

Stateline Meeting Louisiana and Mississippi Related Research Examples

Issue Area – Fire/Prescribed Fire

Managing smoke at the wild-land urban interface.

<http://www.srs.fs.usda.gov/pubs/28550>



When prescribed burning is conducted at the wildland-urban interface (WUI), the smoke that is produced can sometimes inconvenience people, but it can also cause more serious health and safety problems. The public is unlikely to continue to tolerate the use of prescribed fire, regardless of the benefits, if burn managers cannot keep smoke out of smoke-sensitive areas. In the South, forest management organizations commonly require that plans for prescribed burns pass a smoke screening review and some States require such a review before they will authorize a burn.

Current screening systems, however, do not incorporate criteria for use at the WUI. This guide describes modifications to the Southern Smoke Screening System for burns at the WUI. These modifications couple new research findings with the collective experience of burners who have extensively used the 1976 Southern Smoke Screening System. This new smoke screening system is designed for use on burns less than 50 acres in size and has undergone several years of successful field testing in Florida.

Southern forestry smoke management guidebook.

<http://www.srs.fs.usda.gov/pubs/viewpub.php?index=683>

A system for predicting and modifying smoke concentrations from prescription fires is introduced. While limited to particulate matter and the more typical southern fuels, the system is for both simple and complex applications. Forestry smoke constituents, variables affecting smoke production and dispersion, and new methods for estimating available fuel are presented.

Forest fires and smoke – impacts on air quality and human health in the US.

<http://www.srs.fs.usda.gov/pubs/1000>

Scientific and regulatory interest in the air quality impacts of forest fire smoke (both prescribed and wildfires) followed the implementation of the 1970 Clean Air Act amendments. Attention on forest fires became more focused as a series of new amendments were enacted to protect the air quality and visibility of "natural" areas; and as the particulate matter air quality standards on "inhalable" and "respirable" particles were tightened, Forest fires have been shown to be a significant source of these small particles. Resource managers are adapting to these regulations by adopting Smoke Management strategies which include sophisticated decision support systems. Currently, the Environmental Protection Agency (EPA) (with public & private input) is developing a natural "Wildland Fire/Air Quality" policy which attempts to integrate two public policy goals (1) to allow fire to function its natural role to maintain healthy ecosystems and (2) to protect public health and welfare by mitigating smoke impacts

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Ecological, political and social challenges of prescribed fire restoration in east Texas pineywoods ecosystem: a case study.

<http://www.srs.fs.usda.gov/pubs/5434>

The effectiveness of prescribed fire restoration of forested sites in three state parks in east Texas, USA was studied. Two sites consisted of mixed shortleaf (*Pinus echinata* Mill.) or loblolly pine (*Pinus taeda* L.) and broadleaf overstoreys. The third site was a longleaf pine (*Pinus palustris* Mill.)/little bluestem (*Schizachyrium scoparium* (Michx.) Nash.) stand. Mid- and understoreys at all sites consisted of a variety of shrubs and herbaceous vegetation.

Prolonged drought resulting in county burn bans prohibited burning until immediately after rain events. Results indicated no effect from the burns in the overstorey, seedling, shrub or herbaceous layers at any park. At two sites, there was a significant increase in the percentage of dead standing saplings in the burn plots from pre- to post-burn. The only significant decreases in fuels were in the weight and depth of combined Oi and Oe horizons (litter).

Compliance with burn bans greatly reduced the restorative powers of the burns. Park visitors' attitudes concerning fire were also examined, indicating a need for education concerning differences between wildfire and prescribed fire, and benefits of prescribed fire.

Population growth and the decline of natural Southern yellow pine forests.

<http://www.srs.fs.usda.gov/pubs/9734>

Population growth has created social and economic pressures that affect the sustainability of naturally regenerated southern yellow pine forests. Major causes of this decline include (1) a shift in public attitudes regarding woods burning (from one favoring it to one that favors fire suppression) and (2) an increase in land values (especially near urban centers).

The increase in land values reduces the chance of farmland abandonment, which was common in the first half of the 20th century. Abandoned farmlands provided many of the sites for the naturally regenerated pine stands that are being harvested today. Also, higher land values and higher taxes put pressure on landowners to subdivide their land for development or to establish more profitable tree plantations.

These population-related factors and outbreaks of the southern pine bark beetle have resulted in a decline in naturally regenerated southern pines of more than 38 million acres since 1953. As population pressures reduce the incidence of wildfire, prescribed burning, and the abandonment of old fields, the decline in naturally regenerated southern yellow pine will continue. By 2030, only 23 million acres of natural southern yellow pine may remain.

