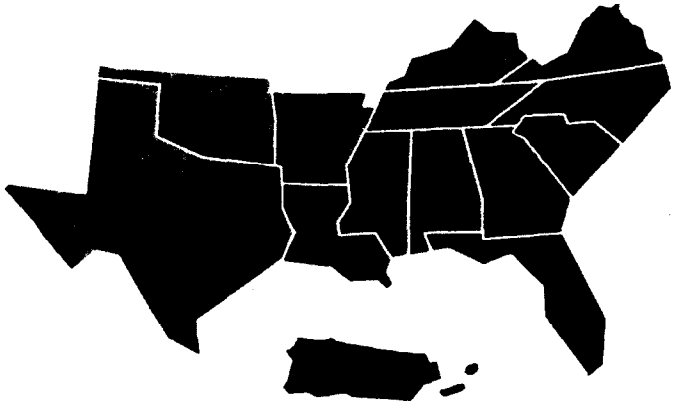
SOUTHERN REGION



Program of Research for Forests and Associated Rangelands

Prepared by

A Joint Task Force of U.S. Department of Agriculture and National Association of State Universities and Land Grant Colleges

U.S. Department of Agriculture • Forest Service
General Technical Report SO-19

SOUTHERN REGION FOREST
RESOURCES PLANNING GROUP
INSTITUTIONS

State Agricultural Experiment Stations and Forestry Schools

Auburn University
University of Arkansas, Fayetteville and Monticello
University of Florida
University of Georgia
University of Kentucky
Louisiana State University
Louisiana Technological University
Mississippi State University
North Carolina State University
Oklahoma State University
Clemson University
University of Tennessee
Stephen F. Austin State University
Texas A&M University
Virginia Polytechnic Institute and State University

U.S. Forest Service

Southern Forest Experiment Station
Southeastern Forest Experiment Station
Northeastern Forest Experiment Station
Forest Products Laboratory

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National Program of Research for Forests and Associated Rangelands

U.S. Department of Agriculture in Cooperation with the National Association of State Universities and Land Grant Colleges

August 1978

Cochairmen
Southern Regional Planning Committee

Dear Cochairmen:

We are pleased to send you the National Program and Southern Regional Plan of Research for Forests and Associated Rangelands. These programs were developed as a joint effort between the U.S. Forest Service, SEA-CR, and the forestry schools.

Through regional and national conferences, we obtained suggestions from governmental, industrial, consumer, environmental, and conservation organizations having an interest in forestry research. These programs reflect the advice given to us by those organizations.

This planning effort is directed toward several objectives. First, to guide forestry research planning in the Science and Education Administration and the participating forestry schools. Second, to provide the basis for the research portion of the 1980-85 Forest Service program required by the Resources Planning Act. And third, to provide a reference base for future planning.

Sincerely,

R. G. MERRIFIELD
Cochairman
Southern Regional Forest Resources Planning Group

LAURENCE E. LASSEN
Cochairman
Southern Regional Forest Resources Planning Group

Enclosure

FOREWORD

This research plan for the Southern Region is a companion publication to the National Program of Research for Forests and Associated Rangelands. While the national program reflects both regional and national priorities, this plan provides details on forestry research matters concerning the South. For the reader's convenience, background information on development of this regional-national planning effort is also presented.

Although this is not the first coordinated effort to plan forestry research in the South, it is unprecedented in the extent to which research needs have been identified by a broad cross section of public land management agencies, industries, environmental and citizen groups, and professional organizations.

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THE PLANNING PROCESS

On July 16, 1976, the Agricultural Research Policy Advisory Committee, a joint committee of the U.S. Department of Agriculture and the National Association of State Universities and Land Grant Colleges, requested its member organizations to prepare a National Program of Research for Forests and Associated Rangelands. The Deputy Chief for Research, U.S. Forest Service, and the President of the Association of State College and University Forestry Research Organizations were designated cochairmen of a steering committee for this effort. The Regional Director, North Central Region, State Agricultural Experiment Station Directors, and the Deputy Administrator, Cooperative State Research Service, USDA, were appointed members of the committee.

Long-range planning of forestry research on a coordinated basis is not new to the South. Actually, development of this regional plan extends efforts begun in 1972 within the framework of the Regional and National Agricultural Research Planning System-an iterative planning process to identify and solve local, regional, and national problems affecting agriculture and forestry. This planning system is headed by a national committee that coordinates activities of four regional planning committees—Northeastern, North Central, Southern, and Western. It operates continuously, projecting new S-year research efforts every two years.

The Research Program Group on Forest Resources (RPG-2) was established by the Southern Regional Planning Committee in 1972 to aid development and continuous evaluation of forestry research in the South. In 1974, all Research Programs (RP's) were thoroughly evaluated by six task forces composed of scientists with the disciplinary knowledge needed to identify principal needs. Reports of these task forces, which were distributed to research administrators and scientists throughout the South, provided much background for the current planning effort.

In planning the development of a National Program of Research for Forests and Associated Rangelands, the National Steering Committee determined that two major facets of the program required study-its conduct and its content. Program conduct was studied at the national level during a three-day Forest and Rangelands Symposium. The

report, "A Review of Forest and Rangeland Research Policies in the United States," was published in 1977 under sponsorship of the Renewable Natural Resources Foundation.

To examine the content of the program, cochairmen of the four regional Research Planning Groups held regional working conferences to get opinions on research needs from a broad spectrum of public and private consumer and user groups. Later, a national working conference brought together results of the policy study on program conduct and the four regional conferences on content to provide perspective to the entire planning effort. This approach responded to the Forest and Rangeland Renewable Resources Act of 1974, which requires forestry research planning to be a continual process, with ample opportunity for public participation.

