

***Compass*—Summer 2000**
The Southern Research Station
Recent Publications Catalogue
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Fire—Power and Purposes, Light and Dark Sides

In the spring and early summer of 2000, lightning fires, human-caused fires, and escaped prescribed fires consumed thousands of acres of forest land and hundreds of homes. The Cerro Grande fire, initially a USDI National Park Service prescribed fire, burned over large portions of the Los Alamos National Laboratory. Non-quantifiable losses include trauma to people who have suffered physical and emotional injuries, lost companion animals, or experienced the destruction of a lifetime of personal treasures. Smoke and fire have destroyed wildlife and their habitat.

In Colorado, the Bobcat and High Meadow fires hit the foothills of the Rocky Mountains close to Denver, destroying more than 40 homes. At the urban-wildland interface—where people escape from the city to live closer to nature and further from each other—homes dot the forest like a mosaic. This pattern creates unique opportunities and challenges. For the people who live on the edge of wildlands, commuting to work and community activities results in longer drives, more expensive in time, fuel, and contributions to air pollution. County service providers find themselves trying to stretch the infrastructure to cover homes further and further away.

In June and early July, representatives of the USDA Forest Service Southern Research Station and the Southern Region met with people living and working in the wildland-urban interface to talk about the special issues that concern them. Focus group participants discussed sprawl, changing land use, and population growth in Volusia County, FL; Loudoun County, VA; Biloxi, MS; Houston, TX; Birmingham, AL; and White County, GA. To learn more, visit www.interfacesouth.org.

Fire evokes strong emotions, enhanced by personal and economic loss. But fire also serves forest sustainability. Many tree species depend on fire for regeneration, notably the longleaf pine. Some birds and wildlife need the open canopy and browse that fire creates. Fire retards the growth of vegetation that overtakes more desirable species. Prescribed fire—an ignited fire by management actions on a defined area for a specific purpose, taking into consideration weather and safety conditions and weighing fire behavior patterns—can promote safety by reducing fuel load or enhance productivity of certain tree species. A written, approved fire plan must exist, and NEPA requirements must be met prior to ignition. Barriers to using prescribed fire include air pollution, traffic hazards caused by smoke, and escaped wildfires.

In GTR SRS-37 **Influences on Prescribed Burning Activity and Costs in the National Forest System**, David A. Cleaves, Jorge Martinez, and Terry K. Haines relate the status of prescribed burning on the National Forest System. The authors examine the legal environment, rights and responsibilities of Federal agencies, costs, and anticipated burning levels on national forests for the next decade. The public and legislators are scrutinizing prescribed fire ever more closely as a source of air pollution, traffic hazards caused by smoke, and escaped wildfires. Considering the goal of burning 3 million acres of national forest land per year by the year 2010, incorporating research into land management decisions makes more sense than ever. The fire prescription provides natural resource managers with valuable on-the-ground technology transfer opportunities. To learn more about fire management and prescribed fire, check out these Web sites: www.fs.fed.us/fire; www.firelab.org; and www.nifc.gov. The latter site for the National Interagency Fire Center in Boise, ID includes a “fire info” page with a glossary of wildland fire terms.

Publications about fire in this issue of *Compass* include:

Boyer, William D.; **Long-term Effects of Biennial Prescribed Fires on the Growth of Longleaf Pine (1)**

Cleaves, David A.; Martinez, Jorge; Haines, Terry K.; **Influences on Prescribed Burning Activity and Costs in the National Forest System (34)**

Clinton, Barton D.; Vose, James M.; **Plant Succession and Community Restoration Following Felling and Burning in the Southern Appalachian Mountains (19)**

Vose, James M.; **Perspectives on Using Prescribed Fire to Achieve Desired Ecosystem Conditions (21)**

Forest Productivity

Forest productivity research builds upon our understanding of primary biological and physical processes—above ground and below ground—that occur in the forest. We need to know what governs these processes and to comprehend their role in forest productivity. Productivity research addresses water quality and quantity, habitat requirements for Neotropical migratory birds, availability of biomass, and growth predictions.

Restoring and maintaining forest health creates a tricky balancing act for public and private forest managers. USDA Forest Service, Research and Development scientists work within this challenging environment, providing both long-term research results and investigating issues and problems that develop in our evolving society. The publications listed below demonstrate the wide range of topics Southern Research Station scientists focus on to deliver information needed to manage forests, both on private lands and in the public trust of the National Forest System.

Cain, Michael D.; Shelton, Michael G.; **Revisiting the Relationship Between Common Weather Variables and Loblolly-shortleaf Pine Seed Crops in Natural Stands (2)**

Fettig, Christopher J.; Dalusky, Mark J.; Berisford, C. Wayne; **Nantucket Pine Tip Moth Phenology and Timing of Insecticide Spray Applications in Seven Southeastern States (4)**

Foster, G.S.; Stelzer, H.E.; McRae, J.B.; **Loblolly Pine Cutting Morphological Traits: Effects on Rooting and Field Performance (5)**

Gardiner, Emile S.; Russell, Jr., D. Ramsey; Hodges, John D.; Fristoe, T. Conner; **Impacts of Mechanical Tree Felling on Development of Water Tupelo Regeneration in the Mobile Delta, Alabama (15)**

Haywood, James D.; **Mulch and Hexazinone Herbicide Shorten the Time Longleaf Pine Seedlings Are in the Grass Stage and Increase Height Growth (8)**

Lemly, A. Dennis; Hilderbrand, Robert H.; **Influence of Large Woody Debris on Stream Insect Communities and Benthic Detritus (16)**

Perry, Roger W.; Thill, Ronald E.; Peitz, David G.; Tappe, Philip A.; **Effects of Different Silvicultural Systems on Initial Soft Mast Production (22)**

Prestemon, Jeffrey P.; Buongiorno, Joseph; **Determinants of Tree Quality and Lumber Value in Natural Uneven-aged Southern Pine Stands (10)**

Shelton, Michael G.; Cain, Michael D.; **Regenerating Uneven-aged Stands of Loblolly and Shortleaf Pines: The Current State of Knowledge (11)**

Vozzo, J.A., Ph.D.; Patel, Ramesh, M.D.; Terrel, Allen, C.R.T.; **Determinacion de la viabilidad de las semillas de *Juglans nigra* a traves de imagenes obtenidas usando Tomografia Computarizada y Resonancia Magnetica (38)**

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Southern Pines

Boyer, William D. 2000. **Long-term effects of biennial prescribed fires on the growth of longleaf pine.** In: Moser, W. Keith; Moser, Cynthia F., eds. Fire and forest ecology: innovative silviculture and vegetation management; Tall Timbers fire ecology conference proceedings, no. 21; 1998 April 14-16; Tallahassee, FL. Tallahassee, FL: Tall Timbers Research Station: 18-21.

