



## Science for Tomorrow's Forests



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## Response to National Fire Plan

The National Fire Plan was developed in response to the report to the President by the Secretaries of Agriculture and the Interior on the wildfires of 2000 ("Managing the Impact of Wildfires on Communities and the Environment" September 8, 2000). Implementation of the National Fire Plan will ensure sufficient firefighting resources for the future, restore ecosystems damaged by the recent fires, rebuild community economies, and reduce future fire risk through fuel reduction efforts. Forest Service Research and Development will take steps to address an increasingly complex set of problems in fire-adapted ecosystems and the urban wildland interface and to produce new knowledge and tools that will contribute to solving fire-related problems. The Southern Research Station will undertake several studies designed to add to an already strong base of information about fire ecology, smoke management, fuel reduction treatments and tradeoffs, economic effects, fire protection programs, and fire severity prediction. A new research work unit – Human Influences on Southern Forest Ecosystems: Research in the Wildland-Urban Interface — is being established in Gainesville, FL that will include an emphasis on fire prevention, risk reduction, behavior, and management.

### Specific SRS proposals funded under the National Fire Plan are:

- Southern Regional Models to Predict Smoke Movement and Mitigate Impacts at the Wildland-Urban Interface.
- High-resolution Model Predictions for Fire Weather and Smoke Impacts: the Southeastern Interagency Modeling Consortium.
- Long-Range Forecasting of Fire Season Severity.
- Quantifying the Ecological and Economic Tradeoffs of Fire and Fire Surrogate Options – Piedmont and Southern Appalachian Mountains.
- Quantifying the Tradeoffs of Fire and Fuels Management Options – Longleaf and Slash Pine Ecosystems of the Atlantic and Gulf Coastal Plain.
- An Integrated System for Mechanical Reduction of Fuel Loads at the Wildland-Urban Interface in the South.
- Fire and Herbicide Combinations to Reduce the Threat of High Intensity/Severity Fires.
- Impacts of Wildfire on Local Economies.
- Quantifying Tradeoffs of Alternative Vegetation Management Strategies, Wildfire, and Suppression in Fire Prone Regions of the United States.

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### Response to National Fire Plan

- Develop Methods for Assessing the Conditions of Fuels and Values at Risk at Various Scales of Analysis.
- Enhancing Southern Wildland-Urban Interface Firefighting Capacity and Collaboration.
- Fuel and Fire Risk Reduction Needs of Smaller Forested Landownerships in the Southern Wildland-Urban Interface.

Prior to the National Fire Plan, we received a grant from the inter-

agency Joint Fire Sciences Program to cooperate in the National Fire and Fire Surrogate Study. This national study will compare the effects of alternative fuel reduction treatments on numerous ecological and sociological variables in 11 ecosystems across the country. SRS study sites are being established in a Piedmont pine-hardwood ecosystem on the Clemson University Experimental Forest and in a Florida flatwood ecosystem at Myakka River State Park.

### Response to New Planning Rule

After more than 11 years of preparation, the National Forest and Grassland planning regulations are finalized and the Agency is beginning implementation. The new planning rule will help guide management on 191 million acres of public land over the next several decades. Consistent with the recommendations of the Committee of Scientists paneled by Secretary of Agriculture Dan Glickman in 1999, the new planning rule is based on the premise that in order to meet the needs of people now and in the future, the health, diversity, and productivity of the land must be secured. Ecological sustainability serves as the guiding star of the new regulations.

The new rule:

- Integrates the principles of ecological, economic, and social sustainability to provide a wide variety of uses, values, products, and services.
- Requires actively engaging the public and other Federal, State, local, and tribal partners in the stewardship of National Forests and Grasslands;
- Integrates science into planning, requiring a focus on managing entire ecosystems rather than single species; and
- Institutes innovative problem solving approaches to the management of natural resources.

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## Response to New Planning Rule

Science will play a greater role in nearly every stage of this new land and resource management planning



process because the new rule requires that the best available science be used to provide the Forest Service and the people, communities, and organizations involved in the plan-

ning process with sound information on which to base informed recommendations and decisions. Science will be used to identify new issues, inform broad-scale assessments and local analyses, and help managers and the public formulate potential solutions to issues. The rule provides for independent scientific review during the plan revision process to determine if land and resource management plans are meeting sustainability goals. Scientists from a broad range of disciplines and institutions may be involved in the planning process in a variety of roles and relationships.

The public will have more opportunities to interact with scientists during the planning process.

The planning rule incorporates science in the planning and decisionmaking by 1) recognizing the lessons learned in recent years about developing and analyzing information at the regional ecosystem level; 2) emphasizing monitoring and evaluation of resource conditions and trends over time so that management can be adapted as conditions change; 3). providing for the establishment of science advisory boards, independent scientific review to determine if land management plans meet sustainability goals, and, when appropriate, science consistency evaluations to determine whether the planning process is consistent with the best available science.