With direction from the National Steering Committee, regional working conferences were held in Philadelphia, Minneapolis, New Orleans, and San Francisco during July 1977. In preparation for these conferences, a National Reference Document was prepared by a joint task force of the U.S. Department of Agriculture and National Association of State Universities and Land Grant Colleges. Its purpose was to provide attendees to the working conferences with background information on the overall scope of forest and rangeland research, including past accomplishments, current programs, and research administrators' suggestions for emphasis in 1980 and 1985. At the same time, a Southern Regional Reference Document was published as a companion to the national document. It provided scientist and research administrator views of emerging research needs specific to the South, and projected research efforts in terms of scientist years (SY's) for 1980 and 1985.

This research plan for the Southern Region is based in part on results of the working conference held in New Orleans, Louisiana, on July 27-28, 1977. About 120 representatives of public and private consumer and user groups in the South attended the conference and identified a total of 533 problems.

In December 1977, seven task forces composed of university and Forest Service research scientists evaluated the conference results. Each task force consisted of six to nine persons representing disciplines within the subject areas of concern. Evaluation consisted of examining problem classification by subject area, determining whether or not problems were researchable, and rating their relative importance, considering user needs together with scientific opportunity and likelihood of successful solution. The final step involved redistribution of the 1980 and 1985 SY projections contained in the Southern Regional Reference Document to reflect both user needs and scientific opportunities. Thus, the scientist task forces played a critical role in the planning effort by melding the concerns of users and scientists into a workable research plan.

Final projections and plans reported in this document were developed by Forest Service and university representatives. The plan is based on results from the Southern Regional Working Conference, together with the scientist task force evaluation. Consideration was also given to results of the National Conference and the subsequent assessment by the scientist task forces.

ROLE OF THE SOUTH

When forestry leaders speak of meeting wood product demands in 1985 and beyond, all eyes turn southward. The soil, climate, and topography of the South combine to form near ideal conditions for the growth and harvesting of trees. So much so that southern forests are expected to produce half the Nation's wood products needs by the year 2000, while providing livestock forage, clean water, wildlife habitat, and recreational opportunities.

A writer once said that the South's true fascination lies not in its rich heritage but in its dramatic potential. This holds doubly true for its forests. The most recent national timber review found that southern timberlands were producing 30 percent more pine sawtimber than was being harvested, yet the average acre of forest land in the South is capable of growing two to three times more timber than at present. While over 60 million acres of forested rangelands are now providing forage for cattle, production from such lands can be increased greatly by using management guidelines developed by research. Populations of many wildlife species and opportunities for recreation in the South can be increased through new forest management techniques.

This potential offers a unique challenge to forestry research, because most of the gain in forest goods and services must come from small, nonindustrial ownerships that control 72 percent of the forest land. And the key to meeting the South's goals lies in more intensive management and better utilization practices. Developing ways of achieving these two objectives would be challenging enough, but research also must foresee and provide acceptable solutions to attendant problems that arise. For example, insects and diseases will become more important as intensive management increases. Wildfires will become more costly as forest investments rise and plantations of genetically improved trees are established. Soil productivity and water quality will gain higher priorities for future research, as will impacts for wildlife and recreation usage.

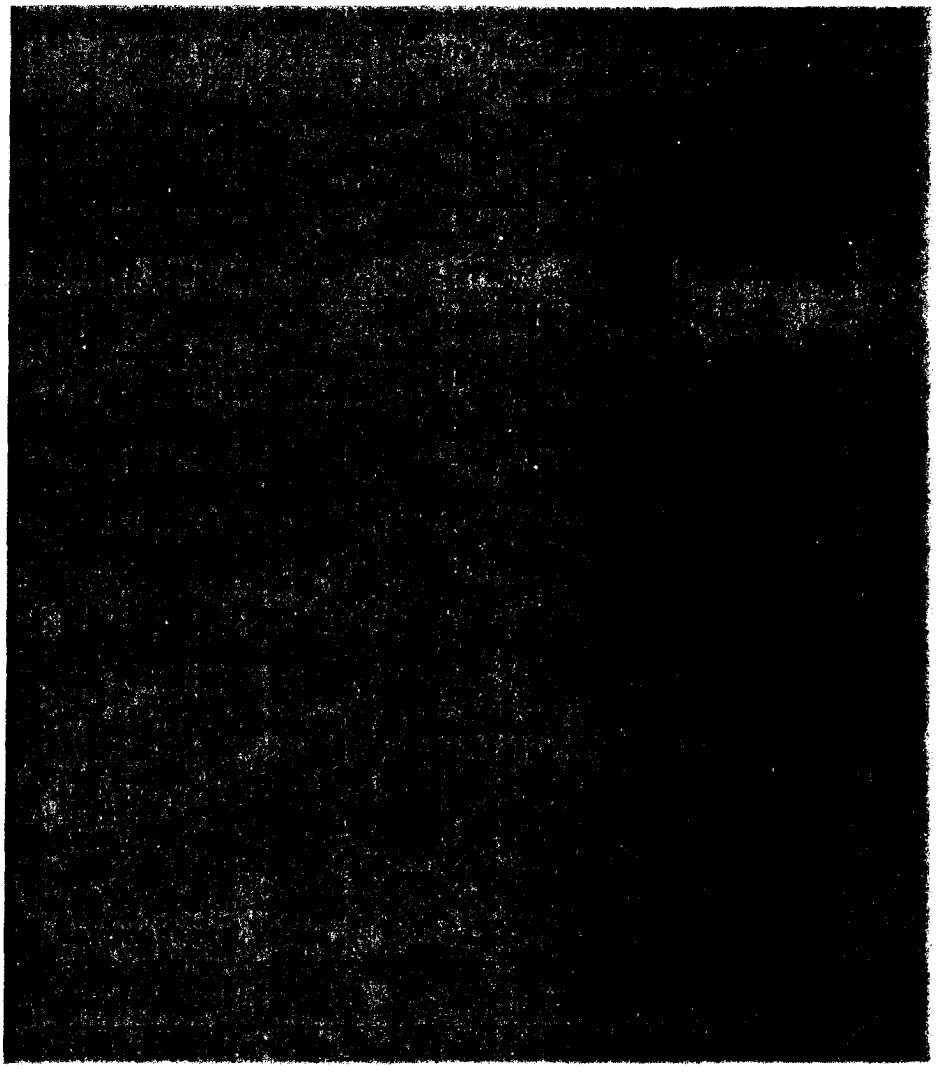
While considerable research attention will still be given to pine forests, overall land management and production goals cannot be met without an advancement in hardwood silviculture and utilization. This includes bottomland hardwoods that are decreasing in quantity each year due to agricultural encroachments, and low-grade hardwoods on sites where pine would be more productive. Rehabilitation of degraded upland and mountain forests will be necessary to meet demands for large, high-value hardwoods now in short supply. Too, utilization of small, low-grade hardwoods must be improved to supplement burgeoning demands on softwoods, and permit reforesting depleted stands with more desirable species.

