

Dry Longleaf Pine

Mid-Atlantic Coastal Plain

Longleaf pine habitats can range from moist to very well drained sites, including Mesic Pine Flatwoods, Pine/Scrub Oak Sandhill, Xeric Sandhill Scrub, and Coastal Fringe Sandhill. These types often grade into each other or occur as a mosaic on the landscape. Frequent fire maintains a canopy dominated by longleaf pine, an open midstory, and an understory dominated by wiregrass or other grass/herb ground cover. When fire is absent or infrequent, scrub oaks, other hardwoods, and shrubs become common in the midstory and shade out native grasses and forbs. The historical expanse of longleaf pine habitats likely supported stable populations of many early seral species without the understory of a mature or old growth pine forest. Longleaf pine is a very long lived species, so the old growth component of this habitat type was very significant. Prescribed growing season fire needs to increase dramatically in these systems and midstory reduction is essential.

Coastal Fringe Sandhill communities typically occur within a few miles of the coast on the central and southern coastal plain. They have an open to sparse canopy of longleaf pine, scattered scrub oaks, abundant lichens and bare sand, and like sandhill communities naturally experienced frequent low intensity fire except in areas with too little herb cover to carry a fire (Schafale and Weakley 1990). Without fire, oaks and shrubs increase in dominance, leading to litter buildup and shading that reduces herb diversity. With long-term fire suppression the litter buildup and changes in the microenvironment can allow invasion by more mesic species (Schafale and Weakley 1990).

Mesic Pine Flatwood sites occur on mesic (non-wetland) sites, range throughout the coastal plain and sandhills and have a closed to open canopy of longleaf pine occasionally mixed with loblolly pine (Schafale and Weakley 1990). The low shrub layer can be dense and the herb layer is dominated by wiregrass in frequently burned areas. These communities naturally experience frequent low to moderate intensity surface fires that maintained a rather open canopy, open to sparse shrub layer and thick diverse herb layer (Schafale and Weakley 1990). Many of these sites were cleared for agriculture due to high fertility, whereas others are rapidly in transition to pine-hardwood forests or to loblolly pine forests with a well developed hardwood midstory due to lack of fire.

Pine/Scrub Oak Sandhill communities are found on rolling to more steeply sloping sites with Coastal Plain sediments with a clay layer near the surface, or sandy to loamy well-drained soils primarily in the Sandhills region but also in the Coastal Plain in sandy areas (Schafale and Weakley 1990). Longleaf pine typically dominates the open canopy with open to dense understory dominated by scrub oaks like turkey oak, blackjack oak and bluejack oak. These communities naturally experienced frequent low intensity surface fires and in the absence of fire the scrub oaks become denser and larger, forming a closed or almost closed subcanopy (Schafale and Weakley 1990). This is the dominant upland community in the 'Sandhills' region of the state.

Xeric Sandhill Scrub sites occur on deep sand ridges and swale systems. Relict aeolian sand deposits, Carolina bay rims and sandy uplands in mainly the Sandhills region and southern Coastal Plain (Schafale and Weakley 1990). Longleaf pine dominates the open canopy with

open to dense understory of turkey oak. Although the least productive, most barren sites produce too little fuel to sustain frequent fires, most of these communities naturally experienced frequent low intensity surface fires with the peak fire season believed to be in early summer (Schafale and Weakley 1990). In absence of fire the scrub oaks become denser and larger and in turn reduce the herb layer and possibility of surface fires. Table 1 provides a list of priority species associated with this habitat for which there is conservation concern.

Table 1. Priority species associated with coastal plain dry longleaf pine habitats.