The effects of several hardwood control treatments on understory succession and overstory growth have been followed for 22 years on a Coastal Plain site in southwest Alabama. The study began in 1973, with 12 treatment combinations in 14-year-old naturally established longleaf pine (*Pinus palustris*) thinned to about 1,236 stems per hectare (500 stems per acre). Four burning treatments, namely biennial burns in winter, spring, and summer, plus an unburned check, were each combined with 3 supplemental hardwood control treatments: an initial chemical injection of all hardwoods, periodic cutting of all woody stems, and no treatment. Pine stands were thinned to 16 square meters basal area per hectare (70 square feet per acre) in 1990. All measures of pine growth were significantly reduced by burning. By 1995, the volume yield of 257 cubic meters per hectare (3,675 cubic feet per acre) on unburned plots significantly exceeded the average yield of 210 cubic meters per hectare (2,996 cubic feet per acre) for the 3 burning treatments, which did not differ significantly among themselves. The significant effect of fire on pine diameter and height growth did not extend beyond age 24, although effects on basal area and volume growth continued to age 30, when plots were thinned. Volume, but not basal area, growth from age 33 to age 36 was once again significantly greater on unburned than burned plots. Supplemental treatments have not yet affected pine volume growth. (1)

Cain, Michael D.; Shelton, Michael G. 2000. **Revisiting the relationship between common weather variables and loblolly-shortleaf pine seed crops in natural stands.** *New Forests*. 19: 187-204.

Seed production was monitored during 24 years using seed-collection traps in loblolly-shortleaf pine (*Pinus taeda* L.-*P. echinata* Mill.) stands located in southeast Arkansas, north-central Louisiana, and southwest Mississippi on the southeastern Coastal Plain, USA. Sound seed production was correlated with mean monthly precipitation and temperature from National Oceanic and Atmospheric Administration weather stations located near the seed-collection areas to determine the potential of weather factors in forecasting pine seed crops. Correlations were restricted to three critical periods in the pine reproductive cycle—strobili primordia differentiation, pollination, and fertilization. The most important ($P < 0.05$) variables correlated with pine seed production for combined locations were cumulative precipitation ($r = +0.60$) during July, August, and September at 27 to 25 months before seed dispersal and mean temperature ($r = -0.45$) in August at 26 months before seed dispersal. Because multiple environmental factors can negatively impact pine seed development during the two years following strobili primordia differentiation, seed-production forecasts based on weather variables should be verified by on-site cone counts during the summer preceding autumn seed dispersal. (2)

DeBarr, Gary L.; Hanula, James L.; Niwa, Christine G.; Nord, John C. 2000. **Synthetic pheromones disrupt male *Dioryctria* spp. moths in a loblolly pine seed orchard.** The Canadian Entomologist. 132: 345-351.

Synthetic sex pheromones released in a loblolly pine, *Pinus taeda* L. (Pinaceae), seed orchard interfered with the ability of male coneworm moths, *Dioryctria* Zeller spp. (Lepidoptera: Pyralidae), to locate traps baited with sex pheromones or live females. Pherocon 1 C® traps baited with synthetic pheromones or live conspecific females were hung near the center of two 1.2-ha circular plots during emergence of *Dioryctria amatella* (Hulst), *Dioryctria disclusa* (Heinrich), and *Dioryctria merkei* (Mutuura and Munroe). In a paired design, trap catches for the mating-disruption treatment with synthetic pheromone dispensers consisting of three polyvinyl chloride rods placed in every tree were compared with the control treatment. Treatments were alternated at intervals of 2 to 3 days. Trap catches of *D. amatella* were reduced by 91 percent when plots were treated with 2.5 g/ha of Z-11-hexadecenyl acetate. Catches were reduced by 99.5 percent for *D. disclusa* and by 97 percent for *D. merkei* when plots were treated with 12.5 g/ha of Z-9-tetradecenyl acetate, whereas catches of *D. amatella* were unaffected by this mating-disruption treatment. Daily disappearance of Z-9-tetradecenyl acetate from the dispensers averaged 0.46 g/ha or less. Manually placing dispensers on nylon lines in the tops of trees was an effective method for releasing synthetic *Dioryctria* pheromones in the orchard. These data suggest it may be feasible to prevent mating of *Dioryctria* spp. in pine seed orchards by using synthetic pheromones for mating disruption, but large-scale tests will be required to demonstrate cone protection. (3)

Fettig, Christopher J.; Dalusky, Mark J.; Berisford, C. Wayne. 2000. **Nantucket pine tip moth phenology and timing of insecticide spray applications in seven Southeastern States.** Res. Pap. SRS-18. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 21 p.

The Nantucket pine tip moth, *Rhyacionia frustrana* (Comstock) (Lepidoptera: Tortricidae), is a common pest of Christmas tree and pine plantations throughout much of the Eastern United States. The moth completes two to five generations annually, and insecticide spray timing models are currently available for controlling populations where three or four generations occur. The thermal requirements for the Nantucket pine tip moth to complete a generation were obtained from published data and used along with historical temperature data to produce maps indicating the number of annual generations predicted to occur throughout seven Southeastern States. Spray timing prediction values were also obtained from published data and used to predict optimal spray periods based on 5-day increments for each location where either three or four generations occurred. Approximately 80 percent of the predicted optimal spray periods were within one optimal spray period of previously field-determined spray dates. Land managers who use contact insecticides, such as synthetic pyrethroids, may find the predicted optimal spray periods useful in optimizing spray effectiveness. (4)

Foster, G.S.; Stelzer, H.E.; McRae, J.B. 2000. **Loblolly pine cutting morphological traits: effects on rooting and field performance.** New Forests. 19: 291-306.

Shoot cuttings were harvested from 4-year-old loblolly pine hedges in March and September of 1987, and placed into a series of factorial combinations of cutting length, diameter class, and the presence/absence of a terminal bud to assess effects on rooting and field performance. Average rooting in the March trial was 50 percent and only 20 percent for the September trial; however, the best treatment in March yielded 100 percent rooting. Terminal bud status did not appear to influence percent rooting. Shorter cuttings (5.1 or 7.6 cm) with an average diameter of 2 or 3 mm tended to root better and develop more roots. Field performance of the rooted cuttings through age 5 suggests that the original cutting does not require a terminal bud, but the best set of morphological traits differs, depending on bud status. Considering both rooting ability and field growth with an original tip bud present, the best cutting dimensions were 5.1 or 7.6 cm long and 2 or 3 mm in diameter. Without a tip bud present, cutting dimensions were restricted to 7.6 or 10.2 cm long and 3 mm in diameter. Number of main roots was a weak predictor of tree height or d.b.h. at age 5. (5)

Gumpertz, Marcia L.; Wu, Chi-tung, Pye, John M. 2000. **Logistic regression for southern pine beetle outbreaks with spatial and temporal autocorrelation.** *Forest Science*. 46(1): 95-107.