Forestry research in the South encompasses all this and much more. To a very great extent, the success of future research in contributing to forestry progress will depend upon the priorities and directions decided upon right now.

PRESENT AND PROJECTED FORESTRY RESEARCH EFFORT

The University-Forest Service research effort in the Southern Region is outlined here for the base year 1975, with projections for 1980 and 1985, in terms of scientist years (SY's) of research work. As shown by the accompanying table, plans call for increasing the effort 36 percent by 1980, and 59 percent by 1985. A further breakdown of these data, showing present and projected SY's for universities and the Forest Service separately, appears in the Appendix.

Information is presented on current program emphasis, and priorities are listed for continuing and new research. These priorities represent the research needs identified and rated during the regional working conference and evaluated by the scientist task forces. Many of these priority research needs were highlighted in the six 1974 Task Force Reports, prepared under the guidance of the Research Program Group on Forest Resources (RPG-2).



MULTI-RESOURCE INVENTORY, APPRAISAL, AND EVALUATION

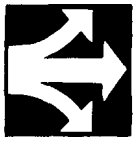
Inventory is vital to any business, and forestry is no exception. To meet future demands for forest goods and services from the South's 200 million acres of forest land, we must keep a constant check on supply of resources available. Predictions of future demands must be based on reliable data that reflect the ever-changing mood and tempo of the nation. Ownership patterns must be monitored continually, for management objectives differ widely among various ownerships. And, because the forest land base is decreasing each year, better ways to accommodate multiple uses in conjunction with increased timber production on available acreage are imperative.

	Scientist Years		
	1975	1980	1985
Multi-resource Inventory and Appraisal	22	45	45
Alternative Uses of Land	1	3	3
Multiple-Use Potential and Evaluation	6	10	11
Total	29	58	59

Multi-Resource Inventory and Appraisal

Current Program Emphasis

- *Status and trends* of *the timber resources* of *each southern state. This* is *determined in statewide* surveys every 10 years, with *updating for some states at 5 years.*
- *Statewide analyses* of *forest land management opportunities, ownership patterns, timber products output, and potential* for *expanding the forest-based economy.*
- *Regional analyses to answer specific questions. For example: supply* of *utility poles, extent* of *land clearing* for *agriculture, and hardwood distribution on poor sites.*
- *Basic techniques for collection, compilation, and evaluation* of *statistical data on forage for livestock and on wildlife habitat.*



Priorities for Continuing and New Research

- *Shorten Forest Survey cycles* for *up-to-date information on important changes in resource base.*
- *Develop methods to define commercial forest land* so inventory *data show* actual *availability* of *timber, game, and other resources,*
- *Develop methods to inventory ecosystems, their biological components, and the physical environment.*
- *Provide ground control techniques to facilitate high-altitude remote sensing for multi-resource evaluation.*
- *Improve the availability and usefulness* of *multiple resource data.*

Alternative Uses of Land

Current Program Emphasis

- Economic feasibility of combining *timber production with other land uses such as forage production* for *livestock and habitat for wildlife.*
- *Institutional factors affecting land use. These include taxes, ownership patterns, credit sources,* government and private *assistance programs, laws, and population growth.*
- *Future forest land requirements for uses such as agriculture, highway rights-of-way, and urban and industrial development.*

Priorities for Continuing and New Research

- *Identify the* effects of *each use* of *forest land on the long-term productivity* of *that land.*
- *Develop* forest *land taxation alternatives to simplify and stabilize forest management.*
- *Compile information to compare forestry returns with alternative uses* of *land and capital.*
- *Examine owner objectives in relation to owner characteristics, ownership size, tenure, and planning horizon.*
- *Determine economic trade-*offs *between intensive timber management practices and production* of *forest game and forage for livestock.*

Multiple-Use Potential and Evaluation

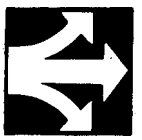
Current Program Emphasis

- Effective ***allocation*** of ***cost-sharing funds*** in ***forestry incentive programs.***
- ***Methods for ranking forestry investments.***

