Selection
The slender gay feather was selected as a management indicator species because it meets several of the criteria required of a management indicator species. It has special habitat needs (open pine woodland). It is a non-game (plant) species of special interest. It is also associated on the NFGT with pine communities particularly in open woods and savannah conditions that have been treated with a frequent fire regime. This plant species is associated with the open, longleaf woodlands preferred by other unusual (rare or endangered) Texas species such as the RCW.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
The TNHP report documented nine locations of this species on the NFGT; eight locations were on the Angelina NF and one location on the Sabine NF which served as the baseline for the *Plan* in 1996. Surveys conducted since the 1990 baseline was established found this species to be relatively common in frequently burned, open pine forests with low understories. This species is also found on highway in right-of-ways with frequent mechanical maintenance. Currently, there are 42 occurrences. Locations are recognized on both the Angelina and Sabine NFs. These populations exceed the long-term objective of 35 populations.

A survey was conducted on October 26-27, 2004 in Compartment 139 on the Sabine NF for unrecorded occurrences of *Liatris tenuis*. One new population was documented in this area. No other surveys were conducted in FY 2005 specifically for this species; however, other botanical surveys in longleaf pine habitat were conducted in 2005 with no new occurrences noted.

A hillside seepage slope bog floristic survey conducted between 8/8/06-8/11/06 resulted in the documentation/association of *Liatris tenuis* in three locations in Boykin Springs on the Angelina NF and one location on the Stark Tract on the Sabine NF. In addition, a project survey conducted in C-139 on the Sabine NF following a prescribed burn revealed literally thousands of *Liatris tenuis* in flower across the landscape.

Evaluation
It appears that *Liatris tenuis* is not strictly restricted to dry upland longleaf pine savanna. This species has also been documented in relation to hillside seepage slope bogs (spaghnum-beakrush series) and Catahoula pine barrens (rayless goldenrod-little bluestem series). With this expansion of suitable habitat and continued use of frequent fire as a management tool, it is expected that populations for this species will continue to increase.

Need for Change
Slender gay feather commonly occurs in frequently burned longleaf pine habitat or may be found in areas frequently mowed such as right-of-ways. Simply counting all locations gives very limited information about the quantity or quality of the habitat. A two-tiered method of assessing populations may be appropriate for assessing slender gay feather: tracking quality longleaf habitat through prescribed burn history of longleaf communities and determining actual populations through inventories. Only populations that are present within the last five years should be counted towards forest objectives. It is suggested to add a monitoring task to track the number of acres of longleaf habitat burned on a two-to-three year cycle.

Figure 12. Slender Gay Feather.

Photo by Tom Philipps, USFS.

About 80 percent of the upland longleaf pine habitat has been burned on the Angelina and the Sabine NFs, much of which has been burned again (see Table 5) in the last three years. All prescribed fire locations are recorded into the GIS to allow better monitoring of potential slender gay-feather habitat. One suggestion is to consider that signs be placed to protect known sites from mowing in the flowering season.

Incised Groovebur (*Agrimonia incisa* Torr. & Gray)
Background
This species occurs in the coastal plain from southern South Carolina south to north-central Florida and west to Mississippi. In southeast Texas, it grows in fire-maintained dry upland longleaf pine savannas on well-drained sandy soils and can occur with *Liatris tenuis*. However, *Agrimonia* is much more narrowly distributed on NF land, and is found only within the Longleaf Ridge area.

Selection
The incised groovebur was selected as a management indicator species because it meets several of the criteria required of a management indicator species. It has special habitat needs (open pine woodland) very much similar to the slender gayfeather. It is a non-game (plant) species of special interest. And it is associated on the NFGT with pine communities particularly in open woods and savannah condition that have been treated with a frequent fire regime.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
The TNHP Report, completed in May 1990, noted two locations for this species (all in the Trout Creek area of the Angelina NF). The 1996 baseline is four populations in the Longleaf Ridge area of the Angelina NF. Subsequent surveys by biologists identified at least 23 sites, including the two TNHP sites. Therefore, 25 locations –occurrences - are known for this species on the NFGT, which meets the short-term objective and approaches the long-term objective in the *Plan*. These additional sites need a more detailed field survey that must be conducted in late summer – during September, specifically. The Global Status of the incised groovebur is classified as G3-Vulnerable, and S2-Imperiled for the State of Texas (NatureServe 2006).

A hillside seepage slope bog floristic survey conducted between 8/8/06-8/11/06 resulted in the inadvertent documentation of one additional population of *Agrimonia incisa* in C-77 of the Angelina NF. Another survey specifically designed to relocate known populations of this species was conducted between 9/21/2006 and 9/24/2006. A total of 15 historical populations were visited resulting in the relocation of 9 extant populations. To date, there are a total of 10 confirmed extant populations on the Angelina NF.

Evaluation
Agrimonia incisa, like *Liatris tenuis*, responds very favorably to the effects of prescribed burning. Its numbers seem to be most numerous the season after burning and tends to drop off every year until the next scheduled fire event. The compartments surveyed have not been recently prescribed burned, but most are scheduled to be burned in the next year or two. It is predicted that the numbers of extant *Agrimonia incisa* populations will rebound when post burn surveys are conducted.

Need for Change
As with *Liatris tenius*, simply counting sites gives very limited information on population sizes, so occasional population counts to determine density and vigor may be desired. Where both species occur, perhaps only counting one species would suffice as a measure of habitat quality. The most comprehensive method for monitoring incised groovebur is to survey particular longleaf sites that are burned on a two-to-three year cycle.

Scarlet Catchfly (*Silene subciliata* B.L. Robins)
Background
Scarlet catchfly grows within the ecotone between upland longleaf pine savannas and forested ravines, and is maintained by low-intensity ground fires. The 1990 TNHP Report noted the occurrence of this endemic species only in southwest Louisiana and southeast Texas, including five Texas counties. NatureServe (2006) has locations known in eight Texas counties. The Global Status of the scarlet catchfly is classified as G3-Vulnerable, and S3-Vulnerable for the State of Texas (NatureServe 2006).

Selection
The scarlet catchfly was selected as a management indicator species because it has special habitat needs (open pine woodland). It is a non-game (plant) species of special interest. It differs from the slender gayfeather and incised groovebur in that it is associated on the NFGT within the ecotone between frequently burned upland longleaf pine savannas and forested ravines that have been treated with a low-intensity fire regime.

Figure 13. Scarlet Catchfly.

Photo by Tom Philipps, USFS.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
Current records indicate that there are three known populations located on the Sabine NF. Two are located on the Stark Tract in Newton County, and one population is located in Fox Hunters Hill. The potential for additional sites on the NFGT is limited due to the association between uplands and steep ravine systems. *The Plan's* baseline is two populations on the Sabine NF.

A hillside seepage slope bog floristic survey conducted between 8/8/06-8/11/06 resulted in the inadvertent documentation of one additional population of *Silene subciliata* in the Stark Tract of the Sabine NF. This population is in addition to the known population of this species in this area, which occurs off a different drainage. The known population present in C-139 on the Sabine NF was also relocated. In addition to these surveys, a survey specific to locating new populations of this species was performed between August and September 2006 on the Angelina and Davy Crockett NF. Many areas of excellent habitat potential was surveyed; however, no extant populations were discovered.