Group	Scientific name	Common name	State status* (Federal status)
Birds	<i>Aimophila aestivalis</i>	Bachman's Sparrow	SC
	<i>Ammodramus henslowii</i>	Henslow's Sparrow	SR
	<i>Caprimulgus carolinensis</i>	Chuck-will's-widow	
	<i>Caprimulgus vociferus</i>	Whip-poor-will	
	<i>Colaptes auratus</i>	Northern Flicker	
	<i>Colinus virginianus</i>	Northern Bobwhite	
	<i>Contopus virens</i>	Eastern Wood-pewee	
	<i>Dendroica discolor</i>	Prairie Warbler	
	<i>Falco sparverius</i>	American Kestrel	
	<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	
	<i>Picoides borealis</i>	Red-cockaded Woodpecker	E (E)
	<i>Sitta pusilla</i>	Brown-headed Nuthatch	
Mammals	<i>Lasiurus seminolus</i>	Seminole Bat	
	<i>Sciurus niger</i>	Eastern Fox Squirrel	SR
Amphibians	<i>Ambystoma tigrinum</i>	Eastern Tiger Salamander	T
	<i>Bufo quercicus</i>	Oak Toad	SR
	<i>Hyla andersonii</i>	Pine Barrens Treefrog	
	<i>Hyla gratiosa</i>	Barking Treefrog	
	<i>Plethodon glutinosus sensu stricto</i>	Northern Slimy Salamander	
	<i>Pseudacris ornata</i>	Ornate Chorus Frog	SR
	<i>Rana capito</i>	Carolina Gopher Frog	T
	<i>Scaphiopus holbrookii</i>	Eastern Spadefoot	
Reptiles	<i>Cemophora coccinea copei</i>	Northern Scarletsnake	
	<i>Crotalus adamanteus</i>	Eastern Diamondback Rattlesnake	E
	<i>Crotalus horridus</i>	Timber (Canebrake) Rattlesnake	SC
	<i>Elaphe guttata</i>	Corn Snake	
	<i>Heterodon platirhinos</i>	Eastern Hog-nosed Snake	
	<i>Heterodon simus</i>	Southern Hog-nosed Snake	SC
	<i>Lampropeltis calligaster rhombomaculata</i>	Mole Kingsnake	
	<i>Lampropeltis triangulum elapsoides</i>	Scarlet Kingsnake	

Table 1. Priority species associated with coastal plain dry longleaf pine habitats.

Group	Scientific name	Common name	State status* (Federal status)
	<i>Masticophis flagellum</i>	Eastern Coachwhip	SR
	<i>Micrurus fulvius</i>	Eastern Coral Snake	E
	<i>Ophisaurus attenuatus longicaudus</i>	Eastern Slender Glass Lizard	
	<i>Pituophis melanoleucus melanoleucus</i>	Northern Pinesnake	SC
	<i>Sistrurus miliarius</i>	Pigmy Rattlesnake	SC
	<i>Tantilla coronata</i>	Southeastern Crowned Snake	
*Abbreviations E Endangered T Threatened SC Special Concern SR Significantly Rare			

Location And Condition Of Habitat

Longleaf pine communities, once the most abundant Coastal Plain habitat, now exist in just 3% of their previous range throughout the southeast (Frost 1995). Longleaf pine forest and savanna is one of the most endangered habitats in the country today (Noss and Peters 1995). Urban development and a lack of fire continue to threaten many of these forests. Frost (1993) states that "Of 352 longleaf pine remnants examined in North Carolina, only 91 stands (26%) were being maintained by fire, while the rest (74%) were fire-suppressed and in transition to other forests types". Map 1 depicts locations of dry longleaf pine communities in the Mid-Atlantic Coastal Plain ecoregion.

Longleaf pine forests presently occur in the following North Carolina counties, with number of acres in parentheses: Moore (30,200) Hoke (28,300), Richmond (25,800), Bladen (25,400), Brunswick (25,200), Cumberland (22,600), Pender (18,600), Scotland (17,900), Onslow (17,800), Carteret (10,800), New Hanover (8,100), Sampson (5,800), Craven (5,200), Pitt (3,100), Columbus (2,800), Harnett (2,800), Robeson (2,500), Jones (2,200), and Lenoir (400).

The best remaining examples of the dry longleaf pine habitat in the Coastal Plain are on the military bases of Fort Bragg, Camp Lejeune, Sonny Point, and Cherry Point, the Croatan National Forest, Holly Shelter Game Land, and Sandhills Game Land. Most of the acreages on the above sites are in fair to good condition, due to regular prescribed burning. There are many other sites on both public and private lands where little to no burning has depleted the value of the habitat; these sites would thus be considered to be in poor condition.

Problems Affecting Species And Habitats

The majority of the loss of this habitat type has been due to urbanization, agriculture, and regeneration of other timber types. Longleaf is considerably more difficult to get established than loblolly, and many foresters do not have the training in order to feel comfortable making recommendations to plant longleaf. Pine production on the Coastal Plain is typically high intensity with short rotations, resulting in densely stocked, closed canopy plantations of loblolly or slash pine with very little herbaceous understory.

