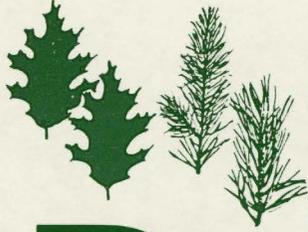


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South Carolina
**Forest
Resource
Plan**

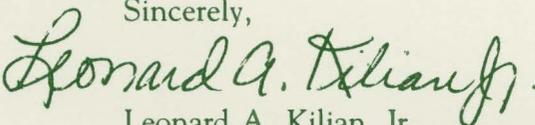
Dear Friend of Forestry,

South Carolina is moving into an era of rapid growth in both population and industry. We are being challenged to produce more and better timber and nontimber goods from our forest lands. But at the same time, conflicting land uses are placing increasing demands on the state's land base for residential, industrial, agricultural, and other uses. Since forestry requires a long term commitment, every action is critical.

Improved management of South Carolina's forests can benefit individual citizens, forest industry, and the state as a whole. Reaching our goals of increased quality and quantities of timber, forest land recreation, clean water and air, wildlife, and other benefits from forest land will depend on our cooperation, commitment, and long range plans. Each of us must fulfill our responsibility.

This long range plan for our forest resources was developed from the ideas of many people involved in the management of South Carolina's forests. It outlines many of the actions needed to fully realize the potential benefits from the state's forest land. Our goal in developing this document is to encourage the cooperation and commitment of every party involved. Because times and people change, it will require continual updating. The writing of this long range plan is only the beginning...the rest is up to us.

Sincerely,

A handwritten signature in cursive script that reads "Leonard A. Kilian, Jr." The signature is written in dark ink and is positioned above the printed name and title.

Leonard A. Kilian, Jr.
State Forester

CONTENTS FOREST RESOURCE PLAN

South Carolina Forest Resource Plan

Developed by
South Carolina Forestry Commission
Leonard A. Kilian, Jr., State Forester

Written by
Debra M. Price
Crosby Rice

Graphics by
Anne Kyle



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STATE DOCUMENTS

FOREST RESOURCE PLAN

Objectives

- To provide a guide for the orderly development, management, protection, and use of South Carolina's forest resources to supply multiple benefits for present and future populations.
- To examine the importance of the state's forest resources.
- To provide a mechanism by which information about the condition and needs of South Carolina's forest resources can be channeled into local, state, federal, and private planning efforts.
- To improve coordination with agencies and groups within the state on forest related activities and concerns.

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STATE DOCUMENTS

SUMMARY

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The demand for timber in the U.S. is projected to increase by more than 65 percent by 2000.

SUMMARY

South Carolina's forests are a renewable resource, and over the years have produced abundant quantities of timber and nontimber products. Trees provide the raw material used by the state's third largest manufacturing industry. Forest industry produces over 2.5 billion dollars of forest products annually, including wood products for homes, furnishings, packaging, and paper. Additionally, forest lands supply outdoor recreational opportunities, wildlife habitat, clean water and air, and site quality protection.

The state's growing population will demand increasing quantities of timber and nontimber goods. At the same time, urban, industrial, and agricultural expansion will place additional demands on the state's land base. The key to meeting future demands is to augment the productivity of South Carolina's forests through improved forest management.

Forest landowners must be motivated to manage their lands on a multiple-use basis. The greatest opportunities for improving productivity are on the nonindustrial private woodlands, composing 73 percent of all forest land. Increased financial incentives, landowner education, and technical assistance can stimulate additional forest management activity.

Through improved regeneration, use of genetically improved seedlings, and reduction of losses to fire, insects and diseases, net annual growth per acre can be increased over 50 percent in the next 30 years. Furthermore, through careful planning and implementation of silvicultural operations, nontimber amenities can be enhanced.

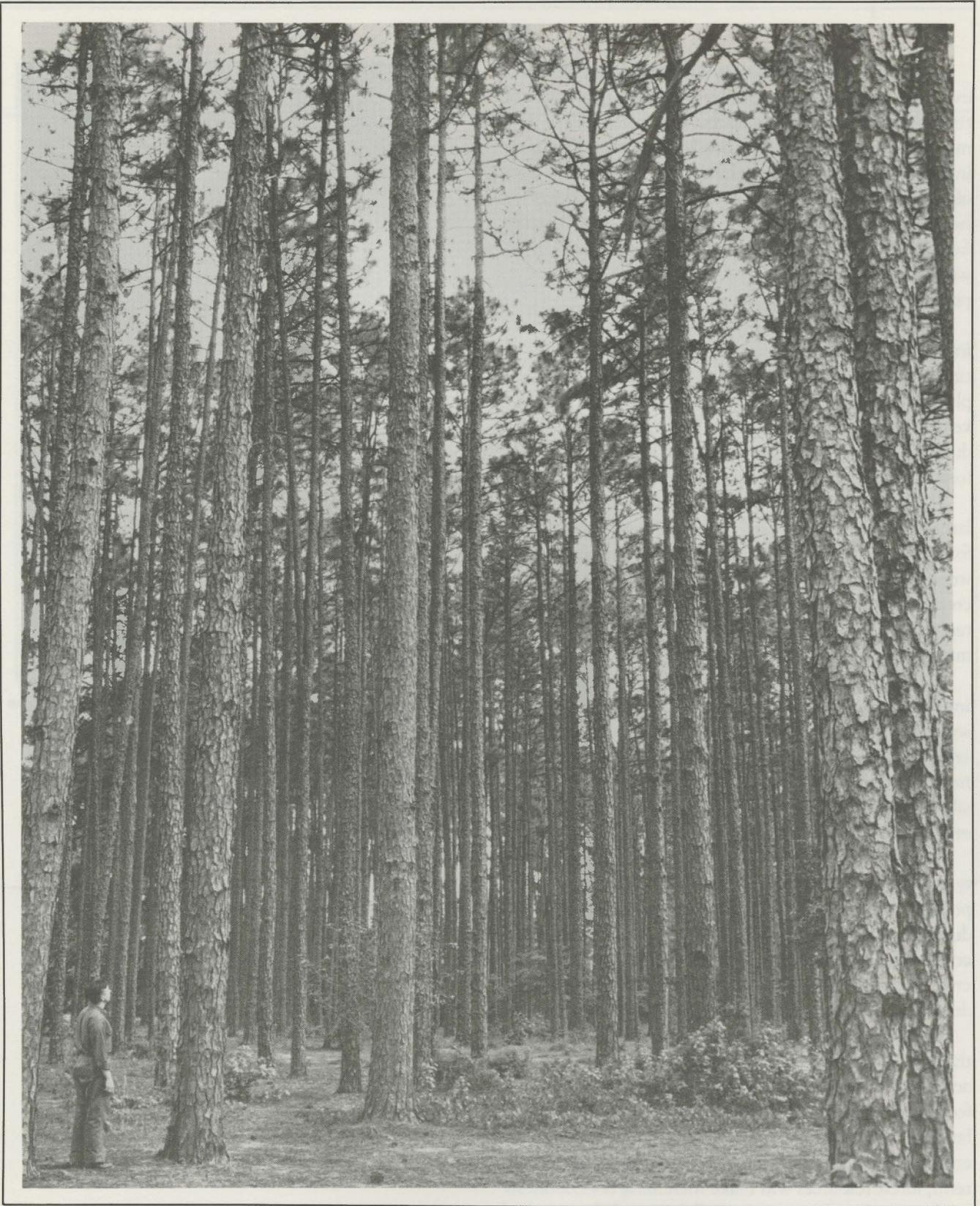
Equally as important as improved forest productivity is development of South Carolina's secondary forest products industry. Further manufacturing of forest products would increase employment, payrolls, and general economic prosperity. Returns to the state would also accrue in terms of improved markets for primary forest products and increased utilization of a renewable resource.