. ***Impacts on forest resources*** of ***changing land-use patterns.***

. ***Ways to maximize returns*** from forestry ***investments.***

. ***Response*** of ***forest owners to public and private forestry assistance programs.***



Priorities for Continuing and New Research

. ***Derive management systems for optimum mix*** of ***timber, wildlife, recreation, and other benefits.***

- ***Evaluate impact*** of ***anticipated high demands on the forest resource for energy.***

. ***Develop methods*** for ***quantifying intangible values for non-marketable forest resource uses and benefits.***

- ***Compile cost-benefit data*** for ***single resources or multi-resource combinations on small woodlands.***

. ***Find new approaches to arbitrating resources allocation issues on public lands.***

. ***Define and evaluate alternative public programs directed toward multi-resource management, particularly small ownerships.***

TIMBER MANAGEMENT

Obviously, to meet future demands for forest goods and services and still produce the needed timber supplies, we must increase timber production per acre. In the South, this translates into the culture of about 70 pine and hardwood species from forest establishment through harvest to reestablishment. Genetic improvement and economics are important elements of this program area.

	Scientist Years		
	1975	1980	1985
Biology, Culture, and Management of Forests and Timber-Related Crops	95	120	130
Genetics and Breeding of Forest Trees	33	32	34
Economics of Timber Production	17	27	31
Total	145	179	195

Biology, Culture, and Management of Forests and Timber-Related Crops

Current Program Emphasis

- *New reforestation methods to insure restocking* of *harvested areas and reclaim abused land with desired species, For example: use* of *containerized planting stock, inoculation* of *seedlings and soils* with specific *mycorrhizal fungi, and encapsulation □↗ seed for direct seeding.*

- *Influence* of site *and cultural practices on stand yield and quality.*

- *Methods* for *integrating other* forest *land uses with timber production. For example: requirements ↗□□ maintaining habitats* of *endangered species such as the red-cockaded woodpecker.*

- *Ways to increase production □↗ timber-related crops. For example: recent studies indicate that oleoresin yields can be increased 50-100 percent with use □↗ genetically improved stock and improved extraction techniques. New research has shown that injections* of *paraquat and diquat can stimulate production* of *resin in the living tree.*

. Data on growth and yield of intensively cultured slash and loblolly pines, including genetically improved strains, by age, site, and stand (plantation) density.

■ *Improved nursery practices for pines and hardwoods, especially genetically improved strains. The objective is to produce uniformly good physiological grades* of *seedlings with consistently high field survival and rapid early growth.*

. Improved methods and intensities of *site preparation for controlling competing vegetation and establishing desirable species.*

. Upland, mountain, and bottomland hardwood management guides for use in natural stands and plantations for optimum yield of *wood products.*

• *Effects* of *management practices, including fertilization and site preparation, on soil and site properties. Particular attention is given to long-term productivity under short rotations.*

■ *Alternative methods* of *regenerating and managing natural stands* of *pine and pine-hardwood types for different landowner objectives.*

Priorities for Continuing and New Research

■ *Provide managed stand growth and yield information.*

. Develop timber management guides for *intensive culture* of *southern pines, including use* of *fire.*

■ *Develop total biomass volume tables by site, species, and diameter.*

• *Provide multi-product growth and yield information* for *both natural stands and plantations* of *pines, hardwoods, and mixed species.*

• *Perfect minimum site preparation techniques to protect sites, reduce costs, and achieve desired stocking.*

■ *Develop practical methods* of *regeneration, TSI, thinning, and management* for *partially stocked stands.*

■ *Improve techniques for regenerating and growing natural stands,* of *hardwoods, including those in bottomlands.*

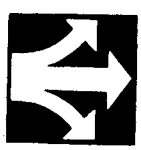
Genetics and Breeding of Forest Trees

Current Program Emphasis

■ *Identification* of *genetic variation and superior traits of more than 15 major hardwood and softwood species in the South. Much* of *this is being accomplished by extensive experimental plantings.*

■ *Improved sexual and asexual reproduction methods to mass produce seedlings with desirable traits. Through genetic improvement, growth increases* of *10 to 25 percent with southern species have been obtained. Such results have encouraged establishment* of *nearly 8,000 acres* of *plantations for the production* of *improved seed.*

. Seed orchard management strategies to insure consistently higher yields of *superior seed.*



Priorities for Continuing and New Research

■ *Expand breeding program for fusiform rust resistance.*

• *Develop breeding strategies for advanced generations.*

• *Improve seed technology.*

. ***Breed improved strains*** of ***oaks, yellow-poplar,*** walnut, ***and other high-value hardwoods that show rapid*** initial ***growth.***

Economics of Timber Production

Current Program Emphasis

. ***Factors affecting costs and benefits*** of *thinnings—commercial* ***and noncommercial.***

■ ***Opportunities and values*** of ***timber stand improvement, with emphasis on cost-sharing with owners*** of ***small, nonindustrial*** forests.

. ***Economic*** effects of ***converting millions*** of ***acres*** of ***land with low-quality hardwood to pine, in response to rising softwood demands.***

• ***Systems to evaluate timber management alternatives based on net income resulting from various management levels, thinning regimes, product combinations, and rotation lengths.***

Priorities for Continuing and New Research

■ ***Evaluate potential returns*** for ***a range*** of ***cultural investments in forest management.***

. ***Relate yield to varying levels*** of ***site preparation to provide best economic prescriptions.***

■ ***Provide economic analysis*** of ***energy demands in forest production.***

. ***Investigate economics*** □↗ ***multi-product wood production.***

■ ***Compare industrial and governmental landowner assistance programs for efficiency and*** effects ***on resource base.***

FOREST PROTECTION

The southern pine beetle is the major/pest in our southern forests. During the past **10** years, this insect has infested more than 40 million acres. But, while the beetle is a major threat, it is by no means the only enemy of southern trees. Other insects, diseases, and wildfire are so menacing that, together, they annually claim more volume of timber than is harvested in any given year.