Issue Area – Biomass

Comparisons of two methods of harvesting biomass for energy.

<http://www.srs.fs.usda.gov/pubs/7383>



Two harvesting methods for utilization of understory biomass were tested against a conventional harvesting method to determine relative costs. The conventional harvesting method tested removed all pine 6 inches diameter at breast height (DBH) and larger and hardwood sawlogs as tree length logs.

The two intensive harvesting methods were a one-pass and a two-pass method. In the one-pass method, all material 1 inch DBH and larger was simultaneously

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harvested. Pines 1 to 6 inches DBH and hardwoods 11 inches DBH and less were chipped for energy wood and all other stems were logged tree length. With the two-pass method, the energy wood (same description as in the one-pass) was harvested in a first pass through the stand, and the commercial size wood being removed as tree length logs was harvested in a second pass.

The conventional harvesting system recovery averaged 52 percent of the standing biomass while the one-pass and two-pass methods recovery averaged 85 percent and 76 percent of the standing biomass, respectively. The conventional system had an average harvesting cost of \$8.75 per green ton onto the log truck while the one-pass and two-pass methods had average costs onto log trucks and chip vans of \$7.60 and \$8.85 per green ton. Both the one-pass and two-pass methods produced energy chips into vans at a cost which was well below the value of the material as a fuel source at the mill.

Alternate biomass harvesting systems using conventional equipment.

<http://www.srs.fs.usda.gov/pubs/7352>

Three harvesting methods were field tested in two stand types. Costs and stand utilization rates were developed for a conventional harvesting system, without energy wood recovery; a two-pass roundwood and energy wood system; and a one-pass system that harvests roundwood and energy wood. The systems harvested 20-acre test blocks in two pine pulpwood plantations and in a natural pine sawtimber stand. The one-pass method resulted in the least cost and better utilization of biomass residue.

Biomass removal and its effects on productivity of an artificially regenerated forest stand in the Missouri Ozarks.

<http://www.srs.fs.usda.gov/pubs/27817>

Intensive harvesting, which removes a greater proportion of the forest biomass than conventional harvesting and the associated nutrients, may cause a decline in forest productivity.

Planted seedling response to three biomass removal levels (1. removal of boles only=OM1, 2. all surface organic matter removed, forest floor not removed=OM2, and 3. removal of all surface vegetation plus forest floor = OM3) was examined in one of the Forest Service Long-Term Soil Productivity (LTSP) research studies located in the Missouri Ozarks. Before harvesting, the study area contained a mature upland oak-hickory (*Quercus-Carya* spp.) forest with some oak-pine (*Quercus* spp.-*Pinus echinata* Mill.) communities. Soil nutrient concentrations at one year and eight years later were compared with soil nutrient concentrations in uncut control plots.

Survival of red oak, white oak, and shortleaf pine seedlings increased with increasing levels of surface organic matter removal. Mean height for red and white oaks was significantly ($p \leq 0.05$) greater for OM1 and OM2 plots than for OM3 plots. Mean diameter at breast height (dbh) was significantly less for OM1 plots than for OM3 plots. Mean height for shortleaf pine was not significantly affected by biomass removal treatments but dbh was. Overall, measurements of tree growth after nine growing seasons and soil and leaf chemistry indicated that site productivity has not been impaired by the removal of surface organic matter.

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Estimates of biomass in logging residue and standing residual inventory following tree-harvest activity on timberland acres in the southern region.

<http://www.srs.fs.usda.gov/pubs/37392>

This report provides estimates of biomass (green tons) in logging residue and standing residual inventory on timberland acres with evidence of tree cutting. Biomass as defined by Forest Inventory and Analysis is the aboveground dry weight of wood in the bole and limbs of live trees \geq 1-inch diameter at breast height (d.b.h.), and excludes tree foliage, seedlings, and understory vegetation.

Total timberland area with evidence of tree cutting averaged just over 6.0 million acres per year for all 13 Southern States over a 14-year period from 1994 to 2008. Final harvest was the primary type of cutting and averaged almost 2.3 million acres. Partial harvest and commercial thinning accounted for 1.8 million acres, and 1.7 million acres, respectively.