South Carolina's economy can be strengthened through management of its forest resources. Legislative actions and forestry sector policies can significantly affect the flows of product and amenity values from forest lands. If these actions and policies are committed to enhancing timber and nontimber resources over the long term, forest resources will make increasing contributions to the social and economic well being of the state.



In order to meet rising timber demands, increasing numbers must commit themselves to reforestation.





South Carolina has been blessed with the soils and climate needed to produce valuable timber. Mature stands such as this one are being harvested daily to provide needed wood products.

THE FOREST RESOURCE

FOREST ACREAGE

South Carolina's forests cover 12.5 million acres, encompassing 65 percent of the state's total land area. Although forest acreage increased slightly between 1968 and 1978, nearly 400,000 acres of forest land were diverted to nonforest use or reclassified as noncommercial forest. Urban expansion and related uses accounted for 40 percent of the loss. Idle cropland has been the primary source of new forest land. However, less land is available for conversion because idle cropland has dropped from 1.6 to 0.3 million acres over the past 30 years. In the future, diversions of forest land are expected to exceed additions, creating an 8 percent decrease in timberland acreage over the next 30 years—a loss of almost 1 million acres. (4)*

OWNERSHIP

The objectives and knowledge of the landowner are two factors influencing the intensity of forest management practiced. The size and location of the ownership also affect the intensity of management.

Private industry and individuals own 91 percent of the state's forest land. Forest industry owns 18 percent, and 73 percent is held by nonindustrial private land-

owners. These nonindustrial private lands cover 9.2 million acres, representing 109,100 different landowners.(4) Many of these landowners lack the desire, knowledge, or technical means necessary for forest management. However, forest industry owns and manages forest land to assure a continuous supply of timber for its manufacturing plants. Typically, these industries are willing to invest in intensive management for timber production, with secondary emphasis on nontimber values such as recreation and wildlife habitat.

Publicly held forest land accounts for 9 percent of the total forested area of the state, with half of this in National Forests and half in state, county, municipal, and other federal holdings. (4) National and State Forests are managed on a multiple-use basis under long range plans. Intensity of management on other public lands ranges widely, depending on the objectives of ownership.

FOREST TYPES

Five general forest types compose 98 percent of the total forest land area. Loblolly-shortleaf pine is the predominant forest type, encompassing over one-third of the total forest land area. The following table shows the acreage in each type, as indicated by the Forest Survey:

FOREST TYPES FOR SOUTH CAROLINA FOREST LAND, 1978

FOREST TYPE	ACRES
Loblolly-Shortleaf Pine.....	4,574,297
Oak-Hickory	2,945,254
Oak-Gum-Cypress.....	1,990,754
Oak-Pine	1,718,544
Longleaf-Slash Pine.....	983,249
Other.....	290,808
TOTAL FOREST LAND.....	12,502,906

* Numbers in parentheses indicate references.

Changes in forest type occur most frequently when a final harvest is made. Between 1968 and 1978, 1.1 million acres of pine stands were harvested. Of this acreage, 42 percent was converted to oak-pine or hardwood types. Between 1968 and 1978, 0.9 million acres of oak-pine and other hardwood stands were harvested. On 84 percent of this acreage, hardwoods continued to dominate the stocking. Hardwood stocking is most prevalent on harvested areas where no site preparation or artificial regeneration is evidenced. (4) To maintain the current softwood acreage, softwood stands will require management techniques assuring softwood regeneration after harvest.