Evaluation
Silene subciliata, like *Agrimonia incisa* and *Liatris tenuis*, responds very favorably to the effects of prescribed burning. Its numbers seem to be most numerous the season after burning and tends to drop off every year until the next scheduled fire event. The new occurrence record on the Stark Tract was documented the growing season right after the application of a prescribed fire. Also, the failure to find any new populations on the Angelina and Davy Crockett NFs suggests that this species is indeed restricted to a narrow geographical area in the southeastern Sabine NF.

Need for Change
Monitoring scarlet catchfly gives limited information about the quantity or quality of longleaf habitat since it is narrowly distributed on NFGT lands and is generally found on the ecotone on the edge of longleaf habitat, not within it. An easier method of tracking quality longleaf habitat is through prescribed burn history of longleaf communities. Add a monitoring task to track the number of acres of longleaf habitat burned on a two-to-three year cycle. Recommend dropping scarlet catchfly as a management indicator species in the next Forest Plan Revision.

Longleaf Pine – Little Bluestem Series

Background

Longleaf pine woodlands are fire-dependent communities, requiring frequent low intensity fires to reduce woody midstory growth and encourage a diverse understory that supports a variety of plants and animals. Burning frequency rather than burning season is the single most important factor necessary to restore and maintain longleaf pine-dominated habitats (Glistzenstein and Streng 1995, Waldrop et al. 1992).

This community type is characterized by mainly evergreen woodlands on loamy or sandy acidic soils in southeast Texas. Longleaf pine is the dominant evergreen species, but loblolly and shortleaf pines may also be present. Common deciduous associates are blackjack, bluejack, and southern red oaks, and sweetgum. A shrub layer containing flowering dogwood, beautyberry, redbay, wax myrtle and vaccinium is common, along with a well-developed herbaceous layer of little bluestem, panicum, switchgrass, sedges and other species.

Selection

The longleaf pine – little bluestem series vegetation community was chosen as a management indicator because of its requirement of a frequent fire regime to maintain the viability. Also, because of the requirement of open woodlands that is need to sustain the little bluestem ground cover.

Monitoring Methods

Two criteria are used to monitor and evaluate the extent and quality of longleaf pine – little bluestem communities. One is more quantitative, the other more qualitative.

The Continuous Inventory of Stand Condition (CISC) was the database used to track forest cover types and was recently replaced by FSVeg, the Field Sampled Vegetation national database. The annual change in this database describes changes in acreage identified as longleaf pine forest (stands dominated by longleaf pine). Since restoration of longleaf pine is a Forest Plan objective, acreage changes for this community reflect (1) stands regenerated from another species to longleaf pine and (2) those that have been treated to favor longleaf pine through thinning or other cultural efforts.

Disturbance through fire is the other criteria used to evaluate longleaf pine – little bluestem community. This effort is gauged strictly on frequency of fire and its impact on the little bluestem component of the longleaf pine stand. FSVeg allows greater quantification of understory vegetation, and this database may be developed to monitor this aspect of this community.

Results

At the end of 2006, a total of 25,027 acres were shown in the FSVeg database. An additional 923 acres are in longleaf-slash, which has the potential to be converted to longleaf-bluestem. The *Plan's* baseline is 21,000 acres with a short-term objective of 40,000 acres. Prescribed burning accomplishments (Figure 2) were again substantial.

Evaluation
Most of the planned increase in acreage of this series is expected from the restoration of areas currently occupied by slash and loblolly pine and an aggressive prescribed fire management program where some longleaf overstory currently exists. Prescribed burning, during both the dormant and growing seasons, has maintained or improved (see Table 5) the quality of most existing stands, but exactly how many and which ones have herbaceous dominated understories is unknown.

Need for Change
Add monitoring items to the *Plan* that: (1) monitor the number of new acres burned in the longleaf forest stand type (not burned in the previous four years), and (2) monitor the number of acres burned on a two-to-three year rotation.

Longleaf Pine-Barrens Habitat

Navasota ladies'-tresses and the little bluestem–rayless goldenrod series plant community were selected as management indicators for longleaf pine barrens habitat. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Navasota Ladies'-Tresses (*Spiranthes parksii* Correll)
Background
This plant species is a Texas endemic, primarily known from two river drainages in east-central Texas and a separate disjunct location in east Texas on the Angelina National Forest. Although approximately 100 populations with a total of about 10,000 plants are known, many of the sites are threatened by strip mining and rapid urban encroachment on suitable habitat. This Federal and State Listed Endangered Species is endemic to the Post Oak Region of East Central Texas. Navasota ladies'-tresses were federally listed as endangered on May 6, 1982. The Global Status of the Navasota ladies'-tresses is classified as G3-Vulnerable, and S3-Vulnerable for the State of Texas (NatureServe 2006).

Selection
The 1990 TNHP Report noted populations in nine counties, including a disjunct population (one specimen recorded) on the Angelina NF in Jasper County. Though not noted as a pineywoods plant species, the few hundred acres of barrens habitat and suitable soil conditions on the southern Angelina National Forest indicated more occurrences were possible. This possible site situation and the single known occurrence served as the baseline for the *Plan* and the potential to improve habitat conditions for more occurrences in barrens habitat is possible in future years.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
The known site and related barrens habitats have been protected and managed to restrict vehicles or other mechanical disturbances. Recent attempts to relocate the population have failed. Detailed research and monitoring is ongoing and will continue cooperatively between the USFWS, Forest Service Research Personnel, TPWD, and the NFGT. Annual surveys are conducted in barrens habitats on the Angelina National Forest both where this species was found in the past and in other locations. This is a perennial species and it is possible that specimens may be found in the future.

Surveys were conducted for *Spiranthes parksii* in suitable habitat on the Angelina NF on October 24-25, 29, and November 7, 2005. No new occurrences for this species were found. There have been two element occurrence records for this species recorded, in 1990 and 2000. Both occurrences were located on the Angelina NF in Black Branch Barrens; however, all recent attempts to relocate this species have failed.

Evaluation
The two occurrences of Navasota ladies'-tresses on the Angelina NF are in an inclusional community surrounded by fire-maintained communities. This supports the belief that Navasota ladies'-tresses populations need fire as a management tool (MacRoberts et. al. 1997). Black Branch Barrens was prescribed burned in the Spring of 2006.

In addition to the preceding theory, it must be realized that orchids can remain dormant for many years until the particular conditions that trigger growth occur. Both past sightings of this species, in 1990 and 2000, were characterized by specific climatic conditions, specifically wet and cooler springs followed by temperate summers. Those conditions have never exactly been replicated since the last reported sighting, and may be a prerequisite for future occurrences.

Figure 14. Navasota Ladies'-Tresses.