Regional outbreaks of southern pine beetle (*Dendroctonus frontalis* Zimm.) show marked spatial and temporal patterns. While these patterns are of interest in themselves, we focus on statistical methods for estimating the effects of underlying environmental factors in the presence of spatial and temporal autocorrelation. The most comprehensive available information on outbreaks consists of binary data, specifically, annual presence or absence of outbreak for individual counties within the Southern United States. We demonstrate a method for modeling spatially correlated proportions, such as the proportion of years that a county experiences outbreak, based on annual outbreak presence or absence data for counties in three states (NC, SC, and GA) over 31 yr. In this method, the proportion of years in outbreak is predicted using a marginal logistic regression model with spatial autocorrelation among counties, with adjustment of variance terms to account for temporal autocorrelation. This type of model describes the probability of outbreak as a function of explanatory variables, such as host availability, physiography, climate, hurricane incidence, and management type. Explicitly including spatial autocorrelation in the model improves estimates of the probability of outbreak for a particular county and of the importance of the various explanatory variables. (6)

Hanula, James L.; Lipscomb, Donald; Franzreb, Kathleen E.; Loeb, Susan C. 2000. **Diet of nestling red-cockaded woodpeckers at three locations.** *Journal of Field Ornithology*. 71(1): 126-134.

We conducted a 2-yr study of the nestling diet of red-cockaded woodpeckers (*Picoides borealis*) at three locations to determine how it varied among sites. We photographed 5939 nest visits by adult woodpeckers delivering food items for nestlings. In 1994, we located cameras near three nest cavities on the Lower Coastal Plain of South Carolina and near two cavities at the Savannah River Site, which is on the Upper Coastal Plain. In 1995, cameras were installed on the Savannah River Site and in the Piedmont National Wildlife Refuge, GA. The cameras recorded adults bringing 33 different types of food to nestlings. Wood roaches (Blattoidea: Blattellidae, *Parcoblatta* spp.) were the most common food, composing 50 percent of the diet overall. They were also the most common prey at each location and for all but one of the woodpecker groups studied. Wood roaches were recorded in 26 percent of the visits photographed on the Lower Coastal Plain and 62 percent of the nest visits on the Upper Coastal Plain in 1994. In 1995, wood roaches were recorded in 57 percent and 50 percent of the visits on the Upper Coastal Plain and Piedmont, respectively. Woodpeckers on the Lower Coastal Plain used blueberries (*Vaccinium* sp.) and sawfly larvae (Hymenoptera: Diprionidae, *Neodiprion* sp.), two dietary items not commonly used at the other locations. Adults at two locations providing [provided] snail shells to nestlings, possibly as an additional source of calcium. Morista's index of diet overlap (*C*) ranged from 0.94 to 0.99 for breeding males and females in the same group, from 0.63 to 0.99 among groups at the same location, and from 0.68 to 0.96 among locations. Because diet overlap of red-cockaded woodpecker nestlings at different geographical locations was within the range that occurred among groups at the same location, we conclude that nestling diets are similar across the geographical area studied, and that it varies little from year to year. (7)

Haywood, James D. 2000. **Mulch and hexazinone herbicide shorten the time longleaf pine seedlings are in the grass stage and increase height growth.** *New Forests*. 19: 279-290.

Herbaceous plant control with mulch or hexazinone herbicide influenced planted longleaf pine (*Pinus palustris* Mill.) seedling total height on a silt loam site in central Louisiana. The site had been sheared and windrowed in 1991, and rotary mowed before three treatments were established in a randomized complete block design: (1) untreated check: no herbaceous plant control after planting; (2) five mulches: on each plot, five randomly assigned mulches were placed around seedlings; the mulches were either a mat of cotton, hemlock and polyester, pine straw, woven polypropylene, or perforated polyethylene; and (3) hexazinone: the herbicide hexazinone at 1.12 kg active ingredient/ha was annually sprayed in the first two growing seasons over the rows of unshielded seedlings. The longleaf seedlings were planted in February 1993.

After three growing seasons, seedlings on the mulch and hexazinone treatments were taller than those on the check plots. About 59 percent of the mulched and hexazinone treated seedlings had grown out of the grass stage (at least 12 cm tall), compared to 17 percent of the check seedlings. After five growing seasons, the percentage of longleaf pine seedlings out of the grass stage was similar on all treatments and averaged 87 percent. However, these better growing pines were taller on the mulch and hexazinone treatments (a 142-cm average) than on the checks (78 cm). Pine straw was an ineffective mulch, probably because the straw smothered the seedlings. The longleaf saplings were tallest when the perforated polyethylene mat was used. (8)

Outcalt, Kenneth W. 2000. **The longleaf pine ecosystem of the South.** Native Plants Journal. 1(1): 42-44, 47-53.

Longleaf pine (*Pinus palustris* P. Mill. [Pinaceae]) was once the most prevalent pine type in the Southern US. Stands of longleaf were also habitat for a vast array of plant species. Decades of timber harvest followed by conversion to agriculture, urban development, or to other pine species, have reduced longleaf- dominated areas to less than 5 percent of its original range. This paper discusses the habitat and history of this once vast resource, outlining its key role as an integral part of native plant communities. The author also focuses on the more recent recognition of the ecological importance of longleaf pine ecosystems. This appreciation, along with advances in technology and additional information, are combining to reverse the long-term trend and should help ensure that longleaf communities remain as a viable and valuable part of the South's heritage. (9)

Prestemon, Jeffrey P.; Buongiorno, Joseph. 2000. **Determinants of tree quality and lumber value in natural uneven-aged southern pine stands.** Canadian Journal of Forest Research. 30: 211-219.

An ordered-probit model was developed to predict tree grade from tree- and stand-level variables, some of which could be changed by management. Applied to uneven-aged mixed loblolly (*Pinus taeda* L.) - shortleaf pine (*Pinus echinata* Mill.) stands, the model showed that the grade of pine trees was highly correlated with tree diameter, tree height, and stand basal area, in non-linear fashion. In addition, a tree was more likely to be of high quality if it grew on industry or government forestland, on poorer sites, and in stands that had been partially cut in the past. However, the effects of changes in these variables on the unit value of recovered lumber were small. The exceptions were tree diameter and height, which were the most important indicators of lumber value. (10)

Shelton, Michael G.; Cain, Michael D. 2000. **Regenerating uneven-aged stands of loblolly and shortleaf pines: the current state of knowledge.** Forest Ecology and Management. 129: 177-193.

