape cover throughout the majority of the year and the availability of hard mast in the fall and winter. Timber harvest techniques, which encourage the release of hard mast producers and maintenance of early succession habitats, will ensure quality deer habitat is provided. Population reductions through hunting are a vital tool in the management of deer herds on the NFGT. Providing opportunity for hunting will aid in preventing habitat destruction by deer herds that may be reaching the carrying capacity of the lands. Quality white-tailed deer habitat is dispersed across the NFGT. This availability of habitat, along with results of annual surveys and harvest levels suggest that white-tailed deer populations on NFGT are sufficient to support current levels of hunting demand.

Need for Change

The white-tailed deer is a habitat generalist not specifically reflective of any seral stage or plant community; thus its role as an ecological indicator is limited. Its primary purpose and value is an indicator of the effects of management on recreational hunting opportunity. If limited to this purpose, no change in monitoring strategy is warranted at this time.

Yellow-breasted Chat *(Icteria virens)*

Background

The yellow-breasted chat ranges from southern Canada and British Columbia east to southern New Hampshire and south to northern Florida, the Gulf Coast and Baja, California. The species winters from southern Texas and central Mexico south through the Yucatan to western Panama. The NFGT is used by this species primarily as breeding habitat, and is seldom seen during the winter seasons. Breeding habitat typically consists of second growth, shrubby old pastures, thickets and woodland margins, bushy areas, scrub, woodland undergrowth, and fence rows, including low wet places near streams,

pond edges, or swamps; thickets with few tall trees; early successional stages of forest regeneration; commonly in sites close to human habitation. The yellow breasted chat nests in bushes, brier tangles, vines, and low trees, generally in dense vegetation less than two meters above the ground (Hamel 1992; Meyers et al. 1978). There has been some decline in eastern U.S. numbers as farmlands and pastures disappeared and reverted to forests or were developed for human occupation or commercial use. Rangewide this species is considered secure with a Global Status of G5 (NatureServe 2006).

Figure 5. Yellow-breasted Chat[1]

Selection

This species was selected in the *Plan* as a management indicator for the brushy, scrub habitat available in early, mid and late seral stage habitats. Acres of habitat in 1996 were estimated to total 174,000 acres, and the *Plan's* short-term objective is to have 140,000 acres. The *Plan* projected that habitat acreage reductions would occur in the early and late succession stages, and increases would occur in the mid succession stages, with overall reductions exceeding increases by 34,000 acres. Reductions in early 11%) and late (11%) seral stages have occurred during the last 15 years.

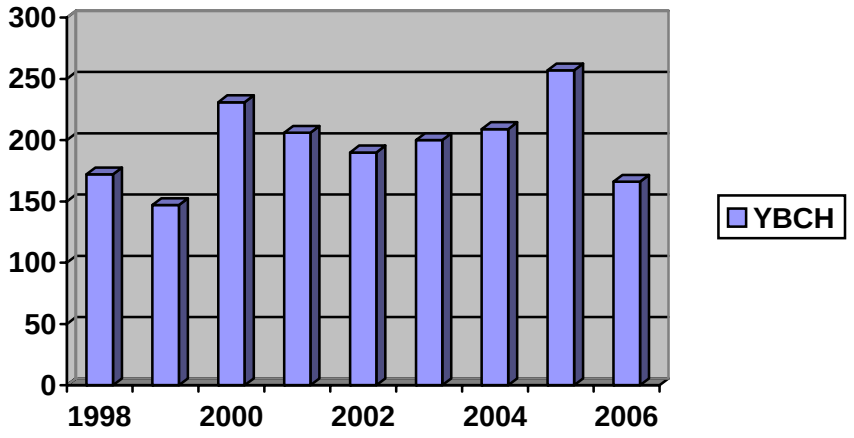
Monitoring Methods

The NFGT have annually conducted breeding bird point surveys since 1998. The NFGT, through neo-tropical bird point-counts, assesses population trends of yellow-breasted chats annually in various forest types and age classes. National forest trend estimates are evaluated in part by comparison with trends estimated from annual Breeding Bird Survey (BBS) data from surveys across the larger regions in which national forests in Texas occur.