Need for Change

Only two occurances of Navasota ladies'-tresses, consisting of a few individuals on the NFGT, is not a good management indicator for longleaf pine barrens. The species is difficult to identify, difficult to monitor on a yearly basis, and population fluctuations may tell little if anything about quality of the Catahoula barrens habitat (Rob Evans personal communication.) In addition, even though species occurrences were reported in 1990 and 2000, no voucher specimens exist in any established herbarium that could confirm the identification of the species. Recent literature disputes the validity of the 1990 record and the 2000 record is also lacking paperwork documenting positive identification. Continued monitoring of this population is necessary since it is an endangered species, but the recommendation is to remove it as a management indicator for longleaf pine barrens in the next Forest Plan Revision. A cooperative agreement between the Forest Service and TPWD has been initiated to conduct further surveys for this species.

Little Bluestem – Rayless Goldenrod Series

Background

This community type is characterized by open grasslands or forb-dominated barrens, and is restricted to flat, shallow soil areas of the Catahoula formation in the southern portion of the East Texas Pineywoods and Post Oak Savanna. These barrens are often interspersed within deciduous woodlands of post oak and black hickory or within dry longleaf pine savannas. This habitat is uncommon, found only on the southern portion of the Angelina NF.

Silveus dropseed (*Sporobolus silveanus*) is believed to be an important component of little bluestem-rayless goldenrod communities that exhibit high quality characteristics (open grassy or forb-dominated areas). This species is fire dependent and may be a good indicator of the quality of the habitat (Rob Evans personal communication). Prescribed burning is a key tool for management of these communities.

Selection
The little bluestem – rayless goldenrod plant community was chosen to gauge the trend (size and quality) in this component of the longleaf pine woodland community. Changes reflect the degree of success of the fire management program.

Monitoring methods
Acreage of this community is monitored through GIS and GPS data. Quality is monitored through site visits to known glades.

Results
The *Plan's* baseline of 440 acres identified from the TNHP Report, documents three sites of 437 acres on the southern Angelina NF. An additional site, less than one acre, was found on the northern Angelina NF since the *Plan* was written. These barrens habitats are normally restricted from mechanical disturbance, with fire being the primary management tool used to enhance this community.

Evaluation
Several small isolated areas of little bluestem-rayless goldenrod communities were found since the *Plan* was written. In FY 05, a plan to map and inventory these sites was developed and implementation began. In FY06, all Catahoula pine barrens in Compartments 84 and 86 were located, documented using GPS, and entered into the Forest GIS database.

Need for Change
Silveus dropseed presence or absence and fire history should be included as indicators of quality of habitat. Fire history for all sites should be monitored with a minimum goal of burning them once every four-year period.

Herbaceous Wetlands (Seepage Bogs) Habitat

The yellow fringeless orchid and the spagnum–beakrush series plant community were selected during *Plan* development as management indicators for the herbaceous wetlands (seepage bogs) habitat. As a wetland, this habitat is protected from much disturbance and falls within the MA-4 direction. In contrast to much of MA-4, fire is a required element of these wetlands to enhance the conditions most suitable to promote the vigor of the many species considered unusual. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Yellow Fringeless Orchid (*Platanthera integra* (Nutt.) Gray ex. Beck)

Background

This orchid can be found in low, wet pine savannas, sphagnum seeps and bogs in the southeastern United States from New Jersey, south to north-central Florida, and west to Tennessee and southeast Texas. The 1990 TNHP Report documented two small populations, both in bogs on the southern Angelina NF. These two sites were examined in 1998 and both were still extant. The 1996 baseline is one population.

Selection

This species was selected as a management indicator species for this plant community as a way to measure the effects of prescribed fire in this habitat. The lack of frequent prescribed burning is the greatest threat to the yellow fringeless orchid. Seasonal flooding and periodic burning are the key components to the communities where this orchid is found. The Global Status of the yellow fringeless orchid is classified as G3-Vulnerable, and S1-Critically Imperiled for the State of Texas (NatureServe 2006).

Monitoring Methods

This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results

Surveys for this species were conducted on August 24-25, September 19-21, 2005 and the following year on August 7-11 and September 5, 2006 in suitable habitat on the Angelina NF. The two known extant populations were not relocated nor were any new occurrences documented during any of these surveys.

Evaluation

This fire-dependent species becomes dormant or is shaded out by invading woody competition in the absence of fire. Previously the areas containing the two known populations have not been burned in over four years. However, they were burned in the spring of 2006. More frequent, higher intensity fire in and around the seepage bog areas will improve habitat conditions for this orchid.

Need for Change

The only two populations of yellow fringeless orchids are found on the Angelina NF. Most seepage bogs on the NFGT do not contain this orchid. Therefore, it provides little information as a management indicator for herbaceous wetlands. Recommend dropping it as an indicator species during the next Plan Revision.

Sphagnum – Beakrush Series

Background

This is an herb-dominated community type which includes various types of seepage bogs. Occurrences are usually small and isolated within a matrix of upland pine or pine-oak forest. Small trees and shrubs such as sweetbay, magnolia and evergreen bayberry invade many bogs in the absence of fire. These mesic sites occur mostly on the Angelina and Sabine National Forests. These mesic habitats host a variety of plant species that are unique to this series.

Selection

The *Plan's* status of 150 acres came primarily from the TNHP Report, which listed 148 acres on 37 sites in the southern portions of the Angelina and Sabine NFs. These sites, as a unique plant community, were selected to gauge the impact of various management actions through time.

Monitoring Methods

Known areas of this community are routinely checked by USFS and cooperators; many have recently been located using GPS equipment. These mid-site coordinates are entered into the Forest GIS database as a center-point, but with acreages only approximated.

Results

Seasonally wet bogs as part of MA-4 are typically protected from timber harvest and road building. These communities are allowed to develop with no or very little human disturbance, but they do depend on prescribed fire on a regular basis (every one-to-three years). The major concern for these habitats is the lack of fire and the development of heavy overstory conditions shading out the herbaceous community. Recent increases in prescribed fire have had positive effects on many of these sites.

Evaluation

In FY 05, a plan to map and inventory these sites was developed in FY 05 and implementation began. In FY06, all hillside seepage slope bogs and low wet pine savannas on the Angelina and Sabine NFs were located, documented using GPS, and entered into the Forest GIS database, although some smaller areas may remain undiscovered. These additional mapping and inventory efforts are needed to locate and protect these herbaceous wetland communities. Many additional sites have been found since the baseline was established in 1990. The quality of many of these new sites is generally undetermined, but they do depend on fire for greater species richness and diversity. Periodic monitoring after initial inventorying efforts are completed will be needed to ensure that the characteristic structure and composition of the community is being maintained. Fire history should be the basic indicator of quality of habitat, along with freedom from mechanical disturbance that alters the hydrological flow. Many sites may need midstory control to restore quality herbaceous conditions.

Need For Change
This is a good indicator of a critical and important habitat and monitoring efforts should continue. Monitoring tasks should be added to monitor the frequency at which the sites are burned. The quality of new sites is generally undetermined and periodic monitoring after initial inventory efforts is needed. Fire history and any mechanical disturbance should be recorded.

Bay-Shrub Wetlands Habitat

Nodding nixie, Texas bartonia and the sweetbay–magnolia series plant community were selected as management indicators for the bay-shrub wetlands habitat during development of the *Plan*. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Nodding Nixie (*Apteria aphylla* (Nutt.) Barnh. ex Small)
Background
According to the TNHP Report, nodding nixie occurs in damp, deeply shaded, seepage saturated forests (baygalls), often in association with mosses (*Sphagnum spp.)* and is generally restricted to eight counties in southeast Texas. The Global Status of nodding nixie is classified as G4-Apparently Secure, and S2-Imperiled for the State of Texas (NatureServe 2006). These areas are typically protected during harvest treatments. Occasionally in drier years, prescribed fire may creep into these sites.