NET GROWTH

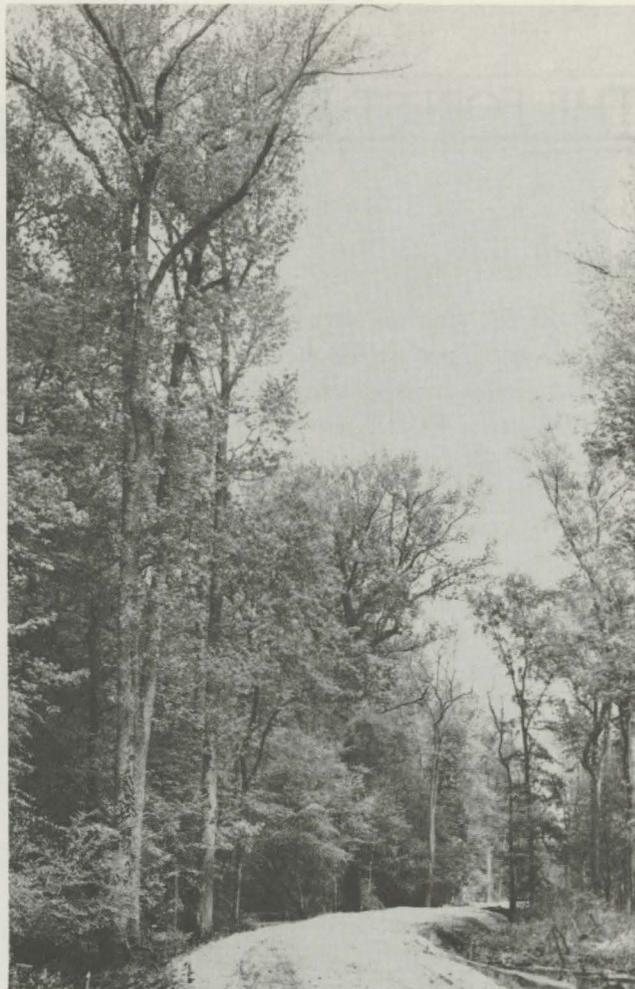
Net annual growth in South Carolina reached a record high for the Southeast at 77 cubic feet per acre in 1977. Extensive acreages of natural and planted pine stands established on old fields reached merchantable size, accounting for a large portion of the increase. Since growth increased dramatically, removals as a percentage of growth declined from 68 percent in 1968 to 51 percent in 1978. (4)

The current growth rate is approaching the capacity of the forests when fully stocked with natural stands. This may be difficult to maintain as the large acreage of 20 to 40 year old stands matures and is harvested. However, the 1978 Forest Survey identifies the opportunity to increase net annual growth from 77 to 117 cubic feet per acre over the next 30 years through improved pine regeneration, use of genetically improved planting stock, and by reducing mortality by 50 percent. But this will not happen unless all forest land acres are brought under management.

STAND CONDITION

Sixty percent of South Carolina's forests are in relatively good condition; however, this means 4.6 million acres are in need of treatment before reaching their potential contribution to future timber supplies. The 1978 Forest Survey lists the following opportunities for increasing timber supplies:

- Salvage and regenerate seriously damaged stands on 110,900 acres.
- Harvest and regenerate mature and overmature stands on 621,300 acres.



Sixty five percent of the state's land area is forested. Shown here is one of the many hardwood forests in South Carolina.

- Thin young, immature stands densely stocked with merchantable size trees on 472,400 acres.
- Remove undesirable trees and competing vegetation from other immature stands on 864,000 acres.
- Convert stands with species obviously unsuitable for the site from the standpoint of timber production to more suitable species on 494,900 acres.
- Regenerate 2,072,100 acres too poorly stocked with acceptable trees to manage for timber production. The inclusion of acres classified as idle cropland would add some 310,700 acres to this opportunity.

Over three-fourths of these opportunities are on nonindustrial private lands.

REGENERATION NEEDS

As indicated by the preceding figures, over 2 million acres of timberland have not been adequately regenerated following harvest. This resulted in stands too poorly stocked with acceptable trees to manage for timber production.

Each year final harvest occurs on 205,000 acres of forest land with 172,000 acres adequately regenerated

naturally or artificially. This adds 33,000 acres per year to the acreage of forest land in need of regeneration. The following table shows the regeneration efforts made by each ownership group.

Less than half of the harvested acres are regenerated on nonindustrial private forest land. Regeneration efforts on these lands must more than double just to regenerate acreage harvested annually.

ESTIMATED CURRENT ANNUAL REGENERATION VS. HARVEST*

Owner	Acres Harvested	Acres Regenerated			Difference In Acres
		Planting or Seeding	Planned Natural Regeneration	Total	
National Forest	6,947	6,593	1,673	8,266	+ 1,319
Other Public	3,004	2,860	786	3,646	+ 642
Forest Industry	68,285	61,735	7,995	69,730	+1,445
Other Private**	126,667	27,669	30,316	57,985	-69,682
All Ownerships	204,903	98,857	40,770	139,627	-65,276
					+32,074***
					ESTIMATED ANNUAL SHORTFALL
					-33,202

ACREAGE PLANTED

Planting on federal and other public lands has been fairly constant over the past 12 years, while private planting has increased dramatically. On forest industry lands, tree planting has doubled since the mid-seventies. Nonindustrial private planting has been the most variable. The acreage planted by each landowner group is shown on the following page.

On nonindustrial private lands, planting appears to be strongly influenced by financial incentives. Between 1955 and 1965, the federal Conservation Reserve Soil Bank Program and the federal Agricultural Conservation Program (ACP) stimulated the planting of record acreages. Recently, planting under ACP has been