Periodic regeneration is crucial to creating or sustaining uneven-aged (UEA) stands of loblolly (*Pinus taeda* L.) and shortleaf (*P. echinata* Mill.) pines. Although both species are shade intolerant, they have silvical characteristics that are conducive to natural regeneration in UEA stands. Their seed production is fairly consistent and good, and the wind-disseminated seeds are well dispersed throughout the stand. The disturbed seedbed resulting from periodic logging is favorable to germination, and established seedlings can recover from a fair degree of logging damage. Seedlings are moderately shade tolerant when young, and they respond well when released from either competing understory vegetation or overtopping trees. The key to successful regeneration in UEA pine stands involves regulating the stocking and structure of the merchantable portion of the stand with careful logging and periodically controlling nonpine vegetation, typically with selective broadcast herbicides. Current aftercut guidelines call for basal areas of 10 to 14 m²/ha, maximum diameters of 35 to 55 cm, and a *q* factor in the vicinity of 1.2 for 2.5 cm d.b.h. classes. Applying these guidelines results in a stand with an irregular canopy containing multidimensional gaps. Stand basal area is not allowed to exceed 17 m²/ha during the cutting cycle because regeneration would be adversely affected by shading and root competition. Pines over 40 cm in d.b.h. have been found to be favorable to regeneration because of increased seed production and reduced logging traffic needed to remove harvested trees. Regeneration is most difficult to secure on good sites because of intensive nonpine competition, but selective herbicides are available that will release pine

regeneration from competing nonpine vegetation. Due to the increased interest in UEA silviculture, we present an overview in this paper of more than 50 years of research and experience in regenerating these two important species in UEA stands principally using single-tree selection. (11)

Steele, Philip H.; Kreibich, Roland E.; Steynberg, Petrus J.; Hemingway, Richard W. 1998. **Finger jointing green southern yellow pine with a soy-based adhesive.** Adhesives Age. [No volume number]: 49, 50, 52, 54, 56.

The authors present results of laboratory tests for a soy-based adhesive to bond southern yellow pine using the finger-jointing method. There was some reason to suspect that finger jointing of southern yellow pine (SYP) with the honeymoon system using soy-based adhesive might prove more difficult than for western species. The Wood Handbook classes western species in the “bond easily” or “bond well” category, whereas SYP is ranked in the “bond satisfactorily” category. On the other hand, the specific gravity and the green moisture content of SYP are nearly identical to those of Douglas fir, a western species that has shown good results with green finger jointing in both laboratory and mill trials. Laboratory and mill trial results soon indicated that results of the honeymoon system with SYP were just as favorable as with western species. (12)

Walkinshaw, Charles H. 1999. **Constituent and induced tannin accumulations in roots of loblolly pines.** In: Gross, Georg G.; Hemingway, Richard W.; Yoshida, Takashi, eds. Plant polyphenols 2: chemistry, biology, pharmacology, ecology. New York: Kluwer Academic/Plenum Publishers: 843-852.

Loblolly pine (*Pinus taeda* L [L.]) has become the most important source of wood fiber in the Southern United States. This tree is an excellent competitor and recovers well from a variety of adverse conditions. The author presents a histological study of tannin in pine roots to measure tannin abundance as a primary trait to evaluate root health at the microscopic level. This paper describes the types of tannins in roots and quantifies their occurrence in plantation-grown loblolly pines. (13)

Wetlands, Bottomland Hardwoods, and Streams

Bacchus, Sydney T.; Hamazaki, Toshihide; Britton, Kerry O.; Haines, Bruce L. 2000. **Soluble sugar composition of pond-cypress: a potential hydroecological indicator of ground water perturbations.** Journal of American Water Resources Association. 36(1): 55-65.

Pond-cypress, a deciduous conifer, is a dominant canopy species in depressional wetlands of the southeastern Coastal Plain (SCP). Extensive premature decline and death of pond-cypress trees in central Florida have been attributed to hydroperiod alterations due to excessive withdrawals of ground water from the Floridan aquifer. One factor identified in the decline process is basal decay, which may be related to the presence of *Botryosphaeria rhodina* and *Fusarium* species (nonaggressive, facultative fungal pathogens). These fungi have been cultured from sapwood tissue of declining pond-cypress associated with ground water mining, but not from pond-cypress away from ground water mining areas. In this experiment, differences in soluble (nonstructural) carbohydrate composition of branch tips were evaluated for one- and two-year old, nursery-grown (unsheltered) pond-cypress, following a year of growth under treatment conditions (control, fungal inoculation, water stress, and fungal inoculation plus water stress) in a growth chamber. Results from two methods of wet chemical analysis were compared (trimethylsilyl methylglycoside – method A, and alditol acetate – method B). Three pentoses (arabinose, rhamnose, and xylose) and three hexoses (galactose, glucose, and mannose) were identified in branch tips from both age classes. A fourth hexose (fucose) also was identified in samples from the younger trees. The acidic sugar, galacturonic acid, was identified in both age classes using method A. Results suggest that prolonged water stress is correlated with greater relative concentrations of the neutral soluble sugars rhamnose ($P = 0.02$), xylose ($P = 0.02$), and galactose ($P = 0.02$), in addition to the acidic sugar galacturonic acid ($P = 0.01$), for method A, and

arabinose ($P = 0.02$) for method B. These results also suggest that in the absence of water stress, the fungal pathogen *B. rhodina* does not penetrate to the sapwood of the trees, and that inoculation with this fungal pathogen is not correlated with differences in relative concentrations of nonstructural, soluble carbohydrates, based on method A analysis. Empirical evidence suggests that pond-cypress trees in depressional wetlands respond similarly to anthropogenic perturbations of ground water, but not to natural periods of drought in the absence of such perturbations. Therefore, pond-cypress appear to be integrators of groundwater perturbations. Greater concentrations of the soluble sugars identified in this study in pond-cypress branch tips may be hydroecological indicators of such anthropogenic perturbations as unsustainable yield from the regional aquifer and adverse impacts from aquifer storage and recovery (ASR) activities in the SCP. (14)

Gardiner, Emile S.; Russell, D. Ramsey, Jr.; Hodges, John D.; Fristoe, T. Conner. 2000. **Impacts of mechanical tree felling on development of water tupelo regeneration in the Mobile Delta, Alabama.** Southern Journal of Applied Forestry. 24(2): 65-69.

Two water tupelo (*Nyssa aquatica* L.) stands in the Mobile Delta of Alabama were selected to test the hypothesis that mechanized felling does not reduce establishment and growth of natural water tupelo regeneration relative to traditional tree felling with chainsaws. To test the hypothesis, we established six 2 acre treatment plots in each of two blocks on each of two sites, and randomly assigned plots to either mechanical tree felling with a tracked, swing feller or chainsaw felling. Each site was clearcut in fall 1992, and merchantable boles were removed by helicopter. Establishment and growth of regeneration was assessed prior to harvest and annually for 3 yr after harvest in five 0.01 acre measurement plots located in each treatment plot. Stand harvesting promoted establishment of water tupelo seedlings such that 3 yr after treatment we recorded over 270/acre on each site regardless of felling method. Seedling height increased at a steady rate and averaged about 39 inches tall after three growing seasons. Woody competition also responded to the harvest, outnumbering water tupelo seedlings 3 yr after treatment by as much as seven to one on 2. Water tupelo stump sprouts developing from chainsaw felling grew well and averaged about 13.5 ft tall after three growing seasons. However, mechanical felling reduced water tupelo stump sprouting by 50 percent, leading to a lower density of sprout clumps in mechanically felled plots ($P = 0.0253$). Our results indicated that mechanical felling techniques used in this study may adversely impact regeneration of water tupelo swamps where coppice is a desirable form of reproduction. (15)

Lemly, A. Dennis; Hilderbrand, Robert H. 2000. **Influence of large woody debris on stream insect communities and benthic detritus.** Hydrobiologia. 421: 179-185.