Selection
This species was selected as a management indicator for bay-shrub wetland habitat due to it having a preferred habitat within MA-4. MA-4 is classified in the 1996 LRMP as streamside habitat and is generally excluded from project planning by the establishment of an SMZ. This species does not respond well to disturbance and was chosen to determine the effectiveness of MA-4 exclusion from project plans as well as to determine the quality of undisturbed and well developed sweetbay-magnolia plant communities.

Figure 15. Nodding Nixie.

Photo by Tom Philipps, USFS.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
The TNHP Report noted five locations of this species on the NFGT, three on the Angelina NF and two on the Sabine NF. Additional sites have been found on the Sabine NF in the baygall west of Highway 147 in Compartment 51 and in Compartment 90. Houston Sierra Club volunteers located nodding nixie on six sites in three compartments (Compartments No. 90, 91, and 94) on the east side of the Sam Houston NF (all of which are confirmed by a Forest Service Biologist). A hillside seepage slope bog floristic survey, conducted between 8/8/06-8/11/06, resulted in the inadvertent documentation of four additional populations of *Apteria aphylla* on the southern Angelina NF. In addition, species specific surveys for this plant on September 23-30, 2006 resulted in the discovery of two more new populations on the Angelina NF and the relocation of four populations on the Sam Houston NF. The *Plan's* baseline is seven populations. There are currently 21 sites on the southern Angelina NF, with an estimated several thousand plants. The latest population estimate for the NFGT is approximately 27 sites. Surveys for this species are generally conducted in the fall.

Evaluation
Survey data is suggesting that *Apteria aphylla* is common if baygall habitat is present. Populations, when found, number in the hundreds to millions of plants. The fact that the known extant populations continue to increase also suggests that current management practices for this species and the community type where it is found is successful.

Need for Change
Continue to use this species as management indicator in the next Forest Plan Revision.

Texas Bartonia (*Bartonia texana* Correll)
Background
Texas bartonia is found to occur in and around acid seeps in pine-oak forests on gentle slopes and in bay-gall (*Ilex coriacea*) thickets, often on elevated clumps of sphagnum moss or other organic matter. These areas are in MA-4 and are typically protected during timber harvest and road building operations. There are about 15 scattered occurrences, all in southeastern Texas, containing a total of fewer than 1,000 individuals. The Global Status of Texas bartonia is classified as G2-Imperiled, and S2-Imperiled for the State of Texas (NatureServe 2006).

Selection
This species was selected as a management indicator for bay-shrub wetland habitat due to it having a preferred habitat within MA-4. MA-4 is classified in the 1996 LRMP as streamside habitat and is generally excluded from project planning by the establishment

of an SMZ. This species does not respond well to disturbance and was chosen to determine the effectiveness of MA-4 exclusion from project plans as well as to determine the quality of undisturbed and well developed sweetbay-magnolia plant communities.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
This endemic species was not mentioned in the 1990 TNHP Report. Two populations were reported by Bog Research (MacRoberts 1997) on the southern Angelina NF, a third population was located in C-79 on the southern Angelina NF, and a fourth population was found on the Sam Houston NF in Compartment 98. Therefore, a total of four populations have been reported. Surveys conducted on September 23-24, 2006 could not relocate the two populations reported by MacRoberts in 1997, but another survey conducted in late September 2006 on the Sam Houston NF did relocate the C-98 population. Presently, there is one confirmed population of this species on the NFGT. As bay – shrub wetlands are inventoried in the future, additional sites with this species may be found.

Evaluation
No prescribed management is directed at this species, as protection through MA-4 direction would allow the habitat for this species to develop over time. However, this is an elusive species, difficult to identify and has a unpredictable flowering period, anywhere between early September to late October depending on conditions. The fact that another management indicator species for this community, *Apteria aphylla*, was located in all of the reported *Bartonia texana* sites while *Bartonia* was only found once should be evidence that the condition of the bay-shrub wetlands habitats are capable of supporting populations of species which require undisturbed conditions. *Bartonia texana* appears to be truly rare.

Need for Change
This species is difficult to locate and identify and due to its infrequency this species may not be a good indicator of the quality of the bay shrub community (Rob Evans personal communication). Recommend dropping this species as a management indicator during the next Forest Plan Revision.

Sweetbay-Magnolia Series
Background
This community type is a mainly deciduous to evergreen low forest occurring over seeps, in wet creek bottoms, and in other permanently moist soils in East Texas. It is often associated with the sphagnum-beakrush series, and may be successional to bogs in the

absence of fire. These areas are typically protected from logging operations. Periodic fire may maintain some grassy vegetation in these habitats.

Selection
As a valuable component of the mesic plant community associated many times with MA-4, the selection of this community was to evaluate the quality of streamside zones and the associated plants within those communities.

Monitoring Methods
Acreage of this community is monitored through GIS and GPS data. Quality is monitored through site visits to known glades.

Results
The 1990 TNHP Report noted 15 locations on 325 acres of the Angelina and Sabine NFs, and another location of 29 acres on the Sam Houston NF. The *Plan's* status is 250 acres, which was determined from 1991 CISC records. For several years we have monitored this community in CISC and now FSVeg by using forest type code 68 (sweet bay - swamp tupelo - red maple). CISC data from 1992 showed 502 acres in forest type 68. FSVeg data at the end of 2006 shows there were 680 acres in forest type 68.The increase in acreage is most likely the result of better stand type mapping rather than an actual increase in acreage. Some of these sweetbay – magnolia acres coincide with the 354 acres mapped by TNHP. In recent streamside zone protection efforts, better documentation of sites meeting these criteria was realized. The new acreage for these communities will be added to the existing GIS data.

Evaluation
These areas are in MA-4 and are typically protected during timber harvest and other mechanical operations. As new sites are added to FSVeg, TNHP areas need to be checked against FSVeg records to be sure they are correctly identified in the database.

Need for Change
Continued improvement of community identification should be valuable in assessing the extent and quality of this management indicator. Forest Service personnel should be made aware of this habitat type and record it as such in FSVeg, providing a more accurate assessment of extent and quality of this habitat.

Dry-Xeric Oak-Pine Forests Habitat

This habitat is found over much of the northern Sabine, Angelina and most of the Davy Crockett and western Sam Houston National Forests. Chapter V of the *Plan* identified the Red-cockaded woodpecker as a management indicator (discussed previously in 'longleaf pine woodlands and savannahs') and the plant, the Louisiana squarehead, and the shortleaf-oak forest series plant community as management indicators for the dry-xeric oak-pine forest habitat. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Louisiana Squarehead (*Tetragonetheca ludoviciana* (Torr. & Gray) Gray)

Background

Known also as the sawtooth nerveray, this species has been recorded in 19 east Texas counties as well as in western Louisiana and extreme southwest Arkansas (according to the TNHP report). Known populations are small in number of individuals (Rob Evans personal communication), and are known to occur on Davy Crockett and Angelina NFs. Infrequent fires should help maintain this species. The Global Status of the Louisiana squarehead is classified as G4-Apparently Secure, and S3-Vulnerable for the State of Texas (NatureServe 2006).