[1] Courtesy of Hilton Pond Center for Piedmont Natural History, found at www.hiltonpond.org

Results
Figure 6 reflects an increasing trend in this species with secure viability over all four national forests. Though early succession habitat is decreasing, the use of yellow breasted chats of this seral stage continues to show wide-spread occurrence on the NFGT.

Figure 6. Yellow Breasted Chats Found In All Forest Stands.



Evaluation
Yellow-breasted chats respond to disturbance regimes 3-10 years following an event (hurricanes, prescribed fire, wildfire, tornado, or regeneration harvest) and prefer a well-developed shrub layer either in old fields or forested conditions. As early successional habitat declines on the forest, populations of yellow-breasted chats may decline; however the increase in prescribed burning will create and/or maintain a grass/forb/shrub component in the open woodlands and savannahs.

In addition, Figure 6 suggests a stable to increasing trend in this species across all four national forests. However the 2006 data indicated slight decline. This decline will be evaluated again in 2007 to see if it is consistent between years. Analysis of these data by scientists at the Forest Service's Northern Research Station is currently in progress; however, preliminary results support this interpretation (estimated 3.6 % annual increase; LaSorte et al., in prep). Analysis of BBS data (Sauer et al. 2005) for the same period indicate similar increases for the State of Texas (estimate of annual increase = 5.50 %, P = 0.04593, N = 43 routes) and the Upper Coastal Plain ecological region (estimate of annual increase = 1.49 %, P = 0.02092, N = 211 routes). These results indicate the species is doing well in all three contexts, and provide evidence that national forest management is supporting populations similar to that of all lands in the region.

Need for Change
Yellow-breasted chats are birds of disturbance regimes. This lends them to be good indicators of early succession. Their numbers tend to decrease rapidly in forest stands. It is recommended to continue to track population trends of YBCH through annual point count data. This data should only be used as an indicator for early seral habitat.

Pileated Woodpecker *(Dryocopus pileatus)*
Background
Pileated woodpeckers are birds of the forest, preferring large diameter snags/trees, and needing up to 200 acres of foraging habitat per nesting pair. Pileated woodpeckers have demonstrated the ability to adapt to human habitation and are common in managed forests, as well as rural, suburban, and urban park-like settings (Conner 1978: Hamel 1992). Widely distributed in wooded areas of North America; populations have been stable or increasing in recent decades. Rangewide this species is considered secure with a Global Status of G5-Secure and S5-Secure for the State of Texas (NatureServe 2006).

Selection
The pileated woodpecker was identified as a management indicator for the NFGT because of its specific habitat requirements needing large snags (Hamel 1992, Dickson 2001). This species was also selected in the *Plan* as an indicator for three forest or grassland seral stage habitats: mid and late succession and old growth. Acres of habitat in 1996 were estimated to total 280,000 acres, and the *Plan's* short-term objective is to have 372,000 acres. The *Plan* projected that habitat acreage reductions would occur in the late succession stage, and increases would occur in the mid-succession and old-growth stages, with overall increases exceeding reductions by 92,000 acres. Current trends verify an increase in mid and old-growth stages with a net increase of 22,400 acres of suitable habitat for pileated woodpeckers. Pileated woodpecker populations have been monitored through bird point counts on the NFGT since 1996.

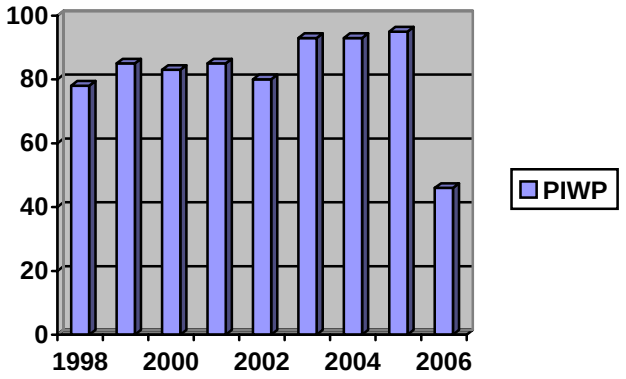
Its use as an indicator is limited by its wide-ranging habits, which causes it to be documented in forest types that are not particularly suitable. It also occurs at relatively low densities, reducing the number of data points available for trend estimates. Local analysis would therefore be limited; analysis in regional trends across national forests would provide more analytical power. Population monitoring would be combined with information on forest age-class distribution to provide a full picture of management effects on snag-dependent wildlife.

