Project Title: The Flomaton Natural Area (FNA): The benefits of returning fire to an old-growth longleaf pine ecosystem.

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Duration of Project: 3 years of post-fire monitoring and development of technology transfer and educational materials. Site would continue as permanent demonstration site.

Annual Funding Requested from the Joint Fire Science Program: (see total funding)
Total Funding Requested from the Joint Fire Science Program: $ 50,000

Total Value of In-kind and Financial Contributions: In-kind $250,000, financial $30,000

Abstract: Only a few fragments of remnant virgin, old growth longleaf pine stands remain in the Southeast, mostly hidden from easy viewing by the general public. One of the few remaining stands in private ownership is the Flomaton Natural Area; a 25 ha stand located in Escambia County, Alabama. The site is located within the city limits of Flomaton and is in close proximity to several landscape level longleaf restoration efforts now underway on nearby public lands. With a state highway passing through the stand, this relatively small site provides a unique and highly visible opportunity to demonstrate the risks of fire exclusion and the benefits of regular prescribed fire for managing fire adapted ecosystems. It also provides the opportunity to demonstrate the economic and ecological benefits of longleaf pine regeneration for private landowners. This stand of 200+ year-old trees was burned regularly up until 1950 when all burning and fuel management ceased. Since 1995, the careful application of four prescribed fires by cooperating partners has greatly reduced the 45 years of unnatural fuel accumulations and the associated risk of wildfire. The site has also been opened for recovery of its understory structure and associated plant and wildlife components. Post fire environmental monitoring and the development of interpretative materials are now needed to fully capitalize the demonstration value of this site.

Signatures:
Principal Investigators ______________________ Date:

Cooperating federal institution ______________________ Date:
Project Leader SRS4105
USDA Forest Service, Auburn, AL
INTRODUCTION

1) Project Justification: Prior to European settlement, forested savannas dominated by longleaf pine (*Pinus palustris* Mill.) blanketed an estimated 37 million hectares in the southeastern United States. These forests, termed “savannas” for their open, park-like nature, were swept by fire once every 1-10 years (Christensen 1981) and were home to the most diverse herbaceous layer in temperate North America. Due to fire suppression, expansion of agriculture, and site conversion, longleaf forests exist today on less than 3% of their former range (Frost 1993). A 1995 U.S. Biological Survey Report listed the longleaf pine forest as the third most endangered ecosystem in the United States (Noss et al. 1995). Old-growth longleaf pine forests are even more imperiled, covering less than 4,000 hectares, or 0.0001% of their former range (Means 1995).

Numerous state, and federal land managers have recently undertaken ecological restoration in the longleaf pine forests of the southeastern United States. Many private landowners are also beginning to plant longleaf pine because of the economic returns as well as a rising awareness of the rich cultural heritage associated with longleaf pine ecosystems. Scientists and managers need more information on how to apply prescribed fire to reduce unnatural fuel accumulations. The general public needs a better understanding of the role of fire in the sustainable management of longleaf pine ecosystems in order to understand and support agency resource management plans and associated fuel/ fire management programs. Strategically located demonstration sites and interpretative materials are needed to facilitate this process of education.

2) Project Objectives:
   a. To develop a demonstration site on the Flomaton Natural Area
   b. To conduct post fire environmental monitoring of overstory morality, litter depth, understory plant and animal communities, and soil nutrients.
   c. To construct an interpretative trail with supporting educational materials for use on site.
   d. To develop an educational guide book for use in the schools of the local community

3) Background: The impacts of ecological restoration on longleaf pine forests are being studied in the Flomaton Natural Area (FMA) in Escambia County, Alabama. The FMA is a 25-hectare virgin longleaf pine stand that was protected from fire for >45 years. In 1993, an agreement was signed among Champion International Corporation (now International Paper), owner of the stand, Auburn University School of Forestry, the Southern Research Station of the U.S. Department of Agriculture Forest Service, The Nature Conservancy, the Alabama Forestry Commission, and the Alabama Natural Heritage Trust of the Alabama Department of Conservation and Natural Resources for cooperative work. Efforts are underway to restore, monitor, and manage the 25-hectare stand as an old-growth longleaf pine ecosystem.
The re-introduction of fire posed a problem because fuel accumulations increased the possibility of burn conditions that can be lethal even to the larger trees that are normally very fire resistant. 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. Fires that consume this layer will damage root systems and result in the death of overstory trees even if the fire is of low intensity and produces little to no visible crown scorch. In an effort to minimize this potential damage with the re-introduction of fire, prescriptions were prepared which called for exacting fuel moisture and meteorological conditions, the sequential application of fire to portions of the site, and the extensive mop-up and watering of duff layers near the base of mature trees. Restoration planning of the Flomaton Natural Area using prescribed fire began in 1993. The first prescribed fire was conducted in 1995. Subsequent prescribed burns were conducted in 1996, 1997 and 2001. In April-May, 1996, a mechanical fuelwood operation to remove mid-story hardwoods was conducted. The contractors removed 1350 tons of hardwood chips and inflicted very little damage to the residual stand.

Several publications describing the site, the restoration goals and process, and early findings have been published (Kush and Meldahl 2000a and b, Varner et al1999, Kush 1999)

Relevance to Task 1: Develop demonstration sites in various ecosystems across the United States that can serve to illustrate various fuels treatment practices or techniques, their cost-effectiveness, and/or environmental effects.

