

# The Flomaton Natural Area: Demonstrating the benefits of fuel management and the risks of fire exclusion in an old-growth longleaf pine ecosystem

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## SITE HISTORY AND LOCATION

The impacts of ecological restoration on longleaf pine forests are being studied in the Flomaton Natural Area (FNA) in Escambia County, Alabama. The FNA is a 25-hectare virgin longleaf pine stand that was protected from fire for >45 years.

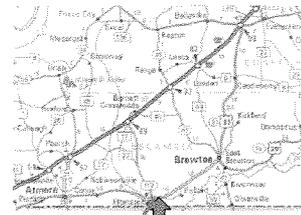
**History:** The importance of the stand was recognized by the Society of American Foresters (SAF) in 1963 when they designated the area, then owned by the St. Regis Paper Company, as the E. A. Hauss Old Growth Longleaf Natural Area. The SAF's definition of a natural area is "a tract of land set aside to preserve permanently in unmodified condition a representative unit of virgin growth of a major forest type, with the preservation primarily for scientific and educational purposes".

**Photo on the left:** Aerial view of the FNA taken in the early 1950's. It is assumed that the stand was still being prescribed burned on a regular basis. Notice the gaps that existed in the stand at that time.

**Photo on the right:** Ground level view of the FNA taken in 1958. It is thought that prescribed burning had ceased a few years earlier. The growth of oak species is an indication that the stand was no longer being prescribed burned.

The FNA is a microcosm of the recent history and many threats facing fire adapted longleaf pine ecosystems. Many of the remnant old-growth longleaf pine stands which remain have been reduced to isolated, often degraded patches in the southern landscape. The FNA was one of these stands before restoration efforts began in 1995. In an effort to restore this longleaf pine habitat, an agreement to restore, manage, conduct research and to use to the stand for education was entered into by and among International Paper (the current owner of the FNA), Auburn University School of Forestry and Wildlife Sciences, the Southern Research Station of the USDA Forest Service, Alabama Forestry Commission, The Nature Conservancy, and the Alabama Natural Heritage Program.

**Location:** The Flomaton Natural Area is located in south-central Alabama. It is within the city limits of Flomaton and near the Florida border. It is 1/2 mile east of the intersection of Alabama Highway 113 with U.S. Highways 31 and 29. The Flomaton Natural Area is open to visitors. There is a parking area located just north of the highway on the east side of the forest. It is in the vicinity of several large blocks of public lands currently engaged in applying fuel treatments for longleaf pine restoration including: Eglin Air Force Base, Blackwater River State Forest, and Apalachicola National Forest.



Blackwater River State Forest, Eglin Air Force Base, and Apalachicola National Forest

**Photo on the left:** Aerial photograph of the stand taken in 1993. The gaps that existed in the 1950's photograph were filled in by other southern pine species and several hardwood species.

**Photo on the right:** Ground level view of the FNA taken in 1993 prior to the reintroduction of fire and restoration efforts. It is believed that this was taken from the same vantage point as the picture above it. The stand had a mid-story dominated by hardwood species and an understory dominated by shrub and woody vine species.

## THE FUEL PROBLEM

The re-introduction of fire posed a problem because years of ground level fuel accumulations increased the possibility of burn conditions that can be lethal to larger trees that are normally very fire resistant (see Fig 3). The absence of fire for 45 years allowed feeder roots to colonize the duff layer near the surface and thus be exposed to the heat of the slow moving surface fire and any subsequent residual smoldering combustion. The proximity of the stand to an US Interstate and US Highway and the urban interface further complicated efforts to re-introduce fire because of potential smoke problems.



The photo on the left was taken in the mid-1950's. Note the heavily stocked stand with numerous large trees typical of old-growth longleaf pine forests. The photo in the middle was taken in 1998, approximately 100 yards south of the 1950's photo. Notice the large opening (red arrow) with a heavy weedy midstory. This opening resulted from ignoring a small trash fire in May 1993. The fire killed 91% of the old-growth longleaf pine greater than 15 in. diameter at breast height (DBH) (photo on the right). One of those trees had a 36 in. DBH and was 340 years old. The fire had no impact on the hardwoods which were in the stand.