Monitoring Methods
Pileated woodpecker populations have been monitored annually through bird point counts on the NFGT since 1998. National forest trend estimates are evaluated in part by comparison with trends estimated from annual Breeding Bird Survey (BBS) data from surveys across the larger regions in which national forests in Texas occur.

Results
Data from point counts suggest a stable to increasing trend (Figure 7), an interpretation supported by preliminary analysis by scientists at the Northern Research Station

(estimated 2.5 % annual increase, but the 90 % confidence interval includes some negative estimates; LaSorte et al., in prep). Analysis of BBS data (Sauer et al. 2005) for the same period indicate similar trends for the State of Texas (estimate of annual increase = 1.80 %, P = 0.57681, N = 27 routes) and the Upper Coastal Plain ecological region (estimate of annual increase = 1.05 %, P = 0.46507, N = 183 routes) These results indicate populations of the species are secure in all three contexts, and provide evidence that national forest management is supporting populations similar to that of all lands in the region.

Figure 7. Pileated Woodpecker Occurrences - All Forest Stands.



Evaluation

Pileated woodpeckers prefer mature deciduous forests, but will utilize virtually any available forests habitats for foraging. Pileated woodpeckers are expected to persist on the NFGT due to net increases of old-growth habitat, and the availability of a variety of habitats across the national forests. The apparent decline in pileated woodpeckers on point counts during 2006 will be watched closely to see if numbers rebound in 2007.

Need for Change

Pileated woodpeckers specific 'large diameter snag' habitat requirement makes it most suitable as a management species for late seral/mature forest and old-growth habitats instead of mid seral succession. The appropriateness of this species as a management indicator species for mid seral, should be revisited during the next *Plan* revision.

SNAGS

Background

Snags are a habitat component of virtually all seral stages, and the lack of snags can be a limiting factor in maintaining or increasing populations of some species. Numerous factors influence the creation and longevity of snags (Dickson 2001). Prescribed burns, wildfires, weather events, insects, disease, and decay are some of the factors that influence the numbers and distribution of snags across the landscape. For example, the prescribed burning program on the NFGT influences snag distribution by both creating and removing snags from the forest. Any prescribed burn will burn with varying intensity as a result of many factors including: the amount, type, and distribution of fuels,

weather conditions, and topographical features. These factors combine to result in a mosaic effect in which some areas burn intensely, while other portions burn with little intensity, or fail to burn at all. The results are that some single trees or pockets of live trees may be killed, creating new snags, while some existing snags are consumed. This creation and consumption of snags results in an uneven distribution of snags across the landscape. When combined with the other factors influencing snag creation and retention, it is obvious that snag numbers and distribution will be very dynamic across the NFGT.

Selection

Snags were selected as a management indicator because they are used by and are important to a wide variety of wildlife species for nesting, roosting, foraging, perching, and other uses in all four successional stages—early, mid, late seral and old growth. Woodpeckers are primary cavity nesters that rely heavily on snags for nest sites (Conner 1978). Snags are important habitat components throughout the forest; therefore it is used as a management indicator in early, mid, late seral, as well as old growth habitat.