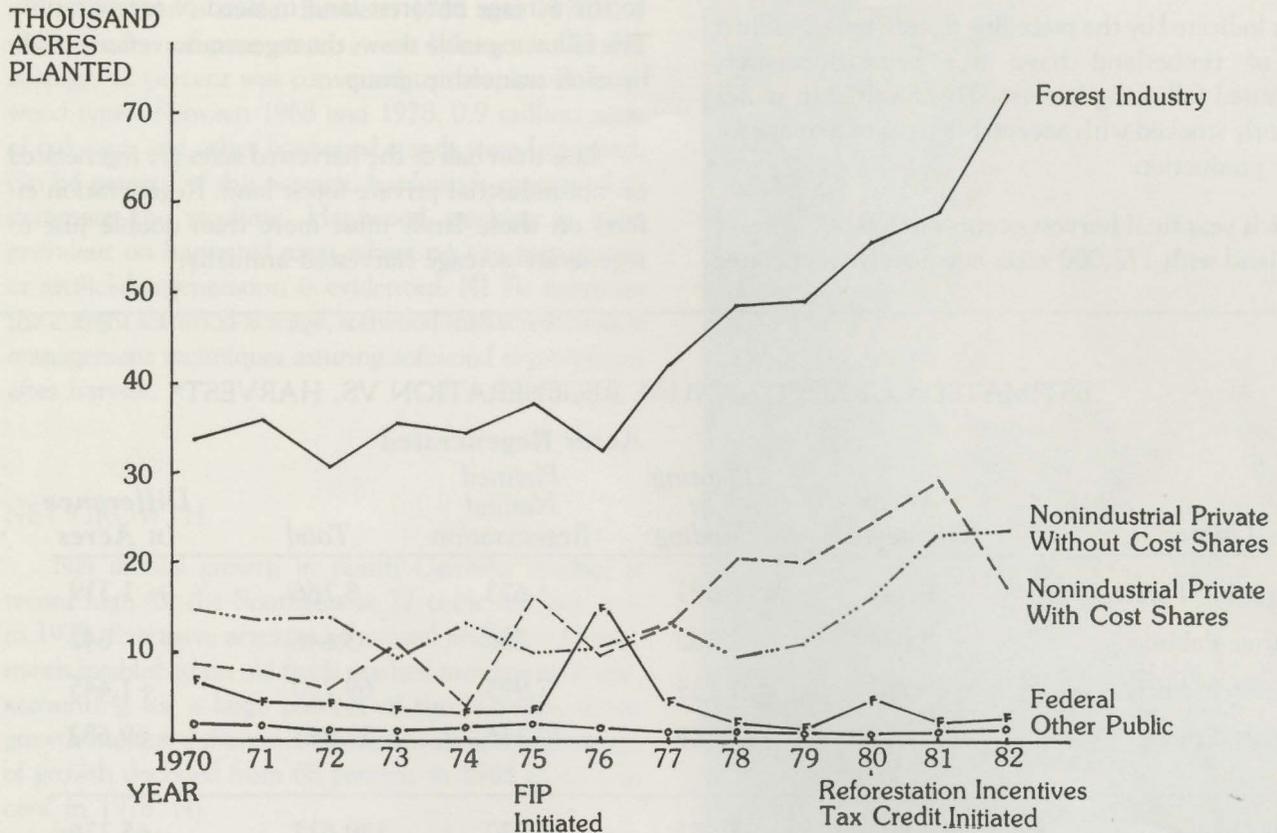
limited to a few thousand acres per year in South Carolina. In 1975, the federal Forestry Incentives Program (FIP) was implemented, dramatically increasing the acreage of nonindustrial private planting. Beginning in 1982-83, the Forest Renewal Program (FRP), a state incentives program, will increase nonindustrial private planting by approximately 6,000 acres annually (if funding remains at the current level). ACP, FIP, and FRP reimburse the landowner for a portion of the cost of reforestation. The amount of planting accomplished with cost shares has been dependent on the amount of funds available, with a waiting list accumulating for each program. (The decrease in acreage planted with cost shares in 1982 is due to the delayed appropriation of funds and unfavorable weather conditions.) Nonindustrial private planting without cost

* From the 1979 survey of Foresters Council Committee on Forest Productivity adjusted to include acreage planted under the Forest Renewal Program, which was implemented in 1982.

** Updated to include 6000 acres planted under the Forest Renewal Program.

*** Forest survey data indicates that 45 percent of pine acres harvested and not planted did regenerate to some degree in the last 10 years.

TREE PLANTING IN SOUTH CAROLINA, BY OWNERSHIP
1970 - 1982



share assistance has grown steadily since initiation of the Reforestation Incentives Tax Credit in 1980. The law provides federal income tax incentives to landowners who reforest.

TIMBER SUPPLIES

South Carolina will face decreased timber supplies if current management practices are continued. The state is already 15 years into a period of reduced pine regeneration.

One indication of declining timber supplies is the distribution of forest acreage by stand-age class. The largest acreage of pine stands, 1.2 million acres, is in the 20-29 year age class. In the 10-19 year age class there are 0.8 million acres, and less than 0.7 million acres in the less than 10 year age class. (4) As older stands mature and are harvested, pine acreage will decrease unless adequate regeneration measures are made.

HARVESTING EFFICIENCY

Harvesting efficiency has improved—more poor quality timber is being harvested and less merchantable wood is being left in the woods. Timber not classified as growing stock—cull trees, dead trees, tops, limbs, and

material on land other than commercial forest land—provided 15 percent of total product output in 1978, compared to 9 percent in 1968. (4)

In softwood and hardwood stands that are harvested, only one cord meeting merchantability standards (greater than 4.5 inches in diameter) is left on each acre. However, the total biomass left in the woods is 22 tons per acre. Unless manufacturing technology is developed for using this biomass, and thus creates a demand for it, the amount of biomass left in the woods following harvest will continue at its present level.

MILL RESIDUE

Due to improved utilization of mill residues, a 26 percent increase in product output was possible with only a 12 percent increase in growing stock removals between 1968 and 1978. (4) Forest industries produced 4.8 million tons of green residues in 1981. Approximately half of this was converted into by-products and half was utilized as industrial or domestic fuel. Less than one percent of all mill residues are unused. (1) Little opportunity remains for increasing by-products or industrial fuel through additional utilization of mill residues.



TIMBER PRODUCTION

With a declining commercial forest land base and a growing demand for wood products, management of South Carolina's forests demands immediate action. The 9.2 million acres of forest land in nonindustrial private holdings offer the greatest opportunities for increased timber production, due to inadequate management in previous years.