As a result of annual tree cutting of all types in all 13 Southern States, a total of > 737 million green tons of residual biomass in standing live trees remained after harvesting. Of that volume, biomass in all-live residual inventory trees (\geq 1.0-inch d.b.h.) on final harvest acres amounted to nearly 457 million green tons. Biomass in rough and rotten trees from all other cutting combined totaled just over 280 million green tons. If recovered, this material could be used to help supply a biofuels industry in the South.

Issue Area – Forest Health

A field guide for the identification of invasive plants of southern forests.

<http://www.srs.fs.usda.gov/pubs/35292>



Invasions of nonnative plants into forests of the Southern United States continue to go unchecked and unmonitored. Invasive nonnative plants infest under and beside forest canopies and dominate small forest openings, increasingly eroding forest productivity, hindering forest use and management activities, and degrading diversity and wildlife habitat. Often called nonnative, exotic, nonindigenous, alien, or noxious weeds, they occur as trees, shrubs, vines, grasses, ferns, and forbs.

This book provides information on accurate identification of the 56 nonnative plants and groups that are currently invading the forests of the 13 Southern States, showing both growing and dormant season traits, and lists other nonnative plants of growing concern.

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A management guide for invasive plants in southern forests.

<http://www.srs.fs.usda.gov/pubs/36915>

Invasions of nonnative plants into forests of the Southern United States continue to spread and include new species, increasingly eroding forest productivity, hindering forest use and management activities, and degrading diversity and wildlife habitat.

This book provides the latest information on how to organize and enact prevention programs, build strategies, implement integrated procedures for management, and proceed towards site rehabilitation and restoration. Effective control prescriptions are provided for 56 nonnative plants and groups currently invading the forests of the 13 Southern States. A companion book, “A Field Guide for the Identification of Invasive Plants in Southern Forests,” (Miller and others 2010) includes information and images for accurate identification of these invasive plants.

Southern pine beetle regional outbreaks modeled on landscape, climate and infestation history.

<http://www.srs.fs.usda.gov/pubs/37411>

The southern pine beetle (*Dendroctonus frontalis*, SPB) is the major insect pest of pine species in the southeastern United States. It attains outbreak population levels sufficient to mass attack host pines across the landscape at scales ranging from a single forest stand to interstate epidemics. This county level analysis selected and examined the best climatic and landscape variables for predicting infestations at regional scales. The analysis showed that, for a given county, the most important factor in predicting outbreaks was that the county was classified as in outbreak status in the previous year.

Other important factors included minimum winter temperature and the greatest difference between the average of daily minimums and a subsequent low temperature point, precipitation history either seasonally in the previous year or difference from average over the previous 2 years, the synchronizing effect of seasonal temperatures on beetle populations and the relative percentage of total forest area composed of host species. The statistical models showed that climatic variables are stronger indicators of outbreak likelihood than landscape structure and cover variables.

Average climatic conditions were more likely to lead to outbreaks than extreme conditions, supporting the notion of coupling between a native insect and its native host. Still, some extreme events (i.e., periods of very low temperature or very high precipitation) did precede beetle infestation. This analysis suggested that there are predisposing and inciting factors at the large scale but the driving factors leading to individual infestations operate at smaller scales.

Issue Area – Forest Sustainability

Fragmentation.

<http://www.srs.fs.usda.gov/pubs/36773>



Effective resource management takes into account the administrative and biophysical settings within which natural resources occur. A setting may be described in many ways; for example, by forest land ownership, by reserved and roadless designation, or by the distribution of human populations in relation to forest (chapter 3).

The physical arrangement of forest in a landscape—popularly referred as “forest fragmentation”—is another aspect of setting. The Forest Service

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(2004) used high-resolution satellite imagery to answer the question of how much forest land experiences different types and degrees of fragmentation. This section summarizes an assessment of landscape “context”—an aspect of setting that describes the proximate causes of fragmentation and thus indicates the types of risk associated with fragmentation.

Defining conservation priorities using fragmentation forecasts.

<http://www.srs.fs.usda.gov/pubs/21390>

Methods are developed for forecasting the effects of population and economic growth on the distribution of interior forest habitat. An application to the southeastern United States shows that models provide significant explanatory power with regard to the observed distribution of interior forest. Estimates for economic and biophysical variables are significant and consistent with theory. Forecasts of interior forest based on the population and economic growth projected for the region are displayed by ecological section and province and by metropolitan statistical area (MSA). Loss of interior forests is expected to be especially high in certain ecological sections, including the southern Appalachian Piedmont in North and South Carolina, the Gulf prairies and marshes in Texas, and the Florida coastal lowlands.