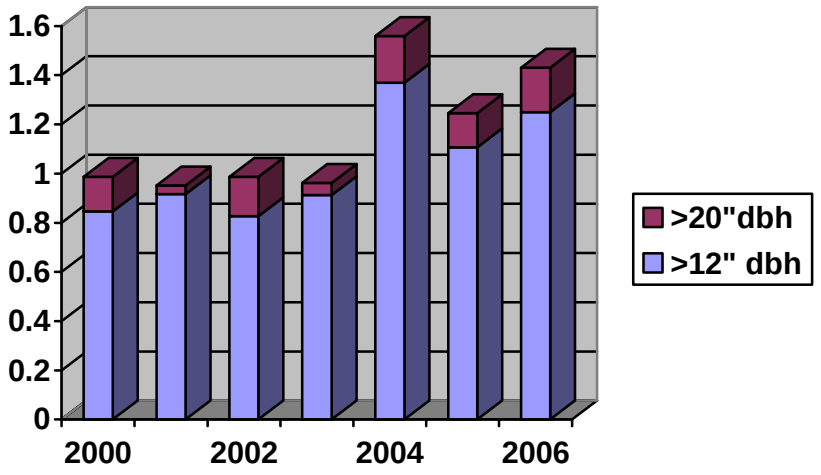
Monitoring Methods

Snag data is gathered as part of the vegetation sampling portion of the R8 Bird protocol. Data on snag numbers has been collected at approximately 700 survey points. A sample of approximately 70 survey points is surveyed annually. Snags are recorded based on their diameter, and grouped into two size categories: 1) 12” – 20” dbh, and 2) larger than 20” dbh.

Results

Figure 8 describes average number of snags per acre from the habitat data collected in the R8 bird point count effort; this combines all seral stages, indicating all areas have from 1 to 2 snags per acre.

Figure 8. Average Number of Snags at Each Sampling Point



Evaluation
As described in Chapter V of the Forest *Plan*, the objective for snags increases as forest stands mature. Management activities, such as prescribed burning, wildfires and natural tree mortality are maintaining a fair number of snags per acre; however, a standard or guide to protect or create snags during timber harvesting activities would increase the availability of snags forestwide.

A research project entitled "Long-term Study of the Population Dynamics of Snags in Pine-hardwood Forest" was initiated in 1994 in cooperation with the Southern Research Station's Nacogdoches Research Work Unit. This study is located on the Stephen F. Austin (SFA) Experimental Forest on the Angelina NF and is examining snag population dynamics for both pine and hardwood species. The results of this study were reported in 2005 (*Conner, R. N. and D Saenz 2005. he Longevity of Large Pine Snags in eastern Texas. Wildlife Society Bulletin 33(2) 700-705*) and described the longevity of large pine snags. In this study, it was determined a number of factors affected longevity of pine snags. Most notably, older pine trees remained standing longer than young trees; certain species, such as longleaf pine also remained standing longer than other pine species. The application of this research will be used in future management on the NFGT.

Need For Change
Utilization of vegetative data collected during bird point counts has established baseline data on density of snags on the forest. Continued collection of this information will establish trends over time forestwide in all seral stages. Snag data is also being collected on the Forest during the five-year Forest Inventory Analysis (FIA) effort. It has not been analyzed to date, but in future M&E reports, FIA snag data may be presented. Other surveys for snags may be needed to capture a broader picture of the amount of snags available on the forest.

Gray and Fox Squirrels *(Sciurus carolinensis* and *Sciurus niger)*
Background
Gray and fox squirrels are popular small game throughout the southeastern U.S., and squirrel hunting is second only to white-tailed deer hunting in most forested areas. Together these species generate considerable revenue and sport, and serve as a noteworthy wildlife species providing the main source of mammalian wildlife viewing opportunities to many people. Optimum habitat for these species consists of mature deciduous and mixed forests with abundant supplies of mast (e.g., acorns, hickory nuts) with availability of permanent water. Streamside zones normally provide this optimum habitat. Range-wide these species are considered secure with a Global Status of G5 (NatureServe 2006).

Selection
These species were also selected in the *Plan* as indicators for forests or grasslands seral stage habitats: mid and late succession and old growth. The gray and fox squirrels were chosen as management indicator species because of their significance as a popular

species identified by the public for recreational game, casual observation and because of their need for dens and hardwood mast produced by mature hardwood trees.