# The Joint Fire Science Program Demonstration Objectives for the Flomaton Natural Area are:

1. to develop a demonstration site on the Flomaton Natural Area
2. to conduct post fire environmental monitoring of overstory mortality, litter depth, understory plant and animal communities, and soil nutrients
3. to construct an interpretative trail with supporting educational materials for use on site
4. to develop an educational guide book for use in the schools of the local community



**Photo on the left:** Prescribed fire was re-introduced to the stand in 1995 and was burned again in 1996, 1997, 2001, and 2003. A very conservative prescription calling for a high duff moisture level and vigorous post fire mop-up and wetting around the base of trees was employed (**middle photo**). **Photo on the right:** The Flomaton Natural Area after four prescribed fires and a mechanical fuelwood operation.

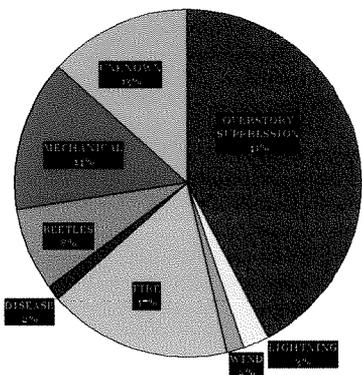
## Current Situation:

Fuel management on the site (repeated prescribed burns and some mechanical treatment) has been successful. Native ground cover understory species are returning. Before restoration efforts, only 1 herbaceous plant and no native grasses were present. As of autumn 2002, 33 herbaceous species and 6 native grasses have been observed in the stand. Longleaf pine mortality following three prescribed fires and fuelwood removal has been substantial, especially in the lowest diameter classes. Annual mortality for all longleaf pine over the study period averaged 4.2%; and 100% for all sampled trees below 3.0 in. DBH (see Fig. 1).

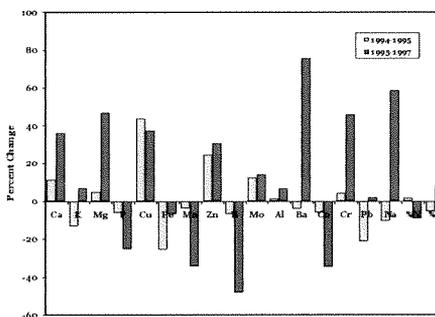
In December 2002, soil samples were collected for analysis of micro and macronutrients. These results will be compared with data collected in 1994 (pre-burn) and 1997 (see Fig. 2). The stand was prescribed burned on February 24, 2003 and the soils will be resampled in March 2003.

Ground cover vegetation and litter samples were collected in December 2002 to determine current fuel conditions. Ground cover vegetation is separated into three categories, small woody seedlings, vines, and herbaceous vegetation. The litter layer is separated into three categories, litter, fine litter, and humus. These data will be compared with 1994 and 1997 data.

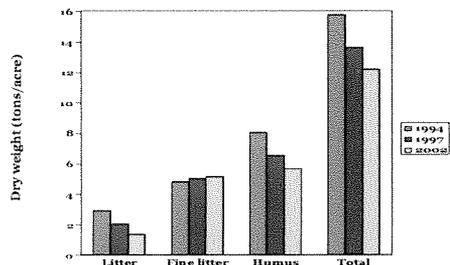
The site now offers numerous demonstration and educational opportunities for land managers, land and the public. Signs have been designed and built for the interpretive trail. They will be placed up this spring. A draft guidebook has been developed based on the information used for the interpretive trial. Educational material and lesson plans for schools will be available as a link on the web site for the Longleaf Alliance which is: [www.longleafalliance.org](http://www.longleafalliance.org).



**Fig 1: Causes of longleaf pine mortality in the Flomaton Natural Area 1993-1997.**



**Fig 2: Soil elemental dynamics** following 4 years of restoration at the Flomaton Natural Area were dramatic. All elements measured, except potassium (K), nitrogen (N), and carbon (C) have been significantly changed (t-test,  $\alpha = 0.05$ ). Strong increases (> 40%) have been observed in copper (Cu), barium (Ba), zinc (Zn), magnesium (Mg), calcium (Ca), and chromium (Cr). Losses have been the greatest (> 30%) in boron (B), cobalt (Co), and manganese (Mn). For several elements, responses have been variable, that is they increased after the first fire, then decreased after the third.



**Fig 3: Change in dry weights of the litter, fine litter and humus layers in the Flomaton Natural Area.** The graph to the left illustrates the dynamics in the ground level fuels in the Flomaton Natural Area. The 1994 data was taken just prior to restoration efforts. The 1997 data was collected after two prescribed fires and a fuelwood operation removing most of the hardwood midstory and understory. The dry weight of the surface litter layer has decreased by nearly 23% since the start of restoration efforts with the highest percentage loss occurring in the litter layer, just over 53%. There was nearly 4 tons/acre of aerial fuels prior to the re-introduction of fire in 1995.

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