The SRS has identified key scientists as contacts in every State who will serve as liaisons with national forests for planning issues and facilitate boundary-spanning scientific review and input.



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### Large-Scale Watershed Restoration

Watershed restoration is one of the most significant issues facing the nation for the 21<sup>st</sup> century. The Forest Service has begun nationally to identify and to restore some large watersheds; four watersheds in the Southern Region (Chattooga, Conasauga, Chesapeake Bay, and Lower Mississippi Valley) were chosen as part of the national pilot. This watershed work is designed to develop a science-based Agency-wide strategy that focuses resource

actions on significant opportunities to enhance clean water, wetlands, migratory birds, fisheries, and riparian areas. SRS and the Southern Region have had a long relationship of cooperation for science-based management in strategic areas. Research on the Chattooga, Conasauga, and Shenandoah Rivers includes sedimentation modeling, watershed restoration techniques, monitoring, biodiversity, nutrient carbon cycling as well as work on prescribed burning.

### Restoring Ecosystems in Southern Forests

There is rising interest in the public for restoring southern forest ecosystems. Restoration of three native forest ecosystems is critical for the South to meet and maintain sustainable forests for the future: greater longleaf pine ecosystem; American chestnut; and upland oak forest community.

The Southern Region and SRS have three programs that contribute to the regional strategy for restoration of longleaf pine: 1) expanding of longleaf pine forest type and fire dependent understory communities on national forests; 2) providing technology transfer information and incentives through State and Private Forestry, and expansion of collaborative research programs; and 3) reaching out to private forest landowners, States, and others interested in managing longleaf pine through the Longleaf Alliance.

A preliminary examination of silvicultural strategies for chestnut restoration is underway. A formal study plan is being developed, seed are in the nursery, and experimental areas are being chosen; outplantings are scheduled for spring, 2001.

Collaboration on sustaining upland oak communities has been well established during the past decade following decades of work on nursery practices for growing high quality seedlings and improving artificial regeneration techniques. Work continues on examining heritabilities for acorn production and understanding the biological basis of artificial oak regeneration management.

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### Managing and Using Small-Diameter Timber

Densely overstocked stands of small-diameter trees are at increased risk for fire, pest, and pathogen damage, have low value as wildlife habitat, and offer little economic value relative to productive, healthy stands. Although there is an urgent need to treat overstocked stands, it is often not feasible because of the low value and costs of harvesting small-diameter trees. Improvements are needed in forest management and wood utilization in order to integrate the use of small-diameter trees into bio-based products to extend our natural resources, increase carbon sequestration, reduce fire and pest risks, and improve forest health in the South. Scientists

anticipate increasing focus in this area on wood properties and product potential for small-stem pines and solid products for wood from different management regimes; behavior of juvenile wood in composite systems and its influence on material properties; solid-wood products options for the economic removal of small-diameter hardwoods for forest health prescriptions; cost-effective technologies for extraction of small-diameter trees and site and stand impacts of removal; and institutional and economic factors that affect the export potential of southern forest products.

### Understanding Recreation Demands

There has been dramatic growth and shifting in the demographic makeup of the South's population. The social science research unit in Athens, GA has been working with the Southern Region and nationally to develop effective approaches, data, and delivery systems for tracking population, demographic, land development, and resource demand changes.

A national assessment was conducted to identify where the greatest impacts are likely to occur over the next decades. The book, *Footprints on the Land: Demographic Trends and the Future of Natural Resources in The United States*, due out this coming

fall, is the first nationwide treatment to interpret the meaning of population and demographic trends for the fields of forest and natural resources management. Areas of significant population, economic and recreation pressures on natural lands, public lands, protected wilderness, water/wetlands, and wildlife habitat have been identified. Identification of such "hotspots" provides information to Federal, State, local and private natural resource interests for developing comprehensive local strategies for sustaining the integrity and productivity of natural lands before the opportunities to do so are lost.

## Science for Tomorrow's Forests

### Understanding Recreation Demands

A Southwide data system, the Social, Economic, Environment, and Leisure Assessment (SEELA) has been developed to enable tracking population and demographic trends and the spatial distribution in the region. A Web-based delivery system ([www.hdf.itos.uga.edu](http://www.hdf.itos.uga.edu)) is on-line cooperatively among the Southern Region, SRS, and the University of Georgia to enable forest-level query

and analysis with mapping of analysis results. A GIS-based method for place identification and mapping of interactions between (1) population, urbanization, economic, and recreation demand changes and (2) natural lands, public lands, forests, water-wetlands, wildlife habitat, and wilderness has been developed and is being published for resource managers.