We examined the extent to which benthic detritus loadings and the functional feeding group structure of stream insect communities respond to channel modifications produced by experimental addition of large woody debris (LWD, entire logs) to Stony Creek, VA. Benthic detritus loadings per sample did not change after LWD additions, but large increases in pool habitats created by LWD increased net detritus by an estimated 27 kg (25 percent) in the 250 m of stream receiving LWD. A large increase in the proportional area of pool habitats may result in a dominance of collector-gatherers and corresponding decreases in shredders and scrapers. Functional feeding group community structure in pools was similar spatially and temporally. Riffles were spatially convergent, but differed temporally. Community structure was significantly different between pools and riffles. The results indicate possible large-scale influences in overall community structure due to channel alterations by LWD, but little within-habitat change. (16)

Lemly, A. Dennis; King, Ryan S. 2000. **An insect-bacteria bioindicator for assessing detrimental nutrient enrichment in wetlands.** Wetlands. 20(1): 91-100.

Field and laboratory studies were conducted to evaluate the use of bacterial growth on aquatic insects as a metric for determining the existence of nutrient impacts in wetlands. Results from field investigations indicated that elevated concentrations of nitrate and phosphate were associated with growth of filamentous bacteria on insect body surfaces and that there were significantly fewer mayflies (Ephemeroptera) in the nutrient-enriched wetland. Laboratory investigations

confirmed a strong linkage between bacterial growth and reduced survival of mayflies. Survival was examined for individuals with bacterial infestation ranging from 0 percent to 60 percent body coverage. A threshold for catastrophic mortality was present at about the 25 percent level of coverage; there were very few survivors above that level. Based on these findings, the diagnostic endpoint for the bioindicator is 25 percent body coverage by bacterial growth, a level that signifies major differences in insect populations in the field and is also easy to detect visually. This study provides evidence that the insect-bacteria bioindicator is a reliable tool for assessing nutrient impacts on wetland macroinvertebrate communities. The bioindicator could be useful in the development of a Wetland Bioassessment Protocol. (17)

The Southern Appalachians

Clinton, Barton D.; Baker, Corey R. 2000. **Catastrophic windthrow in the Southern Appalachians: characteristics of pits and mounds and initial vegetation responses.** *Forest Ecology and Management*. 126: 51-60.

We characterized pit and mound (PM) topography resulting from catastrophic wind in the Coweeta Basin, and located 48 PM's across a variety of forest types. Our measurements included pit length, width, and depth; and mound height, thickness, and width. Species of fallen trees were identified, and d.b.h. (diameter at breast height, 1.37 m) was measured for biomass determination. We identified five distinct microsites at each PM: mound face, mound top, pit bottom, pit wall, and intact forest floor. On each microsite, we measured photosynthetically active radiation (PAR), soil temperature, and soil moisture, and took soil samples from four microsites (intact forest floor, pit wall, pit bottom, mound top) to determine carbon and nitrogen concentrations.

Treefall direction was marginally non-random. Three PM dimensions were significantly related to fallen tree biomass: mound width; mound height; and pit width. Other relationships failed because (1) rooting depth of the fallen tree was not necessarily proportional to tree size; and (2) trees that fell striking other trees often slid back into the pit, altering its dimensions. PAR was highest at mound top ($250 \mu\text{mol m}^{-2} \text{s}^{-1}$) and lowest in pit bottom ($70 \mu\text{mol m}^{-2} \text{s}^{-1}$). Mean soil temperature varied $\approx 3^\circ\text{C}$ across microsites, and soil moisture ranged from 24 percent on the mound top and mound face to 34 percent in the pit bottom. Nitrogen and carbon concentrations were significantly higher on the forest floor ([N] = 0.23 percent; [C] = 4.73 percent) than on the other three microsites ([N] = 0.08-0.10 percent; [C] = 1.4-2.2 percent). Over time, soil nutrition and microsite instability, due to erosion and settling, may be the most influential factors determining rates of vegetative establishment in PM's.

We characterized initial vegetative recovery in 27 blowdown sites. Trees were placed in one of two damage classes: direct wind damage (direct); and damage due to the fall of another tree (indirect). Basal and/or bole sprouting, and live or dead crowns were noted. Blowdown areas ranged from 181 to 4043 m^2 and averaged 1175 m^2 . Mean diameter of indirectly damaged trees was 50 percent of the mean for trees directly damaged, but both had similar minimum diameters. Overall, the biomass of indirectly damaged trees accounted for <10 percent of total biomass but 33 percent of the total number of stems. Of the indirectly damaged trees, 38 percent were topped, 82 percent exhibited basal or bole sprouting, and 21 percent had live crowns. By contrast, of the directly damaged trees, only 5 percent were topped, <50 percent were sprouting, and only 11 percent had live crowns. (18)

Clinton, Barton D.; Vose, James M. 2000. **Plant succession and community restoration following felling and burning in the Southern Appalachian Mountains.** In: Moser, W. Keith; Moser, Cynthia F., eds. *Fire and forest ecology: innovative silviculture and vegetation management*; Tall Timbers fire ecology conference proceedings, no. 21; 1998 April 14-16; Tallahassee, FL. Tallahassee, FL: Tall Timbers Research Station: 22-29.

Recent declines in the yellow pine component of pine-hardwood stands in the Southern Appalachian Mountains has prompted managers to increase the use of fire as a silvicultural tool. The fell and burn treatment is designed to remove competing vegetation (hardwoods and mountain laurel [*Kalmia latifolia*]) to ensure successful establishment of planted

eastern white pine (*Pinus strobus*). Two years after burning, mountain laurel had accumulated more biomass than any other species and accounted for 43 percent of total biomass in year 1 and 20 percent in year 2. By year 4, mountain laurel ranked fifth (8.9 percent of total) in total biomass among hardwood species, behind Allegheny serviceberry (*Amalanchier arborea*, 14.3 percent), chestnut oak (*Quercus prinus*, 13.7 percent), red maple (*Acer rubrum*, 12.4 percent), and scarlet oak (*Q. coccinea*, 9.3 percent). Across sites, woody species richness ranged from 19–24 in year 1 and 14–22 in year 4. Species richness varied across sites and years, and there were substantial changes in the distribution of biomass among species.

The introduction of fire allowed the once dominant pitch pine (*P. rigida*) to successfully reestablish. On our sites, pine accounted for 25 percent of pretreatment stem density, but <1 percent and 2 percent in the first and fourth growing seasons after burning, respectively. However, in year 1, pines had increased in density 20-fold compared to pretreatment levels, and by year 4, had maintained a 17-fold increase compared to pretreatment. The use of fire in forest management has been the subject of considerable criticism. In light of current public concerns over the loss of critical or unique habitats, fire may gain public support for use as a restoration tool. (19)

Flebbe, Patricia A.; Herrig, James A. 2000. **Patterns of aquatic species imperilment in the Southern Appalachians: an evaluation of regional databases.** *Environmental Management*. 25(6): 681-694.