Other threats to dry longleaf pine communities are lack of fire, urban development, and intensive pine straw raking. Fire suppression (or only cool season fires) has caused the deterioration of many additional sites, particularly on private lands and around urban areas where smoke management issues create problems for managers and landowners. In absence of fire, scrub oaks (or mesic trees) become larger and more dense and form closed canopies that reduce understory vigor. The loss of understory grass and the presence of oak leaf litter (less flammability) reduces the likelihood and effectiveness of future surface fires (Schafale and Weakley 1990). Designated Wilderness Areas are a good example of where longleaf is being lost to a lack of fire. Longleaf cannot regenerate itself without fire to control competing vegetation. Remaining stands are often fragmented.

Urban development continues to be a problem and can be excessive on these sites. Dry longleaf pine communities occur on sandy, loamy, or other fine textured soils that are moderately to excessively drained, making them ideal sites for residential and commercial development. In addition, the scenic quality of longleaf pines, coupled with the white sands, make longleaf sandhills ideal sites for golf courses and associated development; many thousands of acres have been developed, particularly around Southern Pines and Pinehurst, North Carolina, for these purposes. Pine straw raking has tremendously impacted understory habitat by removing understory grasses and forbs, preventing their growth, and sometimes creating an almost bare sandy forest floor.

Old growth characteristics (canopy gaps, red-heart fungus, cavities, snags, hollow trees) are lacking throughout, except where red-cockaded woodpeckers are managed, impacting both primary (e.g., woodpeckers) and secondary (e.g., rodents, bats and other birds) cavity users. Habitat loss and lack of fire affects bird species that rely on a grass-dominant understory and open pine ecosystems (red-cockaded woodpecker, Bachman's sparrow, brown-headed nuthatch, Henslow's sparrow, and northern bobwhite). Microhabitat features such as large woody debris have been lost, impacting reptiles and small mammals (Loeb 1999). Fire ant impacts are also a growing threat.

Species And Habitat Conservation Actions and Priorities For Implementation

Habitat restoration through native understory reestablishment, longleaf pine plantings and growing season prescribed burning is needed to maintain the understory and open pine ecosystem. Controlling midstory development and encouraging understory development

through prescribed burning are major objectives in order to restore these communities to presettlement conditions (Lorimer 2001). Although a total eradication of oaks when trying to restore longleaf habitat reduces the food base for many mammals (e.g., eastern fox squirrel), restoration of natural fire frequency, intensity, and seasonality is critical for pine-related reptiles, amphibians, and their prey (Bailey *et al.* 2004). Acceptance of controlled burning can be enhanced through public education, programs to “fire-safe” properties, and cost-share programs to install fire lines and conduct controlled burns. Mechanical or chemical vegetation controls can supplement or replace burning where appropriate. Snag management should be practiced to increase populations of cavity nesting birds (e.g., red-cockaded woodpecker, USFWS 2003).

We must encourage thinning of pine forests and planting longleaf pine (restoration work) in clearcuts and abandoned fields. We must also work with the NC Forest Service to allow wildfires to burn where safety and property protection considerations allow. Opportunities exist to take advantage of existing initiatives and programs such as Partners for Fish and Wildlife, Safe Harbor, the Forest Landbird Legacy Program and Farm Bill programs to influence and improve habitat conditions for birds and other longleaf pine related wildlife. We must also continue coordination with Red-cockaded Woodpecker Working Groups, such as the Translocation Working Group as well as the Sandhills and Coastal Group efforts to better manage for that species.

Management and protection of longleaf communities to promote large, unfragmented tracts is needed for reptiles and some bird species. In order to accomplish this goal, land acquisition and easements, especially for existing unfragmented longleaf pine forest, should be sought through cooperation with land trusts and The Nature Conservancy. This protection could potentially involve poor sites (e.g., recent clearcuts, loblolly pine plantations) whereby conversion to longleaf can be accomplished. Two high priority regions for accomplishing landscape-level connection, protection, and management of longleaf pine and associated communities are the Sandhills region and the Onslow Bight region. In the Sandhills, Fort Bragg, Sandhills Game Lands, and other key priorities need to be connected to facilitate dispersal among the high quality habitats of these managed and protected properties. The Onslow Bight region is located on the Coastal Plain from the Pamlico River to the Cape Fear River. Croatan National Forest, Camp Lejeune, and Holly Shelter Gamelands need to be connected to each other and to other key properties to facilitate dispersal and create a landscape-level mosaic of protected, managed, and high quality habitats. The Natural Heritage Trust Fund and the Recovery Land Acquisition Grants are the primary funding sources at this time for acquisition funds within this habitat.