### Threatened and Endangered Species

Threatened and endangered species issues continue to dominate national forest management. While progress has been made in the conservation of the endangered red-cockaded woodpecker, there is still work to be done. Other threatened and endangered species and their habitats need strong research and conservation efforts. Four areas of particular concern currently are:

1. Forest bats: habitat needs and requirements for the Indiana bat and gray bat are the source of administrative appeals and litigation, but there are very few ongoing investigations and limited conservation work.
2. Upland pine/grass ecosystems: managers need strategies that focus on restorations of these upland pine ecosystems that are habitat for at

least 27 threatened and endangered species and over 75 sensitive species. SRS has ongoing activities investigating restoration efforts at Clemson, SC and Hot Springs, AR. Eleven national forests are undertaking projects in upland pine/grass ecosystem restoration.

3. Aquatic and riparian habitats: coldwater streams have received some attention, but warm-water streams need greater emphasis to provide better strategies for enhancement.

4. Freshwater mussel populations: 248 of 300 mussel species in the South are found in or near national forests and many are listed as threatened or endangered. Currently the national forests face many unanswered questions regarding the reproduction of those species.

# Science for Tomorrow's Forests

## International Activities

Much of the research and development carried out by the SRS has value beyond the South, nationally and internationally. The needs and



demands of the American people for benefits from forested lands are met, in part, by resources from many other countries. It is critically important that sustainable forest management

science and practices be advanced throughout the world. Our scientists continue their participation in the worldwide science community through attending international conferences – making presentations, displaying posters, and publishing papers. They host scientists from other areas and travel to other places to provide expert advice on a wide range of subject, for instance, controlling exotic invasive species of plants, insects, or disease.

The following examples illustrate the range of SRS international activities in FY00:

- Presented a paper at the Conference on Carbon Cycling in Boreal Ecosystems, Edmonton.
- Developed new research capabilities for assessing the carbon balance in managed wetland forests; Swedish Agricultural University, Umeå.
- Presented paper at Tenth World Water Congress and invited lectures by CSIRO (Forestry and CRC Sustainable Production Forestry) related to Chemical and Sediment movement in Forested Landscape and Pesticide Movement and Streamside Management Zone Effectiveness. Gave scientists concrete illustrations on how herbicides (when applied correctly) can often protect rather than harm forested ecosystems and associated water quality, when compared to alternative mechanical treatments.
- Presented research paper at 43<sup>rd</sup> Annual meeting of the International Association of Vegetation Science, “Restoring fire as an ecological process in shortgrass prairie ecosystem.” Followup field study tour and discussions with Environmental Management Staff with Japanese Ministry Officials on benefits of community involvement in the ecological restoration process.

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### International Activities

- Paper presented at 7<sup>th</sup> International Symposium on Society and Resource Management, Bellingham, WA, "Restoring the Longleaf Pine Ecosystem of the Southeastern United States." Summarized ecological, economic and social driving forces behind the ongoing restoration of longleaf pine in the Southeast.
- Served as representative to the Center for International Forestry Research (CIFOR) that is located in Malaysia and to determine the sustainability of tropical plantations.
- Served as principal organizer of 16th North American Forest Biology Workshop in Merida, Mexico. Several SRS scientists participated in the North American Forest Biology Workshop that was held in Merida in July.
- Funded by FAO to visit Mongolia to evaluate their nursery production facilities and make recommendations for improvement.
- Gave tours of the Southern Institute of Genetics to Chinese and Korean scientists.
- Participated in a biodiversity study of the Ivimka Research Station in a bottomland habitat of Papua, New Guinea. In collaboration with entomologists from the Silvard Institute and the Bohart Museum at the University of California at Davis, collected specimens using different techniques, including fogging of canopy trees.
- Visited the laboratory at the Shikoku Research Institute in Kochi, Japan. Gave seminars on several aspects of their research on the symbiotic relationships between woodwasps and wood decay fungi and developed ideas for collaborative projects. Visited the Yanase district which is one of the three major *Cryptomeria japonica* (Sugi) growing regions of Japan and studied the damage caused by the woodwasp *Urocerus japonicus* and its associated fungus *Amylostereum laevigatum*.
- Invited by Universidad Federal de Rio Grande de Sol, Dept. of Botany, to teach a two-credit, postgraduate Seed Physiology course.