Absence of adequate regeneration following harvest has resulted in over 2 million acres of poorly stocked forest land. Each year an additional 33,000 acres is added to this backlog of forest land not adequately regenerated following final harvest.

In order to increase timber production, natural and artificial regeneration efforts must be drastically expanded on nonindustrial private lands. Financial incentives, such as the Agricultural Conservation Program, Forestry Incentives Program, Forest Renewal Program, and Reforestation Incentives Tax Credit are effective in accomplishing artificial regeneration. But demand for cost-sharing funds exceeds the available dollars, and each of these programs has a list of landowners waiting for funding for reforestation activities. Also, natural regeneration is not being utilized in many of the stands where it would be practical. When a landowner fails to contact a forester, or delays it until after the timber sale is made, he often precludes the opportunity to use natural regeneration. These obstacles to regeneration must be removed.

Genetically improved seedlings can improve the yield, straightness, and insect and disease resistance of a forest stand. But due to the shortage of genetically superior seed, only 61 percent of the seedlings grown at state nurseries are improved. When landowners are unable to acquire improved seedlings the value of any genetic improvement is forfeited.

In addition to these regeneration problems, there is a productivity problem. Nearly 2.6 million acres are in need of silvicultural treatment other than regeneration before contributing appreciably to future timber supplies. Practices such as salvage, thinning, timber stand improvement, and species conversion can improve the productivity of this forest land.

Forest products output from each acre can be increased through development of manufacturing technology for small or poor quality timber, thus increasing the demand for and use of this wood.

Much public forest land is carefully managed according to long range management plans. But on other public forest land, productivity can be enhanced through the intensified development and implementation of forest management plans.

GOALS

- Regenerate annually the 33,000 acres of forest land that are currently being harvested without being adequately regenerated.
- Regenerate annually a 40,000 acre portion of the backlog of forest land that was inadequately regenerated following harvest (this will eliminate the 2 million acre backlog over a period of 50 years).
- Increase timber production and use on private and public forests in South Carolina.

ACTION NEEDS

Regeneration: The amount of additional annual regeneration required to meet these goals is summarized below:

	Additional annual regeneration to eliminate the shortfall	Additional annual regeneration to eliminate the backlog
Natural Regeneration	30,000	—
Forest Renewal Program	—	12,000
Forestry Incentives Program	—	18,000
Non-Cost Share Planting	3,000	10,000



Unless adequate provisions are made for reforestation of cutover woodland, the productivity of the state's forests will not be fully utilized.

- The Forestry Commission should acquire and develop a second generation seed orchard to provide genetically improved seed for the production of fast growing, straight, insect and disease resistant seedlings.
- The Forestry Commission should increase nursery capacity for bare root seedlings from 99 to 120 million seedlings.
- The Forestry Commission should increase containerized seedling capacity to 5 million seedlings per year.
- Forest industries should continue producing seedlings for nonindustrial private landowners and increase this production as possible.
- The Cooperative Extension Service, Forestry Commission, consulting foresters, and forest industry should encourage natural regeneration of pine and hardwood stands where practical, emphasizing techniques such as prescribed burning in pine stands for preharvest site preparation.
- The state Forest Renewal Program should be funded at 1.5 million dollars annually as soon as possible to stimulate the planting of 18,000 acres per year.
- The federal Forestry Incentives Program should be funded at 2.5 million dollars annually in South Carolina to encourage the planting of 30,000 acres per year.
- Forest industry, consulting foresters, and the Forestry Commission should inform the landowner about regeneration options, costs, and returns at the time of harvest.
- The Forestry Association and the Forestry Commission should develop a communications network which could identify, by landowner name and county, those acres being harvested. Contacts could then be made to review with the landowner the advantages of regenerating his forest.
- Clemson University, the Southeastern Forest Experiment Station, and other appropriate organizations should continue development of manufacturing technology of low quality timber to promote increased harvesting of this timber, facilitating and reducing cost of regeneration.
- The Forest Renewal Program and the Forestry Incentives Program cost-share rates should be evaluated and reduced where practical, to regenerate more acres per dollar of assistance.
- The Forestry Association, the Forestry Commission, and the Cooperative Extension Service should develop a plan for the distribution of forest regeneration information at the time of harvest through timber buyers and consulting foresters.