Since the Flomaton Natural Area is designated as a “Special Places” site by the International Paper Corp. Program”, the stand will be accessible to the public and researchers for an indeterminate time-period. At the present time, the site demonstrates three aspects of fuel treatments.

a. The first is a result of the sequential restoration process that has been on going for 6 years. This has included spring and winter burning and a mechanical fuelwood (midstory removal) operation.

b. The second area demonstrates the effects of no fire treatment for 50 years with draped fuels and a thick litter layer. ???????

c. The third area demonstrates what happens when a wild-fire occurs to a fire-dependent ecosystem subject to fire suppression for many years. Every longleaf pine over 100 years old was killed in a xha portion of the site from a 19xx wildfire. All that remains are the standing snags.

Data on the overstory, mid-story, ground layer and soils have been collected from the three areas. The area undergoing restoration was re-inventoried in 2000 to determine the fire effects to the longleaf pine overstory.
Longleaf pine remains the dominant species in the Flomaton stand based on the density and the basal area of the overstory trees. Unless restoration efforts are continue, the stand will eventually convert into a mixed hardwood stand dominated by oaks. This succession may be a gradual process or it may happen rapidly through some type of catastrophic event, such as an uncontrolled fire or windstorm. Without fire, dense undergrowth of broad-leaved species develops preventing longleaf pine regeneration.

MATERIALS AND METHODS
The FMA is located within the city limits of Flomaton, AL in the south-central part of Escambia County, Alabama. U.S. Highways 31 and 29 separate the stand into two sections. The site is located just 12 miles south of Interstate 65 making it very accessible for demonstration objectives. The US Forest Service 3,000 acre longleaf pine experimental forest (Escambia Experimental Forest) is nearby. The Auburn University Solon Dixon Forestry Education Center is within 50 miles. Within 150 miles, several landscape level longleaf ecosystem restoration projects are ongoing on state and federal lands (Blackwater State Forest, FL; Conecuh National Forest, AL; Eglin Air Force Base, FL.)

A five-year extension of a memorandum of understanding among the cooperating partners to share in-kind resources was established in January 2000.

The FMA will serve as a living laboratory and will be the basis for outdoor and indoor classroom instructional materials. There will be two components to this demonstration project: 1. Environmental Monitoring and 2. Technology Transfer.

The monitoring component will include overstory, understory and soil monitoring. Although the site is relatively small, wildlife monitoring for the return of critical wildlife species such as gopher tortoise, Red-cockaded Woodpecker, and Bachmans Sparrow will also be noted. Plot centers have been established throughout the entire tract on a 60 m by 80 m grid with plot centers located at least 30 m from the edge of the old-growth tract. Each plot is circular, enclosing an area of 0.08 ha (radius = 16.05 m). Data recorded for every tree or shrub (>1.25 cm DBH) on each plot includes: tree number, azimuth and distance from plot center, diameter at breast height (DBH) of live trees and standing snags, crown position in the tree canopy, crown height, total height, and litter depth at the base of each tree. Small woody tree seedlings, and shrubs are monitored by 0.3 m height classes. Four, 1.42 m² quadrants per plot have been staked off and ground cover vegetation surveyed quarterly for presence and relative abundance. Ground cover vegetation is separated into three categories, small woody seedlings, vines, and herbaceous vegetation. Soil samples are monitored for micro and macronutrients by inductively coupled plasma (ICP) spectrometry, and for carbon and nitrogen by C/N analyzer.

The technology transfer component is described below (under technology transfer)
PROJECT DURATION
Three years of post-fire environmental monitoring and the development of technology transfer and educational materials will be undertaken. The site would continue to be maintained as a permanent demonstration site.

BUDGET

DELIVERABLES
Research findings related to post fire monitoring and effects on overstory mortality, understory plant community dynamics and fire impacts on soil nutrients will be reported at the 4th Regional Longleaf Alliance Conference tentatively scheduled for the fall of 2002. Technology transfer deliverables are described below.

TECHNOLOGY TRANSFER
The technology transfer component will include:

a. The construction of an interpretive trail through the site. Signs will be erected throughout the stand explaining various aspects about the dynamics of the stand, the role fire plays in the longleaf pine ecosystem; the process of restoring an ecosystem; the ecological and economic values of longleaf pine ecosystems; and the community based effort involved in the on-going restoration process.

b. The production of an interpretative guidebook for the site. This guidebook will elaborate on what is observed in the stand. It would be used in a classroom setting and for groups interested in visiting the site to learn more about longleaf pine, fire ecology and ecological restoration.

c. The construction of a web site that would provide lessons for classrooms about fire, fire suppression and longleaf pine and an on-going restoration project. This will be conducted with the consultation of schoolteachers. Initially, it will be directed at three levels of education, for elementary, middle, and high school students. In addition, it will provide links to other groups and organizations that have some association to longleaf pine ecosystems such as the Longleaf Alliance.
QUALIFICATION OF INVESTIGATORS

John S. Kush, Senior Research Associate and Ph.D candidate, Auburn University School of Forestry and Wildlife sciences. For seven years he has been the lead researcher and project coordinator for Flomaton Natural Area restoration project. Over 15 years experience in the field of ecology and management of longleaf pine ecosystems, including the use of fire and the effects of fire on plant community dynamics.

Ralph S. Meldahl, Associate Professor, Auburn University School of Forestry and Wildlife Sciences. Over 15 years experience in the field of longleaf pine stand dynamics, the modeling of growth, yield and mortality. PI on Longleaf Pine regeneration and restoration projects with the USDA Forest Service, Fort McClelland, and Eglin Air Force Base.

Charles K. McMahon, USDA Forest Service, Research Project leader, Auburn AL. Fourteen years experience as research leader of the Forest Vegetation Management and Longleaf Pine research unit in Auburn, AL and 14 years experience as unit leader of the Combustion processes in Wildland Fuels research unit at the Macon, GA fire laboratory.

LITERATURE CITED this needs major editing