For regional analyses of species imperilment patterns, data on species distributions are available from the U.S. Fish and Wildlife Service and from the State heritage programs. The authors compared these two different databases as sources of best available information for regional analyses of patterns of aquatic species imperilment for 132 counties in the Southern Appalachians and examined patterns produced from the databases. The heritage program database contained information about a greater number of imperiled species because species need not be federally listed as threatened or endangered to be included in this database. In the Southern Appalachians, about half of imperiled mollusks and about one-fourth of imperiled fish were listed as threatened or endangered; much smaller proportions of other taxonomic groups were federally listed. Most threatened and endangered species appeared on both lists, but for about 40 percent of the species, inconsistencies exist, notably a lack of recent records in the heritage program dataset. Numbers of species in each county were significantly different between the two datasets for Georgia, Tennessee, and Virginia, where the largest number of threatened and endangered species reside. Nevertheless, some counties always appeared as centers of imperilment, and the general spatial patterns of imperilment were similar. (20)

Vose, James M. 2000. **Perspectives on using prescribed fire to achieve desired ecosystem conditions.** In: Moser, W. Keith; Moser, Cynthia F., eds. *Fire and forest ecology: innovative silviculture and vegetation management*; Tall Timbers fire ecology conference proceedings, no. 21; 1998 April 14-16; Tallahassee, FL. Tallahassee, FL: Tall Timbers Research Station: 12-17.

Fire is a potentially powerful tool for achieving desired conditions of forest ecosystems. From an ecological perspective, the use of fire requires affirmative answers to either of the following questions: (1) does it increase ecosystem health and sustainability? and (2) does it preserve or restore unique species or habitats? Health and sustainability can be measured and defined in terms of: (1) rates and pool size of water, carbon, and nutrient cycling; (2) resistance and resilience to low-intensity and -severity disturbance; and (3) minimizing the likelihood of catastrophic disturbances. The departure of current ecosystem conditions from desired ecosystem conditions (defined by structural and functional characteristics) depends on the history of land use and disturbance. The disturbance history also influences the rate of attainment of desired conditions and the magnitude of ecosystem process response to burning. Hence, from an ecosystem perspective, managers must understand the interactions among land use history, current conditions, and desired conditions. These issues are examined using a case study for using prescribed fires in the Southern Appalachian Mountains. (21)

The Interior Highlands

Perry, Roger W.; Thill, Ronald E.; Peitz, David G.; Tappe, Philip A. 1999. **Effects of different silvicultural systems on initial soft mast production.** *Wildlife Society Bulletin.* 27(4): 915-923.

Recent policy changes by federal land management agencies such as the United States [Department of Agriculture] Forest Service have led to increased use of silvicultural systems other than clearcutting. Because soft mast is an integral part of wildlife habitat and the effects of these alternative silviculture systems on soft mast production are unknown, we evaluated effects of different stand-level silvicultural systems on soft mast production in the Ouachita Mountains of Arkansas and Oklahoma. We evaluated differences in soft mast production and coverage among 4 replications of 5 treatments (clearcut, shelterwood, group selection, single-tree selection, and late-rotation, unharvested forest stands) during the first (1994), third (1996), and fifth (1998) years after initial timber harvest. Coverage of all mast-producing plants combined did not differ among treatments over all years. Soft mast production did not differ among treatments the first year after timber harvest, but was greater in harvested stands than in unharvested stands in the third post-harvest year. Production in shelterwood cuts and clearcuts was greater than in single-tree selection, group selections, and unharvested stands the fifth post-harvest year. Unharvested stands, greenbelts (unharvested buffers surrounding stream drainages), and the thinned matrix of group-selection stands produced little mast in all years. A significant linear relationship between soft mast production and residual overstory basal area was present in years 3 and 5. We present equations to predict soft mast production 3 and 5 years after harvest when residual overstory basal areas are known. Without additional stand treatments (e.g., thinning or burning), we expect production in even-aged stands (clearcuts and shelterwood cuts) to decline as canopy closure progresses; likewise, production in single-tree selection stands will likely decline due to midstory development. (22)

Large Scale Assessment and Modeling

Henley, W.F.; Patterson, M.A.; Neves, R.J.; Lemly, A. Dennis. 2000. **Effects of sedimentation and turbidity on lotic food webs: a concise review for natural resource managers.** *Reviews in Fisheries Science.* 8(2): 125-139.

Sedimentation and turbidity are significant contributors to declines in populations of North American aquatic organisms. Impacts to lotic fauna may be expressed through pervasive alterations in local food chains beginning at the primary trophic level. Decreases in primary production are associated with increases in sedimentation and turbidity and produce negative cascading effects through depleted food availability to zooplankton, insects, freshwater mollusks, and fish. Direct effects at each trophic level are mortality, reduced physiological function, and avoidance; however, decreases in available food at trophic levels also result in depressed rates of growth, reproduction, and recruitment. Impacts of turbidity to aquatic organisms often seem inconsistent among watersheds and experiments, but this apparent difference is actually due to the lack of correlation between suspended sediment concentrations (mg/L) and units of measure (Nephelometric Turbidity Units, NTU). The use of NTU as a surrogate measurement of suspended sediment to predict biotic effects within watersheds is dubious. Similar NTU measurements from different watersheds may be correlated with different concentrations of suspended sediment. For monitoring the effects of turbidity within local watersheds, we recommend that the correlation between suspended sediment and NTU's be examined over a range of discharge recordings, and that this be used as a baseline to examine local effects. We recommend that riparian buffer strips and livestock fencing be used to reduce sediment input to streams. (23)

Lemly, A. Dennis; Kingsford, Richard T.; Thompson, Julian R. 2000. **Irrigated agriculture and wildlife conservation: conflict on a global scale.** *Environmental Management.* 25(5): 485-512.

The demand for water to support irrigated agriculture has led to the demise of wetlands and their associated wildlife for decades. This thirst for water is so pervasive that many wetlands considered to be hemispheric reserves for waterbirds

have been heavily affected, for example, the California and Nevada wetlands in North America, the Macquarie Marshes in Australia, and the Aral Sea in central Asia. These and other major wetlands have lost most of their historic supplies of water, and some have also experienced serious impacts from contaminated subsurface irrigation drainage. Now mere shadows of what they once were in terms of biodiversity and wildlife production, many of the so-called "wetlands of international importance" are no longer the key conservation strongholds they were in the past. The conflict between irrigated agriculture and wildlife conservation has reached a critical point on a global scale. Not only has local wildlife suffered, including the extinction of highly insular species, but a ripple effect has impacted migratory birds worldwide. Human societies reliant on wetlands for their livelihoods are also bearing the cost. Ironically, most of the degradation of these key wetlands occurred during a period of time when public environmental awareness and scientific assertion of the need for wildlife conservation was at an all-time high. However, designation of certain wetlands as "reserves for wildlife" by international review boards has not slowed their continued degradation. To reverse this trend, land and water managers and policy makers must assess the true economic costs of wetland loss and, depending on the outcome of the assessment, use the information as a basis for establishing legally enforceable water rights that protect wetlands from agricultural development. (24)

Rudis, Victor A. 1999. **Ecological subregion codes by county, coterminous United States**. Gen. Tech. Rep. SRS-36. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 95 p.