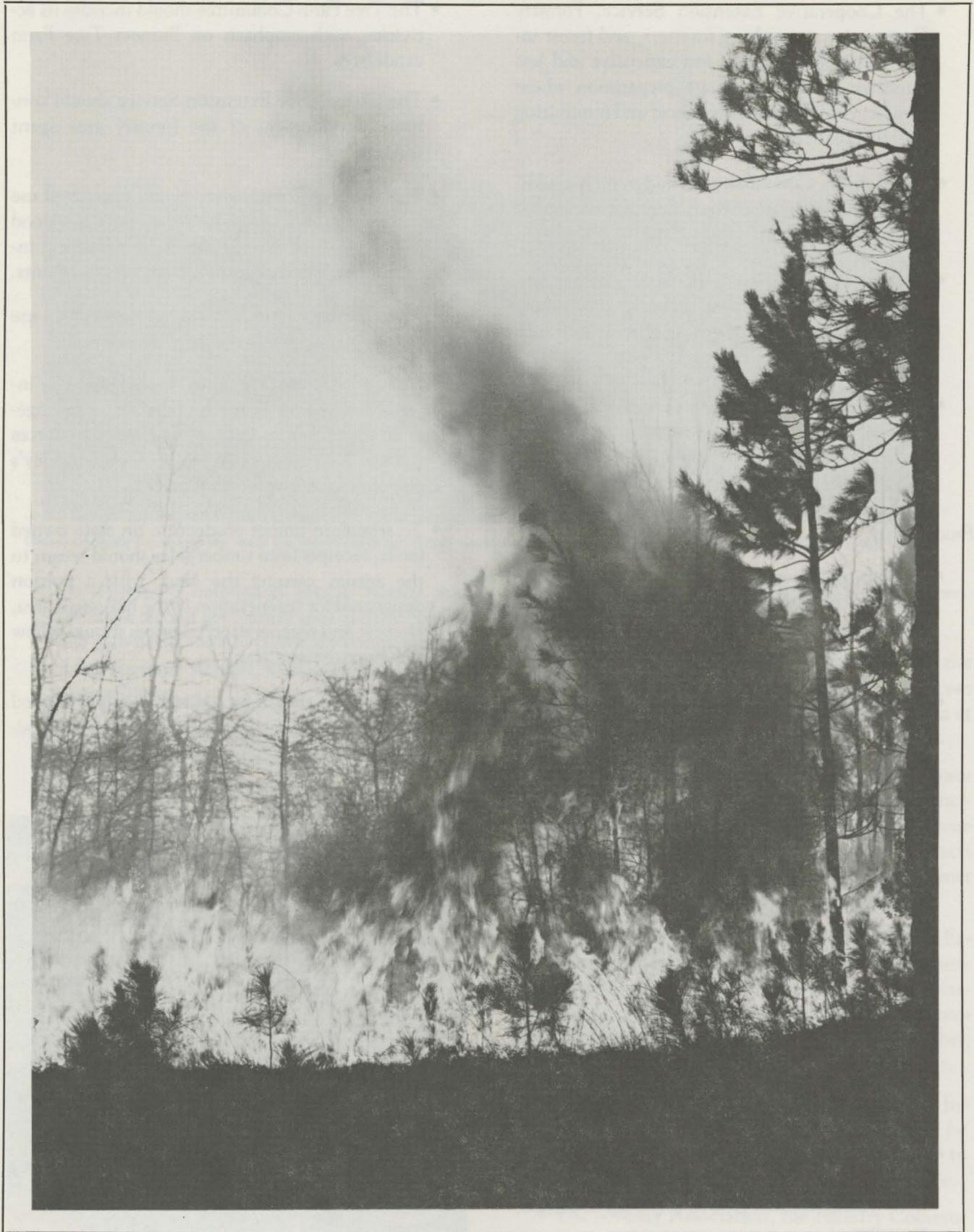
- The Cooperative Extension Service, Forestry Commission, consulting foresters, and forest industry should encourage less expensive and less intensive techniques of site preparation where feasible, reducing landowner cost and minimizing site disturbance.
- The Forestry Commission should purchase additional site preparation equipment for the rental equipment program.
- The Forestry Commission should develop a voluntary training program for site preparation and tree planting contractors to ensure that quality jobs are performed.
- The Forestry Commission, Cooperative Extension Service, and the Forestry Association should investigate other ways to stimulate regeneration following harvest.
- The Tree Farm Committee should increase its activities, with emphasis on Pioneer Tree Farm candidates.
- The Cooperative Extension Service should continue development of the forestry area agent concept.
- The Forestry Commission should encourage use and development of programs to promote wood as an industrial energy source, emphasizing industries with fairly constant energy requirements.
- The Forestry Commission should encourage use of low quality hardwood as a domestic fuel.
- Management of state owned lands should be increased, bringing all tracts under active management for timber and other forest based resources through long range plans based on each agency's objectives for owning the land.

Productivity:

- Consulting foresters, the Forestry Commission, and forest industry should emphasize thorough appraisal of specific site conditions and the development of comprehensive management plans.
- The Forestry Commission should establish a hardwood silviculture staff position with responsibility for identifying opportunities in hardwood management and utilization and to train Commission foresters in assisting landowners to improve hardwood management and utilization.
- Forest industry, Clemson University, and the Southeastern Forest Experiment Station should demonstrate to equipment companies the need for efficient equipment for the initial thinning of pine stands.
- The Cooperative Extension Service, forest industry, and the Forestry Commission should intensify efforts to inform foresters of the benefits of fertilization and herbicide use.
- Clemson University, the Southeastern Forest Experiment Station, and other appropriate organizations should research growth responses to cultural measures.
- The Cooperative Extension Service should intensify its county forestry education programs.
- To stimulate timber production on state owned lands, receipts from timber sales should return to the agency owning the land, with a portion designated for regeneration of the harvested area. Harvest and regeneration practices should follow the management plan.
- Public lands should provide an example of good forest management, with certain areas specifically developed as demonstration areas. 



Artificial regeneration is used to establish adequate, uniformly spaced stands of trees. It also offers the opportunity for use of genetically improved seedlings - faster growing, better quality trees than would naturally occur throughout an entire stand.



Wildfires burn an average of 39,307 acres each year, damaging valuable timber and killing seedlings that one day would have provided timber for wood products.

FIRE PROTECTION

South Carolina is the scene of nearly 8,000 forest land wildfires each year and has the most fires per million acres protected of the 13 southeastern states. (8) These wildfires burned an average of 39,307 acres per year from 1978 to 1982, consuming nearly 6,000 acres of young plantations and 24 million board feet of sawtimber each year. This amounts to an estimated 6.5 million dollar loss of timber annually.

High fire occurrence, rather than acreage burned per fire, is the state's greatest fire problem. The following chart indicates that acreage burned has declined dramatically since the early fifties, while the number of fires declined through the mid-sixties and increased in recent years.