	Scientist Years		
	1975	1980	1985
Control of Insects Affecting Forests	41	45	45
Control of Diseases, Parasites, and Nematodes Affecting Forests	33	35	35
Prevention and Control of Forest and Range Fires	18	14	15
Total	92	94	95

Control of Insects Affecting Forests

Current Program Emphasis

. *Methods for estimating current population levels and predicting future levels* of *southern pine beetle activity.*

■ *Investigation* of *toxicants and behavioral chemicals for controlling* insect *populations.*

. *Relationship* of *bark beetle activity to soil, site, individual tree, and stand* factors.

. *Procedures for monitoring impacts* of *cone and seed insects in orchards.*

. *Techniques and strategies that will protect pine regeneration from pests during the susceptible first 2 to 3 years* of *growth.*

. *Improvement* of *silvicultural controls for pine and hardwood plantation insects (sawflies, tip moths, defoliators, etc.) and supplementation* of *existing natural controls.*

. *Silvicultural practices* affecting *hardwood borers such as the carpenterworm. Also included are studies* of sex *attractants, chemical and microbial insecticides, and impact assessment.*

. *Biological and ecological factors that contribute to cyclic population outbreaks* of *hardwood defoliators such as tent caterpillars.*

Priorities for Continuing and New Research

■ *Develop techniques to prevent, contain, or suppress southern pine bark beetle outbreaks.*

. *Find* ways *to control cone and seed insects in southern pine seed orchards.*

. *Improve methods* of *predicting population dynamics* of *important forest insect pests.*

. *Develop environmentally acceptable, specific insecticides, and biological control techniques for important forest insect pests.*

. *Assess environmental and economic impacts* of *important* forest *insect pests.*

Control of Diseases, Parasites, and Nematodes Affecting Forests

Current Program Emphasis

■ *Control* of *pine nursery and regeneration diseases, which account* for *20 to 30 percent* of *annual seedling losses. Research includes epidemic prediction, chemical controls, and identification* of *microorganisms and cultural practices for biological control.*

. *Control* of *fusiform rust—the most important disease* of *southern pines. Research on this problem has centered on control in the nursery and development* of *rust-resistant pines.*

■ *Control* of Fomes annosus *root* rot- *the second most important disease* of *southern pines.*

. *Control* of *decay fungi in southern hardwoods.*

. *Causes* of *pitch canker-a disease which threatens thousands* of *acres* of *slash pine plantations and causes serious problems in slash and loblolly pine seed orchards.*

. *Control* of *brown-spot needle blight- the most important disease* of *longleaf pine. Research is centered on developing chemical and silvicultural controls and disease-resistant trees.*

Priorities for Continuing and New Research

. *Improve control techniques for cone and seed diseases in southern pine seed orchards.*

■ *Determine influence* of *current and proposed forest management practices on disease incidence and resultant damage:*

■ ***Develop techniques to prevent, contain, or suppress fusiform*** rust ***outbreaks, including tree improvement.***

. ***Evaluate and develop environmentally acceptable and specific chemicals for important forest disease pests.***

Prevention and Control of Forest and Range Fires

Current Program Emphasis

■ ***A multiple-index fire danger rating system.***

■ ***Use*** of ***prescribed fire to*** reduce wildfire occurrence ***and intensity.***

. ***Properties.*** of ***various forest fuels and their behavior during combustion.***

■ Application of sociological ***knowledge to problem*** of ***forest arson.***

. ***Physics and chemistry*** of ***combustion.***

Priorities for Continuing and New Research

■ ***Find*** ways to predict ***blowup fire conditions.***

. Perfect ***decision-making models for fire prevention and control.***

. ***Assess*** damaging ***and beneficial*** effects of ***wildfire on forest resource values.***

■ ***Develop guidelines for reliable, local fire danger rating system.***

HARVESTING, PROCESSING, AND MARKETING OF WOOD PRODUCTS

Thirty years ago, forestry operations in the South from the stump to the actual sale of forest products differed little from the days of Jim Bowie, who operated a peckerwood mill in Louisiana. Since, that time, the South has experienced a veritable industrial revolution, in the woods and mills, brought on by rising costs, increased demands for wood products, and scarcity of labor. This revolution must continue, for the lack of suitable processes, markets, and equipment may be a major limiting factor in the advancement of forest land management.

	Scientist Years		
	1975	1980	1985
Harvesting and Forest Engineering Systems	4	13	15
Properties, Processing, and Protection of Wood	52	59	63
Economics and Marketing of Wood Products	2	8	11
Total	58	80	89

Harvesting and Forest Engineering Systems

Current Program Emphasis

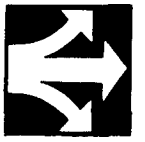
. ***Harvesting systems and*** *equipment to achieve maximum utilization of each tree at minimum cost per unit volume. The* ***recently developed tree puller*** *can harvest and bunch pine up to 12 inches in diameter, with the central root mass intact, at a rate of 1.5 to 2 trees per minute. The machine is being evaluated on hardwoods up to 8 inches in diameter,*

. ***Methods*** of *harvesting* ***forest residues*** for fiber ***and fuel.*** *The mobile chipper, recently designed and being constructed,* should harvest logging slash and *residual standing trees and collect the chips for subsequent use.*