This publication presents the National Hierarchical Framework of Ecological Units (ECOMAP 1993) by county for the coterminous United States. Assignment of the framework to individual counties is based on the predominant area by province and section to facilitate integration of county-referenced information with areas of uniform ecological potential. Included are maps illustrating county-scaled ecological subregion boundaries by division, province, and section; and numeric codes by Federal Information Processing Standard and USDA Forest Service Resources Planning Act region. (25)

Wilson, A.D.; Lester, D.G.; Edmonson, R.E. 2000. **Live oaks, new hosts for *Odontocynips nebulosa* Kieffer (Hymenoptera: Cynipidae) in North America**. Proceedings of the Entomological Society of Washington. 102(2): 360-373.

A study of root-feeding insects as potential vectors of the oak wilt fungus *Ceratocystis fagacearum* (T.W. Bretz) J. Hunt in live oaks, revealed root galls induced by the cynipid gall wasp *Odontocynips nebulosa* Kieffer. The incidence of the wasp on roots of four oak species and natural live oak hybrids at 14 root excavation sites in 7 counties throughout the Hill Country of central Texas was surveyed. The study was limited to sites within and adjacent to oak wilt infection centers of the live oak-Ashe juniper ecotype where oak wilt-infected live oaks were being uprooted and rogued for disease suppression by the Texas Oak Wilt Suppression Project. This is the first report of this root-galling wasp on live oaks, *Q. fusiformis* Small and *Quercus virginiana* Miller × *Quercus fusiformis* natural hybrids, in North America. The incidence of root-galling by the wasp occurred at relatively low levels among trees examined at excavation sites in each county, indicating a sporadic distribution throughout the region. However, examinations of root-colonization and gall induction by *O. nebulosa* in uprooted live oaks showed relatively high levels of root infestations in some trees, including trees exhibiting symptoms of oak wilt disease. This pattern suggests high population densities in small localized areas. Examinations of individual gall clusters formed by the wasp on live oak roots revealed new details of gall morphology and developmental stages of the insect within galls. The significance of this wasp as a potential vector of the oak wilt fungus is discussed. (26)

Inventory and Monitoring

Johnson, Tony G.; Stepleton, Carolyn D. 2000. **Southern pulpwood production, 1998**. Resour. Bull. SRS-50. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 34 p.

In 1998, the South's production of pulpwood declined 2 percent to 74.7 million cords. Roundwood production dropped to 52.7 million cords and accounted for 71 percent of the total pulpwood production. The use of wood residue increased to 21.9 million cords. Alabama leads the South in total production, number of mills, and pulping capacity. Currently, 103 mills are operating and drawing wood from the 13 Southern States. Southern mills' pulping capacity of 140,610 tons per day accounts for more than two-thirds of the Nation's total pulping capacity. (27)

Parresol, Bernard R. 1999. **Assessing tree and stand biomass: a review with examples and critical comparisons**. Forest Science. 45(4): 573-593.

There is considerable interest today in estimating the biomass of trees and forests for both practical forestry issues and scientific purposes. New techniques and procedures are brought together along with the more traditional approaches to estimating woody biomass. General model forms and weighted analysis are reviewed, along with statistics for evaluating and comparing biomass models. Additivity and harmonization are addressed, and weight-ratio and density-integral approaches are discussed. Subsampling methods on trees to derive unbiased weight estimates are examined, and ratio and difference sampling estimators are considered in detail. Error components for stand biomass estimates are examined. This paper reviews quantitative principles and gives specific examples for prediction of tree biomass. The examples should prove useful for understanding the principles involved and for instructional purposes. (28)

Schweitzer, Callie Jo. 2000. **Forest statistics for East Tennessee, 1999**. Resour. Bull. SRS-51. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 60 p.

This report summarizes a 1999 inventory of the forest resources of a 27-county area of Tennessee. Major findings are highlighted in text and graphs; detailed data are presented in 51 tables. (29)

Wilson, A.D. 2000. **New methods, algorithms, and software for rapid mapping of tree positions in coordinate forest plots**. Res. Pap. SRS-19. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 27 p.

The theories and methodologies for two new tree mapping methods, the Sequential-target method and the Plot-origin radial method, are described. The methods accommodate the use of any conventional distance measuring device and compass to collect horizontal distance and azimuth data between source or reference positions (origins) and target trees. Conversion equations are presented to convert field-derived azimuth coordinates to plot-center coordinates, permitting plots of all tree positions relative to the geometric center of the plot. Plot rotation algorithms for Polar X and Polar Y plotting methods allow the rotation of all plotted positions to any orientation within a rectangular mapping frame and permit corrections for magnetic declination. Additional algorithms are provided to calculate horizontal distance and azimuth between plotted trees and plot-center or between any two tree positions in the plot. All algorithms were incorporated into TreeMapper, a computer program for DOS. The methods and software were tested on a forested plot. Low mean differences between actual and calculated values indicated the accuracy of the methods. The mapping methods and software, originally developed to map trees in research plots for spatial and epidemiological studies of oak wilt disease, have wide applications in forest inventory, management, ecology, spatial-modeling, and other field activities and tasks that require accurate information about tree positions and spatial distribution patterns and ways to keep track of tree attributes and treatments over time. More detailed explanations of the methodologies for downloading data and running TreeMapper will be provided in a second paper. (30)

Wynne, Randolph H.; Oderwald, Richard G.; Reams, Gregory A.; Scrivani, John A. 2000. **Optical remote sensing for forest area estimation.** *Journal of Forestry.* 98(5): 31-36.

The air photo dot-count method is now widely and successfully used for estimating operational forest area in the USDA Forest Inventory and Analysis (FIA) program. Possible alternatives that would provide for more frequent updates, spectral change detection, and maps of forest area include the AVHRR calibration center technique and various Landsat TM classification algorithms. Should a switch from proven technology be advised, our general recommendation is to conduct several pilot studies that would focus on developing or refining tools and methodologies to allow objective, repeatable, and accurate forest areas estimation using multispectral earth resource satellite data. (31)

Foundation Programs

Bishir, J.; Roberds, J.H. 1999. **On numbers of clones needed for managing risks in clonal forestry.** *Forest Genetics.* 6(3): 149-155.

An important question in clonal forestry concerns the number of clones needed in plantations to protect against catastrophic failure while at the same time achieving the uniform stands, high yields, and ease of management associated with this management system. This paper looks at how the required number of clones needed to achieve a predetermined maximum acceptable level of risk changes as underlying system parameters—level of loss acceptable to the plantation manager; number or severity of pest attacks; level of clonal resistance to attack; and gene frequencies associated with “susceptible” alleles—increase or decrease. In general, the number of clones needed decreases as the intensity of pest attack increases, and increases if any of the other quantities increases. An explanation of these trends is offered in terms of risk-prone vs. risk-averse behavior, and implications for governmental regulations and forest management are discussed. (32)

Clark, Mark M.; Meller, Russell D.; McDonald, Timothy P. 2000. **A three-stage heuristic for harvest scheduling with access road network development.** *Forest Science.* 46(2): 204-218.