Figure 16. Louisiana Squarehead.

Photo by Tom Philipps, USFS.

Selection

Louisiana squarehead is restricted to sandy soils in sandhill woods and xeric sandhills in longleaf pine savannas. It was selected in order to monitor management effects on these habitats by analyzing the population trends and number of extant occurrences of this species. Management practices that would disturb the deep sandy soil would be detrimental. Periodic prescribed burning would retard woody invasion, thereby maintaining open sandy areas with little competition.

Monitoring Methods

This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
The baseline in the *Plan* was five populations, which included two locations that were reported by TNHP, both occurring on the Angelina NF. Inventories and monitoring following the February 10, 1998 windstorm blowdown found an additional population on the northern Angelina NF. Other populations are known to exist. The current known populations are estimated at 18. The short-term objective in the *Plan* is 20 populations and the long-term objective is 25. A hillside seepage slope bog floristic survey conducted between 8/8/06-8/11/06 resulted in the inadvertent documentation of one additional population of this species in C-92 of the Angelina NF.

Evaluation
Louisiana squarehead is found in deep sandy soils of longleaf pine sandhills and bluejack oak sandhills, as well as within road right-of-ways. It is a fire-adapted species and appears to respond well to any fire intensity, as has been documented following the wildfire in C-77 of the Angelina NF where this species was seen to flourish as the result of that very intense fire. Also, the numbers of individuals found within road right-of-ways suggests that this species does well when there is a lack of woody competition. Forest-wide populations seem to be stable, and new populations are being discovered as additional surveys are completed within suitable habitat.

Need for Change
All populations have been mapped and entered into GIS coverage. Sites have been revisited to determine if they are still extant. Continue to use this species as management indicator in the next Forest Plan Revision.

Shortleaf – Oak Forest
Background
This community type occurs primarily in northeast Texas and is characterized by mainly deciduous upland woodlands on shallow to deep, usually sandy soils. Shortleaf pine is the dominant evergreen species, but loblolly pine may also be present. The common oak species are southern red, white, black, post, and blackjack, and hickories are often present as well. Periodic prescribed fire is the most effective management tool of this community. Frequency and intensity of fires will determine the structure of these communities. More frequent fires will favor shortleaf and infrequent fires will favor hardwoods. The *Plan's* baseline for this community is 150,000 acres with a short-term objective to increase acreage to 160,000.

Selection
This community was chosen as a management indicator due to its importance to many other species such as red-cockaded woodpecker and certain plant species. Quantifying acreage of this community was thought to provide a gauge to the extent of this community and those species of interest.

Monitoring Methods
Two criteria are used to monitor and evaluate the extent and quality of shortleaf pine – oak forest. One is more quantitative, the other more qualitative.

The Continuous Inventory of Stand Condition (CISC) was the database used to tract forest cover types and was recently replaced by a new system called FSVeg. The annual change in this database describes changes in acreage identified as shortleaf pine forest (stands dominated by shortleaf pine). Since restoration of shortleaf pine is a Forest Plan objective, acreage changes for this community reflect: (1) stands regenerated from another species to shortleaf pine; and (2) those that have been treated to favor shortleaf pine through thinning or other cultural efforts.

Disturbance through fire is the other criteria used to evaluate the shortleaf - oak community. This effort is gauged strictly on frequency of fire and its impact on the shortleaf pine stand. FSVeg allows greater quantification of under-story vegetation, and this database may be developed to monitor this aspect of this community.

Results
As of October 2001, a total of 153,887 acres were inventoried in this type. Current FSVeg acreage identifies 153,887 acres in shortleaf pine – oak forests.

Evaluation
Better evaluation of this community and habitat type is needed. As new and more detailed information is entered into the FSVeg database, better assessment of both the extent and quality of this habitat may be improved.

Need for Change
Analysis of fire history using GIS is needed to plan and direct future burning operations in these communities. These communities should persist in the future on the NFGT.

Mesic Oak-Pine Forests Habitat

The *Plan* selected the Red-cockaded woodpecker which is discussed previously in 'longleaf pine woodlands and savannahs' and the loblolly-oak forest plant community as management indicators for the mesic oak-pine forest habitat. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Loblolly – Oak Forest
Background
This community type occurs on loamy or sandy acidic soils in East Texas, and is characterized by mainly deciduous upland forest. Loblolly pine is the dominant evergreen species, but shortleaf pine may also be present. The common oak species are southern red, white, post, and water, and hickories are often present as well. Timber harvest, planting and prescribed fire will convert some stands, where suitable, to more desirable species composition consisting of longleaf and shortleaf.

Selection
This community was chosen as a management indicator due to its large expanse over the NFGT. Quantifying acreage of this community was to provide a gauge to this large forest community and the change through time as areas were converted to longleaf and shortleaf pine.

Monitoring Methods
One quantitative criteria is used to monitor and evaluate the extent and quality of the loblolly pine – oak forest.

The Continuous Inventory of Stand Condition (CISC) was the database used to tract forest cover types and was recently replaced by the system called FSVeg. The annual change in this database describes changes in acreage identified as loblolly pine forest. Since restoration of longleaf and shortleaf pine are *Plan* objectives, tracking the change in acreage of loblolly pine forests was important.

Results
The *Plan's* baseline is 300,000 acres, although the 1992 CISC records show there were 357,297 acres in this community. The *Plan's* short-term objective is a reduction to 270,000 acres in this type being replaced by other types on suitable sites (longleaf, shortleaf, bottomland hardwoods, etc.) either by natural succession or management treatment. Current FS VEG acreage identifies 357,676 acres in mesic oak-pine forests.

Evaluation
The number of acres of loblolly – oak forest has been stable for several years.

Need for Change
Soil layers in GIS will help managers make better decisions on where stands should be converted. This is presently being added to the Forest database.

Mesic Hardwood Forests Habitat

The southern ladyslipper and the beech-white oak series plant community were selected during *Plan* development as management indicators for the mesic hardwood forest habitat. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

Southern Lady's Slipper (*Cypripedium kentuckiense* C.L. Reed)
Background
This species occurs on mesic beech-white oak forested slopes in East Texas. These slopes are generally only impacted by prescribed fire on a rare basis. This species is distributed from the Ouachita Mountains in Arkansas east to the Cumberland Plateau in Kentucky and Tennessee, south to the East Gulf Coastal Plain in Alabama and Mississippi, and west to Louisiana, southeastern Oklahoma and eastern Texas. The TNHP Report noted populations in seven counties in East Texas, including three

populations on the Sabine NF and one on the Angelina NF. The Global Status of the southern ladyslipper is classified as G3-Vulnerable, and S1-Critically Imperiled for the State of Texas (NatureServe 2006).

Selection
This species is quite showy and considered a key element in the mesic hardwood habitats in the southeast. It was chosen to represent the quality understory condition of the beech-white oak community.

Figure 17. Southern Ladies'Slipper.