■ ***Special*** logging systems *for adverse sites. For example: studies are investigating the economic feasibility* of *high-lead cable logging in steep terrain and wet sites, using small mobile-type systems.*

. *Machines and associated* equipment best suited to ***supplying*** *material to whole-tree chipping operations. More complete utilization has been brought closer to realization by the concept* of *whole-tree chipping.*

. ***Productivity*** of ***conventional*** *harvesting systems as related to specific equipment combinations, crew size, and site characteristics.*



Priorities for Continuing and New Research

. ***Develop efficient, acceptable harvesting*** and ***regeneration systems*** *for nonindustrial, private ownerships.*

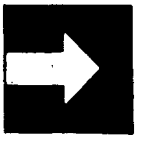
■ *Find new methods to conserve* ***energy inputs into forest*** *production.*

■ ***Perfect system*** of ***producing*** *whole-tree chips on site for* ***flaking or fiber processing, economically*** *delivered to the mill.*

• *Develop equipment for harvesting total biomass with minimum soil impact.*

. ***Compute detailed data on*** *efficiency and costs of logging systems.*

Properties; Processing, and Protection of Wood



Current Program Emphasis

. ***Structural flakeboards,*** *medium-density fiberboards, composite-type panel materials,* and ***composite lumber*** from pine ***and hardwood for exterior and*** *interior use in building construction.*

. ***New adhesive systems from*** *nonpetrochemicals, such as bark extract, and improved adhesives* ***for southern pine plywood and*** *reconstituted wood.*

. ***Systems approach to coordinate*** *the harvesting,* ***breakdown, processing, and drying of furniture parts from low-grade*** *hardwoods.*

■ ***Better protective wood*** *finishes to meet southern climate conditions. Several stain and copper-chromium finishes* ***have been developed that pro-*** vide attractive, ***and long-lasting*** *finishes on southern pine in* ***exterior exposure. A new wood preservative treatment has been developed that reduces pollution,*** *permits multi-treatments, and is cost effective.*

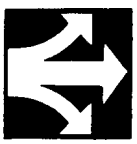
■ Basic research *on fundamental properties* of *wood. This work* is *broad in scope, ranging from studies on anatomical and physical properties to the chemical composition* of *wood and bark from both pines and hardwoods.*

■ *High-yield, nonpolluting* mechanical *pulping process* for *southern pines.*

■ *New methods* for *protecting wood in storage and use* from insects *and decay.*

. *High-temperature drying* of *southern pine. A system has been developed that is more energy efficient and faster than previously used systems.*

. *Systems to make wood processing industries energy self-sufficient. A new green-fuel burner is being developed to direct-fire dry kilns.*



Priorities for Continuing and New Research

■ *Make more efficient use* of *low-quality hardwoods.*

. *Increase use* □↗ *hardwoods* for *fiber, solid wood products, and fuel.*

. *Develop durable and economical construction systems that make efficient use* of materials and *have low energy requirements.*

■ *Improve adhesives and processing systems* for *producing high-performance wood products.*

■ *Reduce processing energy* and *increase yield in manufacture* of *wood products.*

Economics and Marketing of Wood Products

Current Program Emphasis

. *Weight* scaling of logs for *measuring products other than sawtimber and reflecting volumes* of *finished products.*

. *Simplification* of *forest product specifications.*

. *Role* of *retail building supply dealers and building contractors in marketing building materials.*

. *Methods* for *marketing wood residues.*

Priorities for Continuing and New Research

. Evaluate *economics* of *recovering logging residues, versus use* of *alternative fuels,* for *plant energy. Develop marketing programs* for *these residues.*

■ *Investigate use* of *wood by-products for energy.*

. *Determine markets for small diameter timber where growth exceeds drain.*

• *Compare economics* of *in-woods sorting to merchandising at* a mill *yard.*

■ *Identify merchantable harvesting limits as affected by fuel values.*

FOREST WATERSHEDS, . SOILS, AND POLLUTION

Any use of forest lands has environmental impact— good and bad. As forest management intensifies in the South, protection and enhancement of site productivity and air and water quality become even more important considerations.

	Scientist Years		
	1975	1980	1985
Watershed Protection and Management	19	29	36
Soil, Plant, Water, and Nutrient Relationships	3	12	16
Alleviation of Soil, Water, and Air Pollution	10	23	35
Total	32	64	87

Watershed Protection and Management

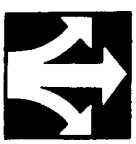
Current Program Emphasis

. ***Levels*** of ***sediment and*** nutrients in surface runoff ***and ground water that occur naturally on forested watersheds.***

. ***Source*** of excessive ***sediment and stormflow in forested areas.***

▪ ***Magnitude and duration*** of ***nutrient, water, and soil losses induced by intensive*** forest practices, ***including harvesting, road building, and site preparation.***

. ***Forest practices guides that permit forestry operations without adverse impact on environment.***



Priorities for Continuing and New Research

▪ ***Develop forest management alternatives that minimize nonpoint source pollution and meet quality standards.***

▪ ***Identify impact*** of ***intensive site preparation on quality and yield*** of ***water on different types*** of ***watersheds.***

▪ ***Develop guidelines to minimize soil erosion and sedimentation resulting from*** road ***building, harvesting, and site preparation.***

. ***Evaluate impacts*** of vegetation ***control methods-chemical, mechanical and*** fire-on ***water quality and quantity.***

. ***Collect data to develop*** criteria for ***stream side management.***

Soil, Plant, Water, arid Nutrient Relationships

Current Program Emphasis

▪ ***Nutrient cycling and physical and biological conditions within natural forest ecosystems. From these base data, changes caused by varying levels*** of ***forest management can be identified.***