Priority Research, Survey, And Monitoring

Surveys are needed to document the distribution, relative abundance and status of many wildlife species associated with dry longleaf pine habitats. Priorities for conducting surveys need to focus on species believed to be declining, at risk or mainly dependent on dry longleaf

pine communities. Secondary priority for surveys should be for species for which current distribution information is already available or for species that are considered common.

Monitoring systems need to be expanded and/or targeted to be able to assess current population status and trend information for all wildlife species associated with dry longleaf pine habitats. Many North Carolina dry longleaf pine bird species require specialized monitoring attention, since neither BBS nor standard point counts adequately sample for many species like Bachman's sparrow, nightjars, American kestrel, Henslow's sparrow and red-headed woodpecker.

- **Surveys -**

- Focus avian status and distribution surveys on Bachman's sparrow, brown-headed nuthatch, red-headed woodpecker, American kestrel, Henslow's sparrow, nightjars and red-cockaded woodpeckers (on nonfederal lands) first and then continue for other birds using dry longleaf pine habitats; of particular importance is documentation of red-cockaded woodpecker clusters around designated recovery populations (see USFWS 2003).
- Conduct winter surveys for Henslow's sparrow in appropriate grass dominated understory habitat (Carrie *et al.* 2002).
- Document the status and distribution of small mammals, bats and eastern fox squirrel.
- Conduct herpetofaunal surveys for eastern tiger salamander, oak toad, Carolina gopher frog, pine barrens treefrog, northern scarletsnake, southern hog-nosed snake, eastern coachwhip, northern pinesnake and pigmy rattlesnake, canebrake rattlesnake and eastern coral snake and expand eventually to include other reptiles and amphibians.
- Inventory reptile and amphibian species on key public lands where good examples of this habitat type still exist; then expand to areas not well managed or fragmented.
- Conduct extensive surveys to determine the status and distribution of the eastern diamondback rattlesnake in order to facilitate initial habitat protection measures.

- **Monitoring**

- Long-term monitoring for amphibians and reptiles needs to be developed or enhanced (Taylor and Jones 2002) and there is a decided lack of long-term monitoring information on most small mammals and for bat species (Ellis *et al.* 2002).
- Establish additional MAPS and migration bird banding stations.
- Initiate long-term monitoring related to snag ecology and cavity nesting birds during different seasons (e.g., northern flicker, red-headed woodpecker and brown-headed nuthatch) (Wilson and Watts 1999; Kreisel and Stein 1999).
- Initiate long-term monitoring during breeding, winter and migration periods for all priority landbirds (Wilson and Watts 2000; Brown *et al.* 2002).
- Initiate long-term monitoring for priority reptiles and amphibian species associated with dry longleaf pine systems (Taylor and Jones 2002).

- **Research**

Genetics

- Determine if the southeastern sub-species of the American kestrel breeds and/or winters in these habitats in North Carolina.

Habitat use

- Study nightjar habitat-use and foraging patterns (using telemetry).
- Conduct habitat-use studies on eastern diamondback rattlesnake (using telemetry).
- Explore spatial and temporal distribution patterns of amphibians related to temporary and scattered water sources (similar to current work being done on International Paper lands in the southeastern Coastal Plain).

Population demographics

- Conduct productivity and nest success research on Bachman's sparrow and brown-headed nuthatch to determine limiting factors for population growth (Wilson and Watts 1999, Stober and Krementz 2000).
- Conduct Seminole bat life history research, as well as demographic information on other bats (Ellis *et al.* 2002).

Predator effects

- Study predator and cowbird parasitism effects on bird productivity for canopy- and ground-nesting birds.
- Study the effect of fire ants on ground nesting birds and herpetofauna.

Management practices

- Examine the effects of red-cockaded woodpecker management on other birds and reptiles, amphibians, and bats (Krementz and Christie 1999, Conner *et al.* 2002, Provencher *et al.* 2002).
- Develop strategies for pine straw raking that minimizes impacts to understory habitat structure.
- Examine the effects of intensive fire management on the habitat requirements of the eastern fox squirrel (Weigl *et al.* 1989).
- Examine the effects of herbicides used to control hardwoods on non-target herbaceous plants; also, study techniques and preferred chemicals for hardwood control that have the least negative impacts on non-target herbaceous plants.

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