Sixty-six percent of loss of interior forests will be in urban counties, which highlights the conservation importance of the urbanizing fringe of several cities. Among the ten MSAs that will lose the most interior forest, seven are found in Florida. These forecasts provide a mechanism for assigning priorities and targeting areas for more detailed study and for conservation efforts

Fragmentation of continental United States forests.

<http://www.srs.fs.usda.gov/pubs/5196>

We report a multiple-scale analysis of forest fragmentation based on 30-m (0.09 ha pixel-1) land-cover maps for the conterminous United States. Each 0.09-ha unit of forest was classified according to fragmentation indexes measured within the surrounding landscape, for five landscape sizes including 2.25, 7.29, 65.61, 590.49, and 5314.41 ha.

Most forest is found in fragmented landscapes. With 65.61-ha landscapes, for example, only 9.9% of all forest was contained in a fully forested landscape, and only 46.9% was in a landscape that was more than 90% forested. Overall, 43.5% of forest was located within 90 m of forest edge and 61.8% of forest was located within 150 m of forest edge. Nevertheless, where forest existed, it was usually dominant—at least 72.9% of all forest was in landscapes that were at least 60% forested for all landscape sizes.

Small (less than 7.29 ha) perforations in otherwise continuous forest cover accounted for about half of the fragmentation. These results suggest that forests are connected over large regions, but fragmentation is so pervasive that edge effects potentially influence ecological processes on most forested lands.

Characterizing Virginia’s private forest owners and their forest lands.

<http://www.srs.fs.usda.gov/pubs/1336>

A recently completed forest inventory and two woodland owner surveys have given us insight about the owners of private forest lands in Virginia. There is increasing parcelization of forested lands and an increase in the number of nonindustrial private (NIPF) landowners in Virginia. More than half of the private owners have harvested timber from their holdings at some time in the past, and they control three-quarters of the private forest. Owners have a positive attitude toward timber cutting at a time when there is greater demand for products from the forest. In terms of decision making, private forest owners have control over marketed and non-marketed commodities. This situation needs monitoring to maintain good stewardship for future generations.

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Issue Area – Silviculture

Longleaf Pine: A sustainable approach for increasing terrestrial carbon in the southern US.

<http://www.srs.fs.usda.gov/pubs/20395>



Natural communities dominated by longleaf pine (*Pinus palustris* Mill.) once covered an estimated two thirds of the forested area in the southeastern United States. Today, less than 1.2 million ha remain.

However, over the past 10-15 years, public land managers have begun to restore many longleaf pine forests. More recently incentive programs have prompted reforestation and afforestation programs on non-industrial private lands.

These activities have been facilitated by improved longleaf regeneration technology and by expanded educational and outreach efforts. In the South, there is also a growing trend towards longer rotations due to changes in wood/fiber markets

and prices. These trends suggest a new strategy to increase terrestrial carbon storage in the southeastern United States in a way that provides many simultaneous ecological and economic benefits.

For example, longleaf pine is a long-lived species with a low mortality rate. Among the southern pine species, it has a high specific gravity and can tolerate a wide variety of habitats. Longleaf pine is better able to sustain growth at older ages (over 150 years) and is tolerant to fire and many insects and diseases. Recent research also indicates that longleaf pine managed for longer rotations outperforms other commercial southern pine species on most sites and might better adapt to future climate scenarios with higher temperatures and higher atmospheric CO₂ levels. Moreover, the higher-value, longer-lasting wood products derived from longleaf pine forests will continue to store carbon over long time periods.

Longleaf pine agroforestry.

<http://www.srs.fs.usda.gov/pubs/41379>

While ecosystem restoration of longleaf pine (*Pinus palustris* Mill.) forests represents a worthy ideal, it is not always a practical alternative for landowners. Agroforestry systems, which can be developed in existing agricultural land, natural forest stands, plantations, or pasturelands, offer the opportunity to provide multiple benefits: high value timber production, continual agricultural production, and improved wildlife habitat when compared to agricultural land.

The possibilities for multiple income sources associated with agroforestry are plentiful and, for forest landowners, may mean the difference between profit and loss in times of commodity price fluctuations. Agroforestry can provide a range of income alternatives, including agricultural products, wildlife, medicinal plants, mushrooms, carbon credits, pine straw or biofuels, providing landowners with a stable income until the trees become merchantable. We discuss alternative income possibilities and the necessity to locate and secure dependable markets to supply a steady cash flow for forest landowners.