. ***Silvicultural practices that maintain and enhance forest soil productivity on a wide variety*** of ***sites.***

Priorities for Continuing and New Research

. ***Quantify short- and long-term effects*** of ***intensive culture and complete-tree utilization on physical and chemical soil properties.***

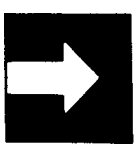
. ***Develop predictive models for site productivity based on soil-plant-water nutrient relationships.***

. ***Identify types*** of ***nutrients depleted or lost from soil through intensive culture and complete tree utilization. Develop guidelines to replace nutrients lost.***

▪ ***Identify relationship between prescribed burning, nitrogen loss, fertilization, costs, and environmental risks.***

. ***Develop silvicultural treatments to alter nutrient cycling.***

Alleviation of Soil, Water, and Air Pollution



Current Program Emphasis

. ***Methods*** of ***prescribed burning with minimal impact on air quality.***

. ***Site treatments that minimize adverse*** effects of ***timber harvesting*** operations on ***the soil and water resource. Short-term*** effects of ***skid, trails, landings, and temporary roads are included in these studies.***

. ***Effects*** of ***land- and water-use*** practices ***on*** quality of ***water entering streams and reservoirs.***

Priorities for Continuing and New Research

. ***Develop site preparation and harvesting methods to minimize soil disturbance and maintain soil quality.***

- ***Find*** ways ***to reclaim abandoned strip mine*** areas.
- Identify impact of forestry on ***water, air, and soil as compared to*** baseline ***levels.***
- ***Find environmentally acceptable techniques*** for ***use and disposal*** of ***various waste materials and their combinations.***
- ***Analyze short-*** and ***long-term*** effects ***of pesticide application*** on soil, water, and ***air.***

FOREST RANGE, WILDLIFE, AND FISHERIES HABITAT DEVELOPMENT

Outputs from southern forests include far more than timber. At last count, more than 60 million acres of forest range were being grazed by livestock, either seasonally or yearlong. With proper management, both the total acreage grazed and the utilization of forage can be increased without harming wildlife habitat. Even under intensive forest management, southern pine forests provide relatively high yields of forage that can support a substantial cattle industry. The importance of southern forests to wildlife is readily recognized, with virtually every acre of forest land serving as habitat for one or more species of game or nongame birds and mammals. The job of research in this area is to develop ways to produce timber, forage, and a wide variety of wildlife and fishery habitats through integrated management practices.

	Scientist Years		
	1975	1980	1985
Management of Range Resources	3	6	13
Wildlife and Fish Habitat	17	35	49
Total	20	41	62

Management of Range Resources

Current Program Emphasis

. ***Responses*** of ***vegetation and livestock to timber management measures.***

. Grazing systems and herd ***management practices that improve quality*** of ***range livestock*** and the amount and nutrition of, ***forage.***

. ***Range and livestock management programs that permit concurrent and harmonious production*** of ***timber and forage resources.***

. ***Range characteristics including the*** identity, physiological ***requirements, and nutritive value*** of forage ***plants*** for a ***wide*** variety of forest types.

. ***Methods for controlling undesirable range plants through fire, chemical, mechanical, and biological measures.***

Priorities for Continuing and New Research

• ***Identify the impact*** of ***grazing on each*** □↗ ***the other*** *multiple-use objectives* for ***forest land. Identify those grazing systems offering the best management alternative for multiple use.***

. ***Examine economics and impacts*** of ***livestock grazing programs on wildlife for the southern National Forests.***

. ***Provide range management cost/benefit analyses for major*** forest ***types.***

. ***Identify responses of forest vegetation to grazing.***

. ***Develop habitat management strategies for unique and endangered and threatened plant communities.***

Wildlife and Fish Habitat

Current Program Emphasis

. ***Habitat-management guidelines that permit production*** of ***both timber and game species, notably white-tailed deer, bobwhite quail, turkey, and squirrels.***

■ ***Habitat requirements for*** *nongame* ***birds and mammals*** and for endangered wildlife.

• ***Methods for improving forest wildlife habitat through*** such ***measures as seeding, planting, prescribed burning, spraying, and fertilizing.***

■ ***Predictive models for estimating wildlife carrying capacity for various forest sites under varying conditions of timber management.***

. ***Guides*** for ***managing*** *green-tree reservoirs as waterfowl habitat and for high-quality timber production.***

Priorities for Continuing and New Research

. ***Evaluate*** effects of ***intensive*** forest ***management practices on wildlife habitat and species diversity.***

. ***Determine impacts of*** *clear-cutting creek-bottom hardwoods on fisheries, wildlife, and wildlfe habitat.*

■ ***Develop optimum strategies for protecting and managing riparian lands for waterfowl and forest wildlife.***

. ***Identify impacts on wildlife*** of pine monoculture as opposed ***to mixed stands.***

. ***Determine*** effects of ***intensive*** game ***and timber management on the rest*** of ***the forest community.***

FOREST RECREATION AND ENVIRONMENTAL VALUES

Trees and forests provide a wide variety of amenity or nonconsumptive values that are steadily assuming greater significance to the American public. This is particularly true in the South, where use of forest lands for recration has increased almost 40 percent since 1970. The goal of research in forest recreation and environmental values is to identify these values and increase their availability to all user groups.