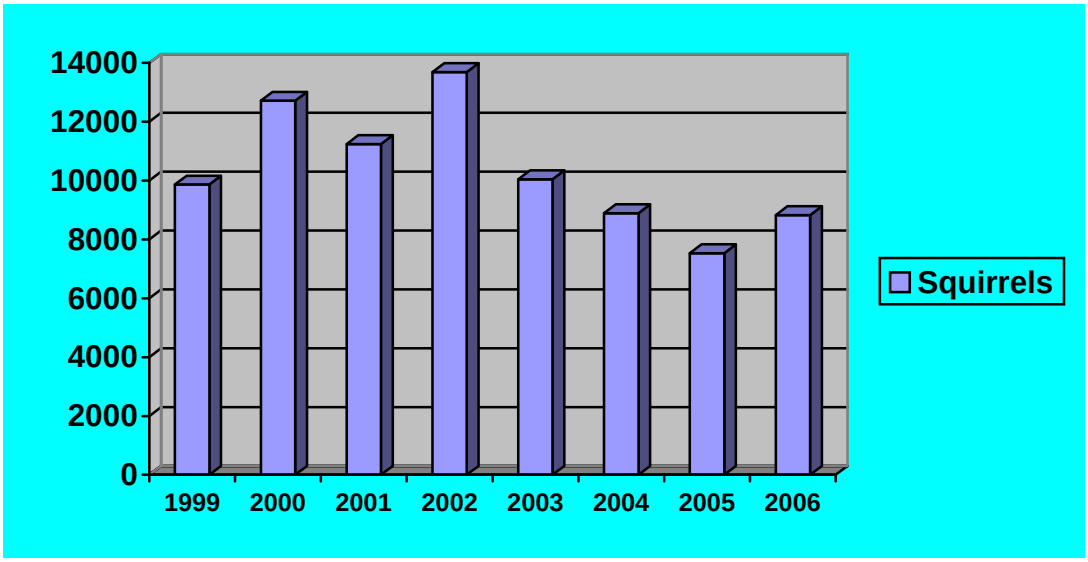
Monitoring Methods

Between 1999 and 2002, the NFGT attempted to develop point-counts for squirrels, similar to the point-counts used to assess numbers of breeding birds. The data collected for these four years was evaluated and it was determined these counts be dropped in favor of more traditional harvest and habitat evaluation techniques. Currently, hunter harvest data and habitat trends are the primary means to assess squirrel populations on the NFGT. To monitor actual trends in squirrel populations, hunter harvest and harvest per unit effort (hunter success rate) are recorded on NFGT Wildlife Management Areas (WMA), some 249,000 acres. These WMAs include all of the Sam Houston National Forest and portions of all other Forests and Grasslands. This area covers approximately 40% of all habitat managed on NFGT.

Results

Acres of habitat in 1996 were estimated to total 200,000 acres, and the *Plan's* short-term objective is to have 264,000 acres. The *Plan* projected that habitat acreage reductions would occur in the mid and late succession stages, and increases would occur in the mid succession and old-growth stages, with overall increases exceeding reductions by 64,000 acres. Current trends verify an increase in mid and old-growth stages of suitable habitat for gray and fox squirrels.

Figure 9. Squirrel Harvest Data on NFGT WMAs



Evaluation

The State of Texas (through TPWD) has opted to evaluate squirrel numbers and establish harvest recommendations based on available habitat, recent harvest trends, and hunter demand. One variable of habitat is that squirrel populations closely parallel the previous

season's mast crop; with populations rising when food is abundant. This factor varies due to weather and is generally not under management control. Therefore, population trends must be viewed over long periods to discern effects of management. Trends in acres of mature mast-producing forest are a more meaningful indicator of effects of management on squirrels and other mast-dependent wildlife.

Need For Change
Population trends will continue to be tracked through hunter harvest. General habitat trends will continue to be evaluated in both forest type and seral stage (Tables 2 & 3). Evaluation of population trends will emphasize implications for meeting hunting demand.