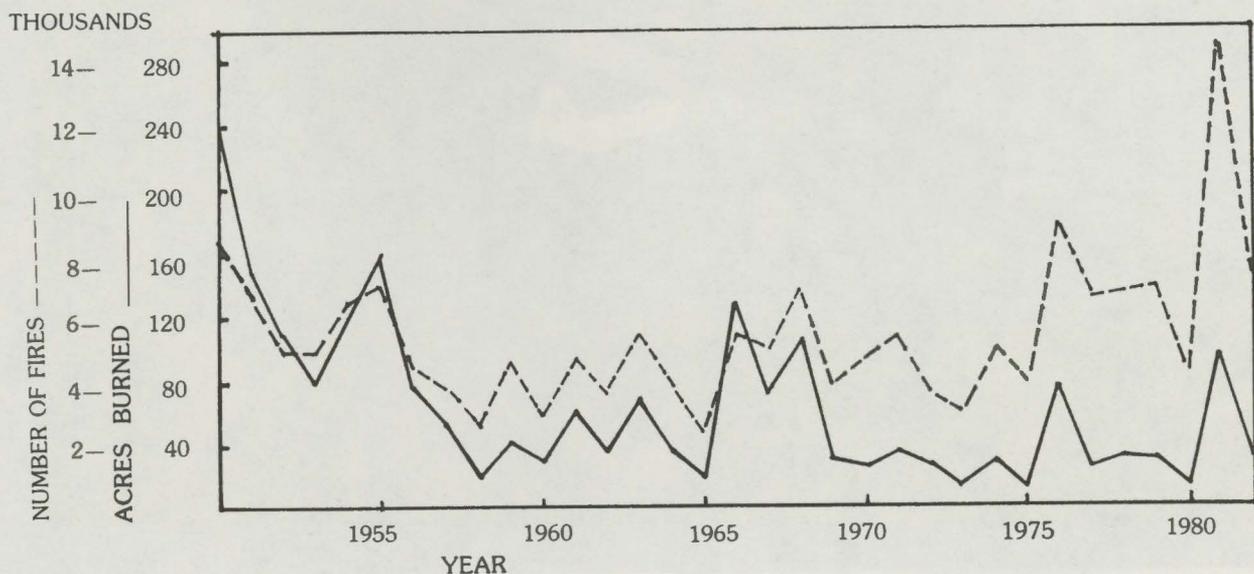
Over the past 5 years, fires have been controlled averaging less than 5 acres in size. (6) Of the 13

southeastern states, only 2 states had a lower average size of forest fire than South Carolina from 1975 to 1979. Four states had a lower percent of protected area burned for the same period. (8)

Nearly 99 percent of all forest land wildfires are caused by people. Between 1978 and 1982, the leading cause of fires was incendiary, accounting for 44 percent of all fires and 57 percent of the total area burned. Other leading causes of fires were debris burning, 25 percent of all fires, and smoking, 12 percent. (6)

Currently over 12 million acres of state and private lands are protected by the S.C. Forestry Commission. An additional 548,724 acres of National Forest are protected by the U.S. Forest Service and 280,101 acres are protected by other federal agencies. (6)

FOREST LAND FIRES AND ACREAGE BURNED IN SOUTH CAROLINA (6)



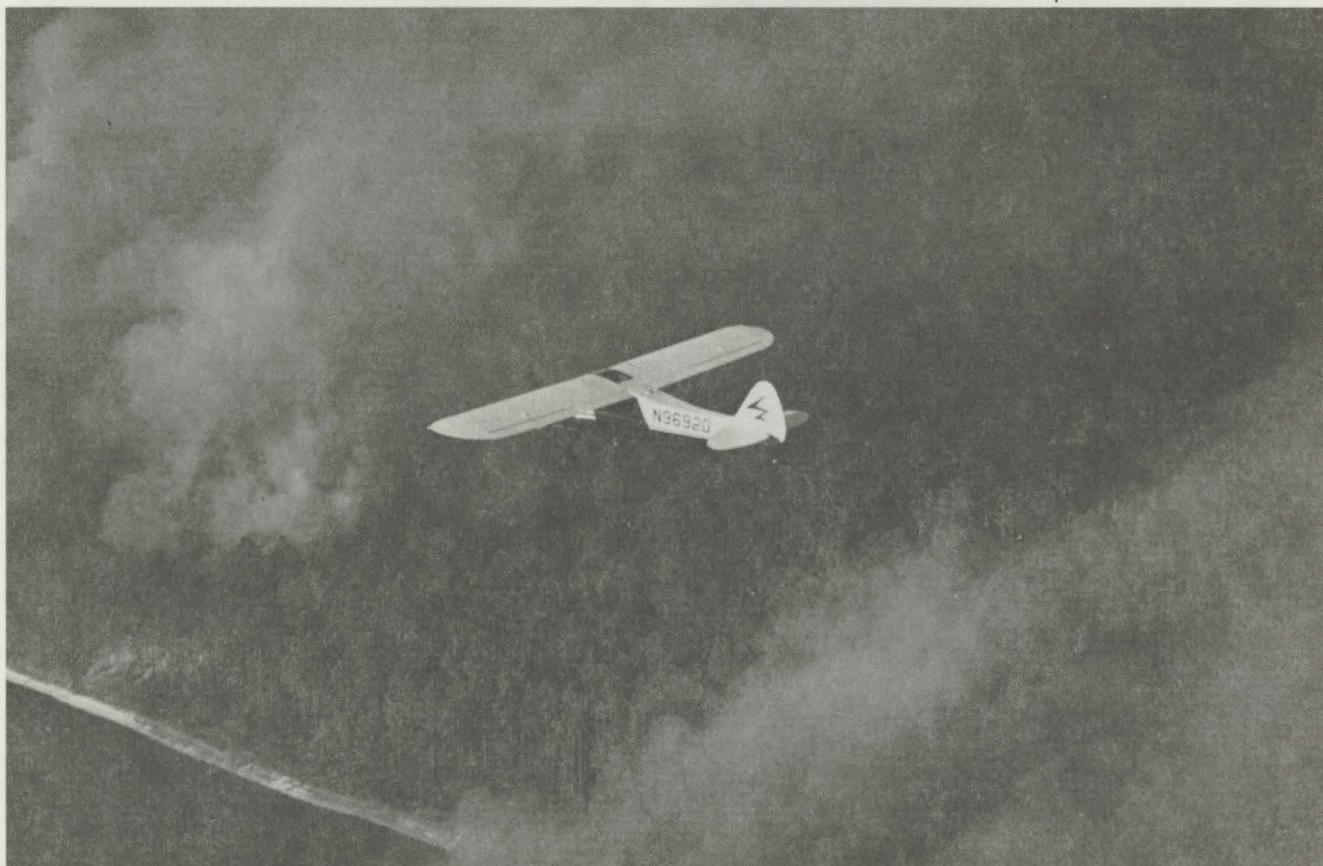
GOALS

- Reduce fire losses to less than 30,000 acres per year and 7,000 fires per year.
- Reduce acreage losses in seedling to sapling size pine stands that are particularly vulnerable to wildfire.