Photo by Tom Philipps, USFS.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
The 1996 status of this species on the NFGT was unknown, so the *Plan* specified a short-term objective to establish the baseline population. Botanists and biologists have conducted targeted surveys of the most likely habitats for this species, and more broad-based surveys have also been conducted. These surveys have established a baseline of nine populations, eight of which are on the Sabine NF, and the other is on the northern Angelina NF. A species specific survey was conducted on April 24-28, 2006 by the Forest Service, TPWD, Azimuth Forestry, and the Pineywoods Chapter of the Texas Native Plant Society. Of the 11 known sites, 8 were relocated and 1 new population was discovered. Current number of known populations is 9.

Evaluation
Populations of this species within the NFGT seem to be stable. The scattered distribution and few individuals within each population seems to suggest that this species is indeed at the edge of its range and may even be considered "relict" populations; remaining individuals of a historically much more numerically widespread distribution. A previous threat to this species has been poaching from orchid enthusiasts. The latest and much more serious threat to this species continued existence in the NFGT is the exponential expansion of the feral hog population. Serious feral hog damage from rooting was observed in proximity to most of the known sites. Another question surrounding this species will be its response to the effects of Hurricane Rita, which had serious impacts on the beech-white oak forest type. The Hurricane felled many of the large beech and white oaks where populations of this orchid occurred, opening up the canopy and exposing much more of these mostly shaded areas to sunlight. The response of this species to this environmental change will be monitored.

Need for Change
A cooperative agreement between the Forest Service and TPWD has been initiated for further surveys for this species and associated species found in the same communities. Continued inventory of four to six compartments a year should survey all suitable habitats within a three-year period. Prescribed fire should be allowed to slowly creep down the slopes and extinguish naturally.

Beech-White Oak Series
Background
The *Plan's* baseline of 2,532 acres results from consolidation of the American beech-white oak series and the American beech-southern magnolia series acres reported by TNHP and as recorded in the CISC database during development of the LRMP. Additional area of this type is known and may be typed in FS VEG as forest type 53 (white oak-Northern red oak-hickory) and others. The Nature Conservancy examined the status and extent of many forest communities in which American beech is present in the overstory during 1997. Many stands of beech were significantly impacted during the blowdown on the Sabine and Angelina National Forest in 1998 and Hurricane Rita in 2006.

Selection
This community type occupies mesic ravines and ridges within creek bottoms. This community is found almost exclusively on the Sabine National Forest and to a limited extent on the northern Angelina National Forest. It is considered as habitat for a number of other less common forest plants.

Monitoring Methods
Identification of this forest series is a primary requirement in order to manage for this habitat. The Ecological Classification System landscape model, the GIS database, and CISC were utilized to select 38 sites on the northern Sabine NF for field survey between 1998 and 2000. Of these sites, 21 were ranked as high-quality examples of natural lower slope mesic forests. Community maps and element occurrence data forms for each site

are on file and will be utilized to incorporate this information into the GIS and FS VEG databases for the Sabine NF. Once recorded as such, regular monitoring of quality and condition can continue as sites are entered during various project planning efforts.

Results
Most mesic hardwood areas are protected from mechanical disturbance; additional sites are contained in TNHP sites and Scenic Areas such as Beech Ravines and Colorow Creek. No real change in acreage from the 2,500 baseline has occurred; beech and all other mature hardwood stands were significantly impacted by Hurricane Katrina.

Evaluation
Many of the known areas for this community type remain unmapped. A consistent means of identifying stands is needed to determine the baseline number of populations. Recent work on the NFGT (by Nature Serve under agreement with USFS Region 8) has helped to clarify the range of variability in this type.

Need for Change
At the western margin of occurrence on the Sam Houston NF, this community may transition into one dominated by laurel oak. Laurel oak stand acreage should be included in future reports as part of this community type. The NFGT does not currently have a forest type code for just laurel oak; however, there is a laurel oak-willow oak, code 64. FSVeg currently has 1.967 acres in forest type 64.

Tallgrass Prairie Habitat

The *Plan* selected the Northern bobwhite quail and the little bluestem-Indiangrass plant community series as management indicators for the tallgrass prairie habitat. This habitat occurs on the Caddo and LBJ National Grasslands. A discussion of the most current information regarding the effects of management to these species/communities and their habitat follows.

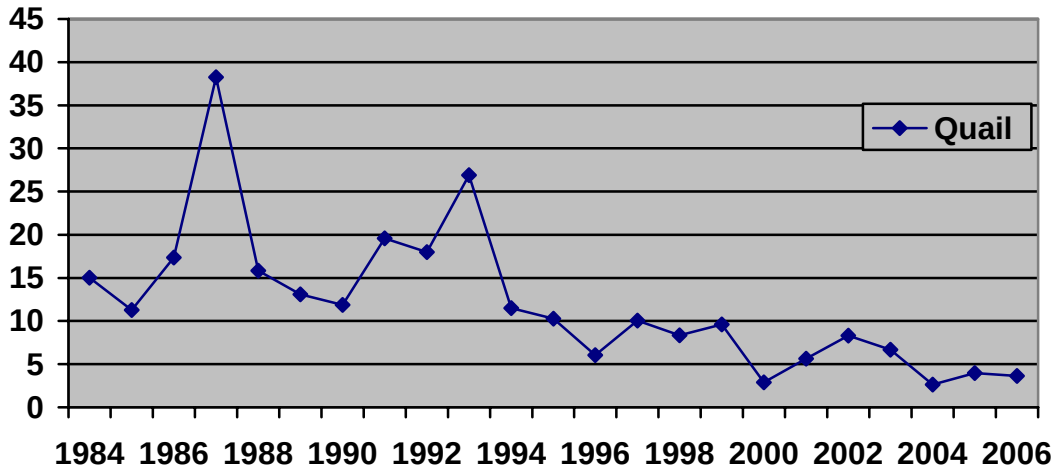
Northern Bobwhite Quail *(Colinus virginianus)*
Background
Tallgrass prairie habitat for the Northern bobwhite is distributed across all units of the LBJ and Caddo National Grasslands of Texas. The LBJ Grasslands has considerably more tallgrass prairie habitat. As a general rule in Texas rangelands, quail prefer areas containing the significant bare ground, with low to moderate grass cover, and some tall forbs. The North American Breeding Bird Survey indicates that from 1966-1998, Northern bobwhite populations underwent a significant range-wide decline of -2.7% every year in nearly every state within their geographic range, and has been nearly extirpated from Ontario, Canada. The Global Status of the Northern bobwhite is classified as G5-Secure, and S4B-Apparently Secure for the State of Texas (NatureServe 2006).

Selection
Northern bobwhite was chosen as a management indicator species for Tallgrass Prairie habitat because of its small home range and habitat diversity requirements. This bird species responds to frequent burning and other disturbance activities that scarify the soil creating grass/herbaceous ground cover in close association with shrubs, vines, and young trees. As an important game bird, selection of this species was an attempt to blend demand with the quality of grassland habitat. The habitat requirements include brushy areas for cover, grass seeds and greenery in the spring, woody plant fruit in the summer, and forb seeds, berries, and oak mast during the fall and winter.