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Longleaf pine plantations: Growth and yield modeling in an ecosystem restoration context.

<http://www.srs.fs.usda.gov/pubs/2479>

Restoration of longleaf pine within its historical range is actively conducted by private individuals and public agencies due to the inherent beauty of the ecosystem and the suitability as habitat for red cockaded woodpeckers and other wildlife. Managers of land restored to longleaf pine desire models that will allow long-term projections to facilitate management decisions.

Managers of restored ecosystems typically desire to predict the dynamics of more than just the trees; understory vegetation, wildlife, fuels, and the effects of fire are pertinent to managers of longleaf pine. Modeling a rare ecosystem is hindered due to inadequate data covering a range of conditions and ages.

Typically, plantations do not exist that approach the planned rotation age. Thus, any forest model will typically be greatly extrapolated. New diagnostics are described that suggest suitability of a model for extrapolation. These diagnostics may also be used as general goodness of fit diagnostics. If data from old plantations are lacking, older natural stands may be used to supplement the data.

A whole stand growth and yield system for young longleaf pine plantations in the SW Georgia.

<http://www.srs.fs.usda.gov/pubs/23404>

A whole stand growth and yield system for planted longleaf pine (*Pinus palustris* Mill.) was developed from permanent plot data collected annually over an 8 year period. The dataset consists of 12 intensively-managed longleaf pine plantations that are located in Lee, Worth, Mitchell, and Baker counties in southwest Georgia. Stand survival, dominant height, basal area, and cubic foot volume yield models were developed and incorporated in a computer growth and yield simulator. Model prediction error remained low across a variety of planting densities.

Growth and Yield Predictions for thinned stands of even-aged natural Longleaf Pine.

<http://www.srs.fs.usda.gov/pubs/604>

This paper presents a system of equations and resulting tables that can predict stand volumes for thinned natural longleaf pine. The system can predict current and future total stand volume in cubic feet and merchantable stand volume in cubic feet, cords, and board feet. The system also provides for estimating dry-weight production of wood. The system uses input data on present and future age, site index, and present basal area. By using the tables, the timber grower can predict volume production for a variety of initial stand conditions, thinning regimes, and rotation lengths.

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Issue Area – Water

Effectiveness of BMP's for sediment reduction at operation forest stream crossings.

<http://www.srs.fs.usda.gov/pubs/44372>



Temporary skid trail stream crossings have repeatedly been identified as having considerable potential to introduce sediment to streams. Forestry Best Management Practices (BMPs) have proven to be effective for controlling erosion and subsequent sedimentation, yet few studies have quantified sedimentation associated with various levels of BMPs for skidder stream crossings.

Three skid trail stream crossing BMP treatments were installed and replicated three times to quantify BMP efficacy for reducing sedimentation. BMP treatments were: (1) slash, (2) mulch and grass seed, and (3) mulch, grass seed, and silt fence. Water samples were collected daily both upstream and downstream from operational

skidder stream crossings for one year following timber harvesting and BMP treatment installation.

Samples were evaluated for total suspended solids (TSSs). Results indicate that both slash and mulch treatments effectively reduced TSS following harvesting. Slash could be the preferred method of stream crossing closure, due to lower cost, especially if application is incorporated into logging operations. However, if slash was being utilized for biomass and was not available, seed and mulch is a viable option for stream crossing closure. The mulch, seed, and silt fence treatment was the most expensive treatment and led to increased TSS, probably due to silt fence installation disturbances near the streams. Thus, silt fences should not be installed directly adjacent to stream banks, if other alternatives exist.

Interactions of woody biofuel feedstock production systems with water resources:

Considerations for sustainability

<http://www.srs.fs.usda.gov/pubs/31630>

Water resources are important for the production of woody biofuel feedstocks. It is necessary to ensure that production systems do not adversely affect the quantity or quality of surface and ground water. The effects of woody biomass plantations on water resources are largely dependent on the prior land use and the management regime.

Experience from both irrigated and non-irrigated systems has demonstrated that woody biofuel production systems do not impair water quality. Water quality actually improves from conversion of idle or degraded agricultural lands to woody biomass plantations. Site water balance may be altered by cultivation of woody biomass plantations relative to agricultural use, due to increases in evapotranspiration (ET) and storage. Incorporation of woody biomass production plantations within the landscape provides an opportunity to improve the quality of runoff water and soil conservation. Given the centrality of water resources to the sustainability of ecosystem services and other values derived, the experience with woody biofuels feedstock production systems is positive.