Longleaf Pine Woodlands and Savannahs Habitat

The *Plan* selected the Red-cockaded Woodpecker, and plants including the Slender Gay Feather, Incised Groovebur and the Scarlet Catchfly, as well as the longleaf – bluestem series plant community as management indicators for the longleaf pine woodland and savannahs habitat. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Red-cockaded Woodpecker *(Picoides borealis)*
Background
The Red-cockaded woodpecker (RCW) was listed as a federally endangered species under the Endangered Species Act in 1970, historically occupying a fairly large range in the pine woodland prevalent in southeastern U.S. (Dickson 2001). Both quantity and quality of suitable habitat are much reduced as historical pine woodland habitat and subsequently RCW populations have declined up to 97 per cent. Short-term rotation timber management has eliminated mature diseased pines required for roosting, nesting, and foraging, and fire suppression has perpetuated a dense under and mid-story vegetation layer that excludes RCW use. However, recent habitat (pine thinning and prescribed fire treatments) restoration efforts have reclaimed some of the historic pine woodland habitat, and population augmentation efforts have resulted in population increases in some areas. The Global Status of the RCW is classified as G3-Vulnerable, and S2-Imperiled for the State of Texas (NatureServe 2006).

Figure 10. Red-cockaded Woodpecker[2]

Selection

The RCW was selected as a management indicator species because it meets several of the criteria required of a management indicator species. It represents a federal and state listed endangered species. It has special habitat needs (large pine trees with red-heart disease). It is a non-game (bird) species of special interest. And it is associated on the NFGT with pine communities particularly in open woods condition with large pine trees including 'Longleaf Pine Woodlands and Savannahs Habitat', 'Dry–Xeric–Oak Pine Forests Habitat', and 'Mesic Oak-Pine Forest Habitat' that have been treated with a frequent fire regime.

Monitoring Methods

Red-cockaded woodpecker clusters have been comprehensively inventoried and tabulated in a consistent manner since 1990 and all current monitoring techniques (RCW Recovery Plan 2003) allow personnel to report data consistently. In addition, each year unoccupied habitat is inventoried (10% or more of existing unoccupied habitat) and new RCW clusters are identified. Active cluster monitoring consists of pre-nesting, nesting & post-nesting monitoring; each active cluster is monitored between February and April to determine the group size (as described as potential breeding group). Between April and July, nesting success is determined by banding nestlings, monitoring fledging and later morning and evening roost checks. Additional data is obtained during later capture and translocation efforts between October and January.

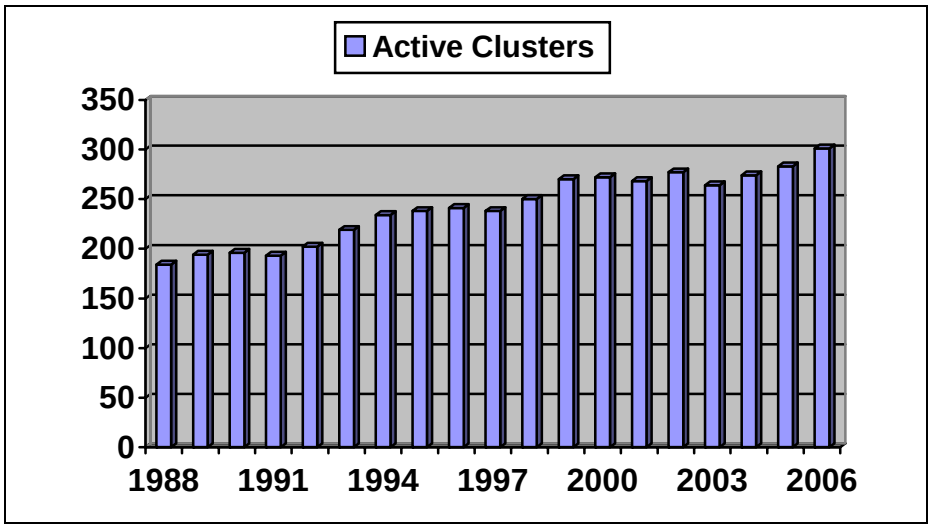
Results

The results depicted in the following figure indicate a steady increase (Figure 11) in the number of RCW active clusters known to occur on the NFGT. The increase from 194 groups in 1989 to 301 groups in 2006 represents a 64% increase in the number of active

[2] Courtesty of USFS. Photograph by Unknown Photographer found at http://www.fws.gov/species/graphics/woodpkr.gif

clusters known to occur on the NFGT. Annual monitoring data suggest that RCW populations are increasing and the viability is fairly secure across the NFGT.