In this article we present a new model for the scheduling of forest harvesting with spatial and temporal constraints. Our approach is unique in that we incorporate access road network development into the harvest scheduling selection process. Due to the difficulty of solving the problem optimally, we develop a heuristic that consists of a solution construction stage and two solution improvement stages. We call our approach INROADS and compare it to three other approaches by employing hypothetical example problems with 225 stands (or cut blocks) over a three-period planning horizon. Thirteen example forests that vary in terms of stand value and spatial dispersion are used to evaluate our heuristic, which outperforms the other approaches tested. (33)

Cleaves, David A.; Martinez, Jorge; Haines, Terry K. 2000. **Influences on prescribed burning activity and costs in the National Forest System.** Gen. Tech. Rep. SRS-37. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 34 p.

The results of a survey concerning National Forest System prescribed burning activity and costs from 1985 to 1995 are examined. Ninety-five of one hundred and fourteen national forests responded. Acreage burned and costs for conducting burns are reported for four types of prescribed fire: slash reduction; management-ignited fires; prescribed natural fires; and brush, grass, and rangeland burns. Rankings of importance are presented for 9 resource enhancement targets, 14 potential barriers to burning, and 12 factors influencing burning costs. Survey responses concerning the presence and impact of Class I and nonattainment air quality areas are discussed. Anticipated burning levels over the next 10 years and burning levels needed to achieve desired management goals on National Forest System lands are also presented. (34)

Grace, J.M., III. 2000. **Forest road sideslopes and soil conservation techniques.** Journal of Soil and Water Conservation. 55(1): 96-101.

Forest road sideslopes have been identified as one of the major sources of erosion losses from managed forest systems. Stabilization by vegetation has shown the greatest potential for mitigation of soil erosion on forest road sideslopes. Sediment and runoff production from a wood excelsior erosion mat, native species vegetative mix, and exotic species vegetative mix were investigated on a newly constructed road during a two-year study. Sediment and runoff production were significantly reduced on both the cut slope and fill slope by the treatments. Vegetative treatments showed more than a 90 percent reduction in sediment production between the two study years. The erosion mat treatment showed increased vegetation cover and relatively insignificant sediment production for both years of the study. (35)

Groom, Les; Mott, Laurence; Shaler, Stephen. 1999. **Relationship between fiber furnish properties and the structural performance of MDF.** In: Wolcott, Michael P.; Tichy, Robert J.; Bender, Donald A., editors; Miklosko, Linda C., assoc. ed. 33rd International particleboard/ composite materials symposium proceedings. Pullman, WA: Washington State University: 89-100.

The structural performance of medium density fiberboard (MDF) is attributable to three primary variables, which are (1) physical and mechanical properties of individual wood fibers; (2) fiber-to-fiber stress transfer; and (3) fiber orientation. These origins of fiber properties and stress transfer can be traced to the fiber generation method wherein fiber orientation is associated with mat formation. This paper is part of an on-going study to determine the mechanisms governing the stiffness and strength of fiber-based composites. Preliminary data are presented in this paper, focusing on the effect of juvenility and fiber generation on the mechanical properties of individual wood fibers and the subsequent properties of MDF panels. Development of panel stiffness and strength is also discussed with regards to fiber packing and stress transfer as determined by testing oriented and un-oriented panels as well as direct observation with microtomography. (36)

McCracken, Randy D. 2000. **On-line delivery of research products.** In: Pioneering new trails, Proceedings for the Society of American Foresters annual meeting; 1999 September 11-15; Portland, OR. Bethesda, MD: Society of American Foresters: 545-546.

Research institutions are under increasing pressure to provide customers with fast and easy access to scientific publications. Responding to a customer base that has grown exponentially over the last decade, roughly 140 USDA Forest Service Southern Research Station (SRS) scientists are now able to provide research results almost as soon as their manuscripts are released for publication. Using the Internet, the SRS Webmaster helps distribute a quarterly catalog of publications to more than 1,000 e-mail addresses worldwide. He and other employees in the SRS Communications Office also maintain a Web-to-database interface that allows R&D customers to search for publications by title, author, subject matter description, or date; and then to view those documents on-line in PDF (Portable Document Format). Before this system was established, customer requests for publications would always take days—sometimes even weeks—to fill. Now, with the use of an active server interface to a Station database, SRS customers have almost instant access to all on-line publications, as well as an archive listing of all SRS publications. This system provides an expeditious and cost-efficient way to manage thousands of records and electronic copies of publication reprints. (37)

Vozzo, J.A., Ph.D.; Patel, Ramesh, M.D.; Terrel, Allen, C.R.T. 2000. **Determinacion de la viabilidad de las semillas de *Juglans nigra* a traves de imagenes obtenidas usando Tomografia Computarizada y Resonancia Magnetica.** In: Salazar, Rodolfo, coordinador. II Simposio sobre avances en la produccion de semillas forestales en America Latina—

memorias; 1999 octubre 18-22; Santo Domingo, Republica Dominicana. Turrialba, Costa Rica: CATIE: 163-167.
[Editor's Note: This publication is available only in Spanish.] (38)

Yin, Suzhou; Rials, Timothy G.; Wolcott, Michael P. 1999. **Crystallization behavior of polypropylene and its effect on woodfiber composite properties.** In: Fifth international conference on woodfiber-plastic composites; 1999 May 26-27; Madison, WI. Madison, WI: Forest Products Society: 139-146.

This paper describes an approach where polarizing optical microscopy is used to observe the crystallization process of different polypropylenes in the presence of wood fiber. The crystallization behavior was found to be related to the chemical composition of the polymer systems and the addition of maleic anhydride grafted polypropylene (MAPP) to polypropylene dramatically altered the crystal structure around the fiber, even at low levels (1 to 2 percent). For neat polypropylene, the wood fiber showed poor nucleating ability, and little difference in bulk and surface crystallization was observed. However, when MAPP was added (1 to 10 percent), the nucleation density at the wood fiber surface became so pronounced that a transcrystalline layer was formed around the fiber. Because the wood fibers themselves had not undergone any prior chemical modification, the increase in nucleation ability of the fiber surface must be attributed to specific interactions between the wood fibers and the maleic anhydride moiety of the MAPP. These observations reveal that the MAPP may not only interact with wood fibers, but may also change the microstructure of the matrix near the fibers. It was observed that the nucleation of the wood fiber surface was selective, indicating that the local physical or chemical characteristics of the fibers might have some influence on the polypropylene crystallization. Dynamic mechanical analysis was used to monitor isothermal crystallization of the polypropylene blends, and provided some additional insight into the contribution of crystalline morphology to strength properties. (39)

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