Monitoring Methods
Monitoring of the species, according to the *Plan,* is accomplished through annual census methods. Quail route data collected annually on the grasslands has been utilized to meet forest-monitoring guidelines. In addition, Texas Parks and Wildlife Department obtains statewide data through survey routes established in 1976 and repeated annually to determine quail population trends.

Results
Northern bobwhite throughout the crosstimbers of north Texas have experienced declines and are currently in very low numbers over the last 20 years (Figure 18).

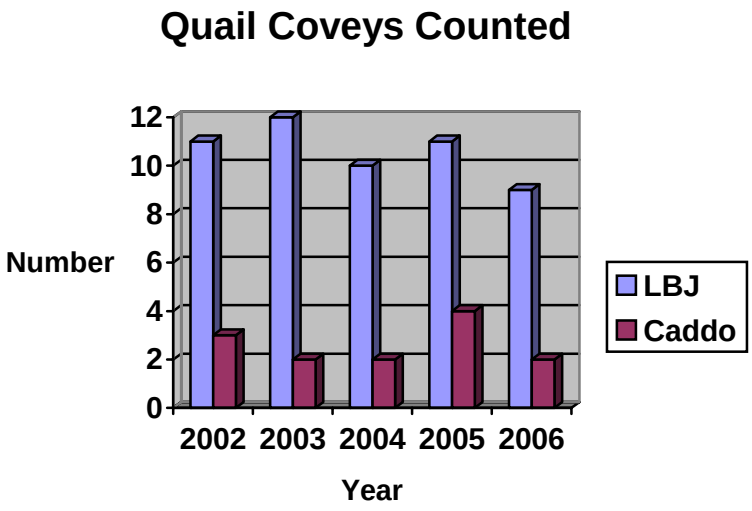
Figure 18. Mean Number of Bobwhite Quail Observed/Route in the Cross Timbers Ecological Region of Texas.



Although inventory data specifically for the grasslands is only available for the past five years, it appears the Northern bobwhite quail on the Caddo and LBJ Grasslands have been stable, and in very low numbers particularly on the Caddo Grasslands (Figure 19).

Evaluation
The long-range viability of Northern bobwhite seems fairly secure on the LBJ, but may be at risk on the Caddo. Grazing continues to decline on both Grassland Units; however, prescribed fire has increased. As habitat changes occur, impacts on recreational use and populations of quail will be evaluated.

Figure 19. Number of Coveys Heard During Point Counts for Quail on the LBJ and Caddo Grasslands



Need For Change
Currently, limited habitat management actions are occurring on the grasslands. Until significant prescribed fire improves more area, quail populations will be impacted mostly by weather. As fire and other management actions occur, a database is needed (similar to FS VEG) to track grassland habitats and conditions. Quail are a good management indicator; however, tracking habitat along with population information is needed.

Little Bluestem – Indiangrass Series
Background
Little bluestem and Indiangrass series represents a unique tallgrass prairie ecosystem on approximately 15,000 acres of the Caddo and LBJ NGs. No other NFGT unit has this plant community series.

Selection
The little bluestem - Indiangrass grass series was selected as a management indicator to capture the unique prairie vegetation, which is of concern throughout North America. Ongoing management activities are designed to maintain or improve tallgrass prairie habitat on both grassland units.

Monitoring Methods
This vegetation type is monitored qualitatively through range analysis. There is no current database to quantify changes through time, but quality is established through habitat management aspects such as prescribed fire.

Results
Prescribed fire and grazing are the management treatments that maintain and restore little bluestem-Indiangrass habitats on NFGT Grasslands.

Evaluation
It is possible in the future some tallgrass prairie could be restored on the Sam Houston National Forest. Through restoration efforts, some sites could exist on the Sam Houston as small remnant blackland inclusions; but, these small patches are disturbed and are not currently representative of tallgrass prairie. Efforts are underway to restore these sites and monitoring through time will evaluate the success or failure of these actions.

Need For Change
While prescribed burning on the grasslands has improved the condition of this community series, there is no known significant increase in acreage. Development of a management tool (similar to FSVeg) to track grassland habitats and conditions is needed.

Bottomland Streamsides Habitat

The *Plan* selected a bird guild – described as the Neotropical Migrants- (yellow-throated vireo, wood thrush, Acadian flycatcher and others), the Neches river rose mallow (a federal candidate plant species), and the bottomland hardwood forest community series as management indicators for the bottomland streamsides habitat. By the *Plan's* direction in MA-4, these habitats are typically protected from timber and road construction projects. Other impact to this habitat is limited to low intensity prescribed fire, weather and/or other natural events. A discussion of the most current information regarding the effects of management to these species/guild/communities and their habitat follows.

Neotropical Migrant Bird Guild
Background
The group of birds specifically listed in the *Plan* as the guild of neo-tropical birds is described as Acadian flycatcher, yellow-throated vireo, and wood thrush. These three birds are typical of hardwood bottoms in East Texas. Key habitat requirements are moist deciduous forests with a moderate understory, generally near a stream (Hamel et al. 1982). The Global Status of all three bird species is classified as G5-Secure, and S5-Secure for the State of Texas (NatureServe 2006).

Selection
This bird guild was selected as a management indicator because of its sensitivity to habitat loss or degradation and habitat fragmentation (and therefore indirectly, cowbird parasitism and nest predation). Stable or increasing populations would indicate preservation of the appropriate habitat without impacts from fragmentation. National

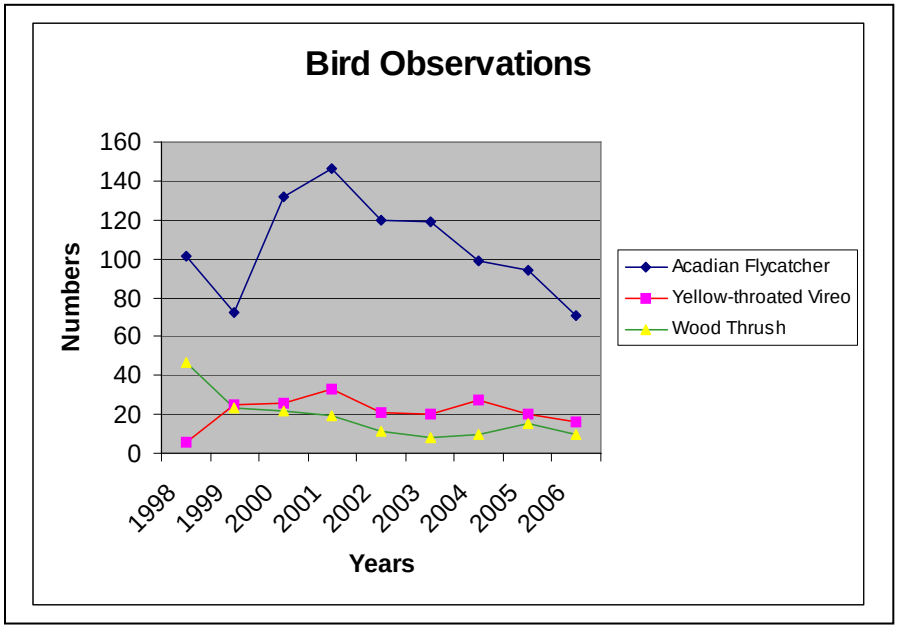
forest trend estimates are evaluated in part by comparison with trends estimated from annual Breeding Bird Survey (BBS) data from surveys across the larger regions in which National Forests in Texas occur. The NFGT have annually conducted breeding bird point surveys since 1998.