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### International Activities

- Presented an invited seminar on seed research to Centro de Biotecnologia, FEPAGRO (Brazilian Dept of Agriculture), and a second university, Universidad de Pelotas, Department of Plant Sciences.
- Visited Danish Forest and Landscape Research Institute to begin a collaborative study on rehabilitating natural forests and plantations through enrichment planting, comparing light availability and seedling performance under several levels of overstory removals.
- Met with foresters and research staff of Coillte, COFORD (Council on Forestry Research and Development), the Forest Ecosystem Research Group (FERG) at University College Dublin, and Bord na Mona, the Irish Peat Board. Forest restoration, rehabilitation, and reclamation research and practice were reviewed.
- Assessed damage to the tree and nursery facilities in Nicaragua from Hurricane Debbie, at the request of the Foreign Agriculture Service and International Forestry.
- Presented an invited paper, *Determinacion de la viabilidad de las semillas a traves de imagenes obtenidas usando Tomografia Computarizada y Resonancia Magnetica*, and two posters at the II Simposio sobre Avances en la Produccion de Semillas Forestales en America Latina in Santo Domingo, Dominican Republic.
- Attended the International Conference on Forest Ecosystem Restoration, held at the Agricultural University (BOKU), Vienna, Austria. Presented two posters, "Promises and pitfalls of reference wetlands in forested ecosystem restoration" and "Soil quality and productivity responses to watershed restoration in the Ouachita Mountains of Arkansas, USA."
- Presented a paper, "Restoration of Temperate and Boreal Forests," at the International Union of Forestry Research Organizations (IUFRO) meeting in Chengdu, China on "Forest Ecosystems—Ecology, Conservation, and Sustainable Management".



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## International Activities



- Presented a seminar entitled “Dendroecological Analysis of *Cordia alliodora*, *Pseudobomax septenatum*, and *Annona spraguei* along a Climate Gradient in Central Panama” at the Universitat für Bodenkultur in Vienna, Austria.
- Attended the IUFRO World Congress in Kuala Lumpur, Malaysia. Helped IUFRO Secretariat organize the technical program and helped edit the congress proceedings. Presented a poster, “Ecology and reproductive biology of pondberry (*Lindera melissifolia* [Walt] Blume)” and a paper “Dendroecology of *Fagus grandifolia* var. *mexicana*, a beech species growing in an extinct volcano in Mexico.”
- Helped organize an international conference on *Sustainability of Wetlands and Water Resources*, held at the University of Mississippi in Oxford. The conference proceedings will be published as a Southern Research Station General Technical Report.
- Began a consultation with Alberta Environment, which is the agency governing water quality regulations for this Canadian province. Assisted in data review and planning and recommended a combination of field and laboratory studies for assessing reproductive effects in fish.
- Invited presentation to scientific organization, British Society of Plant Pathology, Presidential Meeting, Oxford.
- Invited lecture to scientific organization, Third International Congress on Symbiosis, Marburg, Germany.
- Attended International Research Group Conference on Wood Preservation in Kona, HI and presented the paper, “Detrimental effects of boric acid on symbiotic protozoa in *R. flavipes* and *C. formosanus* (Isoptera: Rhinotermitidae).”
- Conducted research in the Australia and Thailand on the ability of wood preservatives to protect against subterranean termites.

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### International Activities

- Attended/Presented at the 3<sup>rd</sup> European Panel Products Symposium, Llandudno, Wales, UK; Lectured at Chalmers Institute of Technology, Polymer Science Department, Göteborg, Sweden; visited with researchers at Oxford University and Shell Renewables; toured manufacturing facilities of Perstorp (Sweden).
- Worked with University of Wales, Bangor, Wales on the characterization of wood and wood fiber properties.
- Coordinated research project with The BioComposites Centre (University of Wales, Bangor, Wales) that utilizes their pilot-scale pressurized-disc refiner to study the effect of refining pressure on southern pine fiber characteristics.
- Directed research with University of Bordeaux-II, Bordeaux, France on the complexation behavior of tannins with protein segments.
- Hosted visiting scientists from the Chinese Academy of Forestry (Dr. Fu Feng and Dr. Wu Shuhong). Experiments were completed on the product potential of short-rotation woody crops and process optimization for the phenolation of preservative-treated wood.
- Established collaborative research with Kyoto University, Japan to study recycling of preservative-treated wood by liquefaction of the wood with phenol.
- Initiated cooperative research with Dr. Higuchi (Kyushu University, Japan) to develop co-reacted soy/phenol-based wood adhesives.
- Collaborated with USAID, USDA Forest Service International Programs, Tropical Forest Foundation and Funda o Floresta Tropical to investigate the economic costs and benefits of reduced impact logging in the eastern Amazon.
- Accepted an adjunct faculty position at Beijing Forestry University, Beijing China with the intent of increasing collaboration on soil erosion modeling.
- Presented over a dozen formal and informal lectures in association with two separate trips to China. The Southern Global Change Program continued to collaborate with Chinese scientists and hosted a visit from one Chinese graduate student.