	Scientist Years		
	1975	1980	1985
Outdoor Recreation	15	9	20
Rural and Urban Environmental Enhancement	0	6	15
Total	15	15	35

Outdoor Recreation

Current Program Emphasis

- ***Impact of large numbers*** of ***people on forest ecosystems.***

. ***Guides for recreation site selection, design, and management techniques to accommodate crowds.***

. ***Psychological needs*** of ***people for recreation and their preferences.***

- Benefit/cost analyses of ***forest recreation alternatives.***

Priorities for Continuing and New Research

- ***Investigate new incentives*** to encourage recreational development ***in the private sector for public use.***

- ***Identify social*** loading ***capabilities, by recreational activity, for planning user density. Develop methods*** for determining ***use loading and design capacities*** of ***outdoor recreation facilities.***

- ***Develop*** effective ***approaches to interpret forest management practices to forest visitors.***

. ***Identify consequences of closure of private land to increasing recreation demand.***

- ***Develop benefit/cost ratios*** for outdoor recreation facilities ***and activities.***

- ***Determine the demand for the various types*** of ***recreation during the next 20 years.***

Rural and Urban Environmental Enhancement

Current Program Emphasis

- Selection of ***tree*** species ***and strains best adapted*** for ***urban areas and for special purposes.***

- ***Culture and improvement*** of ***greenbelts around urban areas.***

• ***Stress factors affecting tree growth in urban areas.***

Priorities for Continuing and New Research

. ***Predict effects of urbanization on forest lands for the next*** 20 years.

. ***Determine psychological benefits*** of ***urban greenbelts and metropolitan forests.***

- ***Develop techniques*** for ***intensive culture and management*** of ***tree species*** for ***urban use.***

. ***Identify impacts*** of ***federal indecision on investment in conservation programs by*** private landowners.

• ***Determine effects*** of ***the conversion*** of ***forest land to*** other uses ***on*** ecological ***balance.***

IMPLEMENTATION OF THE PLAN

Full implementation of the plan is contingent on funding, research staffing, facilities, and current research program commitments. Research planning information is used in the budget building process. Legislators at the local and national levels will be provided with these planning documents in support of budgetary requests. Shifts in emphasis are possible, however, with current resources through reprogramming. Also, new programs can be initiated as current studies are completed, such as the recent program efforts being developed in the key problem areas of nonpoint source pollution, maintenance of site productivity, and energy conservation. Scientists and research administrators will use the plan as a guide, both in developing new program initiatives and redirecting existing efforts.

Research planning is a continuous process. Scientists in the 1974 Southern Task Forces identified and evaluated research needs in six Task Force reports. The 1977 regional conference brought together research users who identified and rated current research needs, issues,, and concerns in the South. Finally, in 1978, task forces composed once again of scientists evaluated the problems identified in the 1977 conference. Continuation of the joint, long-range planning process will be necessary to meet future needs and changing priorities.

The National Program will reflect both regional and national issues and priorities of forestry research conduct and content. It will strengthen the research contribution to the 1980 recommended Resources Planning Act program, enhance Federal/State research planning cooperation, and insure the involvement of consumer and user groups in research planning. This regional plan, together with the National Program; will enhance coordination among research organizations in the South, and will provide documentation for identifying specific thrusts that are needed in the southern region. Ultimately the Forest Service and State Agricultural Experiment Stations and Forestry Schools in the South hope such highlighting of forest resources research will result in a greater awareness of these resources and more effective research directed toward their wise use and conservation.

APPENDIX

SOUTHERN REGION

(SY's) for Forestry and Associated Rangelands Research for the State Agricultural Experiment Stations and Forestry Schools (SAES + F. Sch.), and U.S. Forest Service (US-E Serv.) for 1975, 1980, and 1985.

Research Program and Research Problem Area	1975			1980			1985		
	SAES + US- F. Sch.	F. Serv.	Total	SAES + US- F. Sch.	F. Serv.	Total	SAES + US- F. Sch.	F. Serv.	Total
	Scientist Years								
Multi-resource Inventory									
Appraisal	7	15	22	12	33	45	12	33	45
Alternative Uses	1	0	1	2	1	3	2	1	3
Evaluation	6	0	6	8	2	10	9	2	11
Subtotal	14	15	29	22	36	58	23	36	59
Timber Management									
Biology	37	58	95	44	76	120	49	81	130
Genetics	17	16	33	16	16	32	17	17	34
Economics	11	6	17	17	10	27	18	13	31
Subtotal	65	80	145	77	102	179	84	111	195
Forest Protection									
Insects	14	27	41	19	26	45	20	25	45
Diseases	14	19	33	15	20	35	16	19	35
Fire	1	17	18	3	11	14	4	11	15
Subtotal	29	63	92	37	57	94	40	55	95
Wood Products									
Harvesting	1	3	4	5	8	13	6	9	15
Processing	22	30	52	38	21	59	39	24	63
Marketing	2	0	2	7	1	8	10	1	11
Subtotal	25	33	58	50	30	80	55	34	89
Watersheds, Soils, and Pollution									
Watersheds	4	15	19	13	16	29	19	17	36
Soils	3	0	3	5	7	12	6	10	16
Pollution	2	8	10	6	17	23	8	27	35
Subtotal	9	23	32	24	40	64	33	54	87
Forest Range and Wildlife									
Range	1	2	3	1	5	6	3	10	13
Wildlife	9	8	17	19	16	35	24	25	49
Subtotal	10	10	20	20	21	41	27	35	62
Recreation and Environmental Values									
Recreation	14	1	15	5	4	9	11	9	20
Environment	0	0	0	4	2	6	9	6	15
Subtotal	14	1	15	9	6	15	20	15	35
TOTAL	166	225	391	239	292	531	282	340	622

National Steering Committee for the

National Program of Research for Forests and Associated Rangelands

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U.S. Department of Agriculture and ***the National Association*** **of** ***State Universities and Land Grant Colleges***

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