Monitoring Methods

A standard point-count migratory bird monitoring system was developed by the U. S. Forest Service to establish a long-term standard; the methodology emphasized migratory and resident landbirds. In 1998, the NFGT implemented this strategy and has continuously performed the annual monitoring effort on the four national forests. Approximately 45 points occur on each unit. Standardized bird monitoring procedures were developed for measuring the success in achieving population and habitat objectives at the Forest and Regional levels. The goal of these programs was to contribute information to our understanding of the trends and status of the species occurring in the region.

Results

Figure 20. Netropical Migratory Bird



Preliminary analysis of data (Figure 20) from National Forests in Texas indicate a stable trend for Acadian flycatchers (estimated annual change = 0.4 %, N = 74 points), an increasing trend for yellow-throated vireo (estimated annual change = 7.9 %, N = 68 points), and a decreasing trend for wood thrush (estimated annual change = -25.1 %, N = 64 points; LaSorte et al., in prep). These mixed results nevertheless compare favorably with BBS trends (Sauer et al. 2005). In contrast to stable trends on Texas National Forests for Acadian flycatchers, BBS trends for Texas are negative (estimated annual change = -12.50 %, P = 0.01349, N = 16 routes); trends for the Upper Coastal Plain are also stable (estimated annual change = 0.69 %, P = 0.54519, N = 181 routes). In contrast

to increasing trends on Texas National Forests for yellow-throated vireo, BBS trends for Texas appear stable to slightly increasing in Texas (estimated annual change = 1.21 %, P = 0.74443, N = 21 routes) and in the Upper Coastal Plain (estimated annual change = 2.80 %, P = 0.22267, N = 143 routes). Wood thrushes, declining on national forest in Texas, are declining alarmingly in many parts of their range, including on BBS routes in Texas (estimated annual change = -12.61 %, P = 0.01131, N = 14 routes) and across the Upper Coastal Plain (estimated annual change = -5.07 %, P = 0.00000, N = 220 routes). These results provide evidence that populations of migratory birds using bottomland and streamside habitats on national forests are faring better in general than those on average across broader regions.

Evaluation
There is no well-defined trend for any of these species; however, the information indicates a relatively stable spring breeding population for all three bird species. The viability of these bird species on the NFGT appears to be fairly secure.

By the *Plan's* direction, these bottomland streamsides habitats are typically protected from timber and road construction projects; therefore, habitat degradation and fragmentation would be limited. The population trends demonstrate that the habitat quality and continuity is being maintained at a level which will support populations of these bird species.

Need for Change
Recommend dropping the bird guild as a management indicator and monitoring the habitat type quality and quantity through the FS VEG tracking system. In addition, if monitoring is continued, consider evaluation of only two species through bird point data in bottomlands streamsides. This evaluation may be more meaningful would continue to be an effective gauge of habitat and populations.

Neches River Rose Mallow (*Hibiscus dasycalyx* Blake & Shiller)
Background
Neches river rose mallow is a Texas endemic that was federally declared a candidate species on May 4, 2004. The known range of this species is limited to the Davy Crockett NF on the NFGT, but suitable habitat may occur elsewhere. It is generally found to occur within openings in shrub swamps or along the margins of riparian woodlands in seasonally wet soils (often found near standing water). Sites are typically flooded during late winter and early spring, but the surface soils are often quite dry by late summer. In 2004, it was known from only six sites in three East Texas counties. All of the occurrences are subject to genetic swamping by more common hibiscus species that are perhaps better adapted to human-disturbed conditions. The Global Status of this species is classified as G1-Critically Imperiled, and S1-Critically Imperiled for the State of Texas (NatureServe 2006). The viability of this species is considered to be at high risk of failing.

Figure 21. Neches River Rose Mallow.

Photo by Tom Philipps, USFS.

Selection
This species was selected as a management indicator due to its preference for the bottomland streamsides habitat, as well as its sensitivity to management activities The *Plan* calls for annual surveys.

Monitoring Methods
This species is monitored through ground surveys. Annual surveys are conducted for new populations of this species by Forest Service personnel, partners, and contractors. These surveys may be specific to this species or may be conducted as part of a broader survey effort in support of Forest planning. Information on new populations is recorded via GPS and entered into the Forest GIS database.

Results
Neches river rose mallow surveys were conducted on June 6 and July 20, 2005. Another survey for this species was conducted on June 21, 2006. No new occurrence records for this species were documented during these surveys. There are currently four confirmed populations for this species on the Davy Crockett NF. All four of the confirmed populations were relocated during the 2005 and 2006 surveys. One of the populations appeared to be thriving, two of the populations appeared to be stable despite a dodder infestation and feral hog damage to one, but the fourth population did not appear viable. Plants showed evidence of wilt and severe insect predation.

Evaluation
The viability of this species is currently stable. Re-stocking efforts have proven to have mixed results. By the *Plan's* direction, these bottomland streamside habitats are typically protected from timber and road construction projects; therefore, habitat degradation and detrimental impacts to the known and unknown populations would be limited.

Need for Change
Inventories are needed bi-annually to monitor progress of restoration efforts. Damage occurred in one area where restoration efforts were implemented. A water-control structure needs to be installed at this site. The three unconfirmed populations need to be verified.

Bottomland Hardwood Series
Background
The Bottomland Hardwood Forest community is of great interest throughout the south as well as in Texas. This community series consists of a mix of the following species: swamp chestnut oak, cherrybark oak, sweetgum, Nuttall oak, willow, sugarberry, American elm, green ash, laurel oak, willow oak, overcup oak, water hickory, sycamore and pecan, in bottomland areas.

Selection
This community was chosen as a management indicator due to its important coverage connecting upland communities over the NFGT. Quantifying acreage of this community was to provide a gauge to this important forest community and to understand both the quantity and quality of this habitat to many important species.

Monitoring Methods
Quantity of bottomland hardwood areas would be determined through stand examinations stored in the previously used CISC database and presently in the new FSVeg database. These designations of stand areas are performed with the use of both GPS and GIS technology.

Results
The *Plan's* baseline was 25,000 acres. Acreage was retrieved annually using the CISC records; this broad group includes CISC forest types 46, 61, 62, 63, 64, 65, 67, 75 and 99. According to 1992 CISC data, there were 40,691 acres in these forest types, but the latest FSVeg data shows 41,066 acres. The small increase from 1992 to 2006 is likely the result of stand reclassification and improved mapping during silvicultural exams into one of the above forest types. Some reclassification is attributed to better stand data or succession of mixed hardwood and pine to predominantly hardwood (due to natural mortality of pine).

Evaluation
These areas are protected during timber harvest and road building projects; therefore, direct impacts to this community are minimal. Changes in the community allocation are primarily the improvement of the Forest Land Evaluation and Tracking Database (FSVeg). The old CISC database has been converted to the new FSVeg system; this new system and more refined data capability may improve evaluation of this plant community series across the NFGT.