Figure 11. Number of RCW Clusters from 1989 thru 2006



Augmentation (introducing another RCW to an unpaired RCW within an active cluster) and translocation (introducing pairs of juvenile RCW to unoccupied clusters) are proven techniques for improving RCW populations. Translocations are an important technique used to increase populations in suitable habitat where numbers of birds are low. Red-cockaded woodpeckers are moved internally (Table 4) within the same population to augment single birds and to establish new groups by moving two juveniles into a recruitment cluster. Both techniques have been used with good success when needed to bolster clusters and sub-populations.

Table 4. Number of RCW Augmented or Translocated 1990 - 2005 (by Forest)

National Forest	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06
Angelina	4	0	1	3	5	1	0	13	24	3	1	1	0	0	0	0	0
Sabine	0	0	0	4	17	2	2	1	4	21	1	1	0	0	8	8	4
Sam Houston	2	0	0	3	0	0	4	8	13	15	2	2	25	24	8	0	0
Davy Crockett	1	0	0	0	4	4	1	11	15	6	2	2	5	3	1	0	0
Total	**7**	**0**	**1**	**10**	**26**	**7**	**7**	**33**	**56**	**45**	**6**	**6**	**30**	**27**	**17**	**8**	**4**

Since 2004, 229,310 acres of primarily pine-dominated communities in RCW Habitat management Areas have been treated with prescribed burns specifically for threatened and/or endangered species such as the RCW. The fire treatment is critical to mature pine stands in keeping the open woodland condition with little to no mid story vegetation that would hamper fly-way access to nesting cavities. Due to a number of legal issues, weather and catastrophic events, prescribed fire within the HMA was severely limited until 2003. Since 2003, a forest-wide effort to improve RCW habitat through prescribed fire was initiated, with great success. RCW habitat is being burned at a much higher frequency of three-to-four year return intervals than in previous history.

Table 5. RCW Habitat Management Area Prescribed Fire Effort 2004 - 2006.

Forest	*HMA Acres*	*Acres Burned 04*	*Acres Burned 05*	*Acres Burned 06*
Sabine	52,578	26,526 (50%)	17,990 (34%)	15,571 (30%)
Angelina	50,611	23,000 (45%)	11,680 (23%)	12,997 (26%)
D.Crockett	66,248	13,350 (20%)	11, 110 (17%)	18,211 (27%)
S. Houston	108,412	27,860 (26%)	26,230 (24%)	24,785 (23%)

Evaluation
Continued habitat improvement is expected to have positive impacts on all upland pine habitats and species using those habitats. RCW numbers (up over 20% in the past decade) are showing a consistent improvement on all four National Forests. The increased burning effort is attributed to this increase, with a number of natural expansions in RCW groups. Continued inventory of unoccupied habitat should continue as the RCW population thrives.

Need for Change
Maintaining the *Plan*'s direction for an increased prescribed fire program on the NFGT, and increases in the pine thinning program in targeted areas appears to be providing for more secure viability in the enhanced habitat for the RCW population. Tracking habitat quality in the HMA through analysis of treatments should be added as a monitoring task.

Slender Gay Feather (*Liatris tenuis* Shinners)
Background
The 1990 TPWD Texas Natural Heritage Program (TNHP) Report and Donavan et al. (1979) noted that this species is endemic to Texas and known to occur in only eight southeast Texas counties. It occurs most frequently in fire-maintained, dry upland longleaf pine savannas associated with the Catahoula formation (Donavan et al. 1979). The Global Status of the Slender Gay Feather is classified as G3-Vulnerable, and S3-Vulnerable for the State of Texas (NatureServe 2006).