ACTION NEEDS

- The Forestry Commission should intensify forest fire prevention efforts at the local level through contacts, use of the media, and education aimed at reducing wildfire occurrence.
- The Forestry Commission should employ professional law enforcement officers for law enforcement training of personnel, and to assist in enforcement of fire laws with emphasis on high occurrence areas.
- The Legislature should provide adequate funding for regular maintenance and replacement of Forestry Commission fire control and communication equipment.

- The Cooperative Extension Service, the Forestry Commission, forest industry, and consulting foresters should promote the use of prescribed burning to reduce the hazard of wildfires.
- The Forestry Commission should increase training for Forestry Commission personnel, forest industry, rural fire departments, volunteers, and private landowners in vegetative fire prevention and suppression.
- The Forestry Commission should expand forest fire detection capability through acquisition of fixed wing aircraft.
- The Forestry Commission should study the benefits and costs associated with utilizing helicopters for fire detection and suppression, acquiring helicopters where practical.
- The Forestry Commission should provide presuppression planning for high value stands in areas of high fire occurrence.
- The Forestry Commission should continue to provide contracted aircraft for the aerial delivery of liquid fire suppressants.



Fixed wing aircraft are an extremely important portion of a fire protection program. These aircraft can provide aerial detection of wildfires or give valuable information to ground personnel on going fires.

FOREST PEST MANAGEMENT

Each year timber valued at 15 to 30 million dollars is lost to forest insects and diseases. The major losses due to timber mortality in 1983 were:

Fusiform Rust.....	\$10,000,000
Southern Pine Beetle.....	5,797,000
Littleleaf Disease.....	3,000,000
IPS and Black Turpentine Beetles.....	1,500,000
Annosus Root Rot.....	600,000

Defoliators, including the forest tent caterpillar and the cankerworm, caused an additional 5 million dollar loss through reduced timber growth.

The southern pine beetle reached epidemic levels in 17 Piedmont and Coastal Plain counties by October 1982. This beetle kills weakened or healthy pine trees by feeding on the conductive tissues. Funds for control have not been readily available, delaying salvage of dead trees and permitting further expansion of the infestation.

In addition to reducing timber growth, defoliators have been an increasing nuisance in urban areas, particularly in the Coastal Plain. Where feasible, local governments have initiated control measures at their own expense.

The gypsy moth, defoliator of vast forest acreages in the Northeast, has not yet become established as far south as South Carolina. Already discovered in several areas of the state, the gypsy moth could present a severe threat to urban areas and the upper Piedmont hardwood forests. Before this pest becomes established, a plan for suppression demands attention.

GOAL

Reduce the annual average of insect and disease caused mortality of softwood and hardwood timber 10 percent by 1987.

ACTION NEEDS

- The Forestry Commission should strive to maintain adequate insect and disease program funding and to make pest suppression funds readily available from state sources to prevent costly delay in implementing control measures.

- The Forestry Commission should continue to study the gypsy moth situation and should develop an action plan with coordination of federal, state, forest industry, and private interests.
- The Forestry Commission, Cooperative Extension Service, and the Southeastern Forest Experiment Station should develop a technology transfer program to train foresters and landowners to employ silvicultural practices which have proven effective in alleviating forest insect and disease problems.
- The Forestry Commission should accelerate its Forest Technician Training Program for Rangers in the area of pest management, making more trained personnel available. 



A forester points out pine trees killed by an infestation of the Southern Pine Beetle. Prompt salvage of the infested trees will prevent further spread.

• Reduce the loss of wood to 10% of total wood used
• Increase the use of wood to 50% of total wood used

FOREST PEST MANAGEMENT

The Cooperative Extension Service, the Forest Commission and the South Carolina Forestry Association are working together to develop a forest pest management program. This program will help forest owners and managers to identify and control forest pests. The program will also help forest owners and managers to prevent forest pests from becoming a problem.

The Forest Commission should continue to work with the Forest Commission and the Forest Commission to develop a forest pest management program. This program will help forest owners and managers to identify and control forest pests. The program will also help forest owners and managers to prevent forest pests from becoming a problem.



South Carolina's growing population will demand increasing supplies of forest products. Shown here are custom made roof trusses.

INDUSTRIAL DEVELOPMENT

Forest industry is the third largest manufacturing industry in South Carolina in terms of economic contribution. In 1981, the industry produced manufactured goods valued at over 2.5 billion dollars, and employed 30,105 persons who earned wages of nearly 470 million dollars. (7) Projecting current trends, the contribution of forest industry to the state's economy will increase from 9.5 percent to 11.9 percent by 2000. However, with intensified forest management, a fourfold growth of the forest industry is possible, and forest industry's contribution would grow to 39 percent. (5)

Other indications point to a growing forest products industry. The latest national assessment projects the demand for roundwood timber to increase by more than 65 percent between 1977 and 2000, with a concurrent shift in timber supplies from West to South. Furthermore, South Carolina's primary forest products industry is growing faster than national trends. The state's growth rate for plywood and paper production exceeded national figures over the past 10 years. (5)

Forest products are the leading export through the state's ports, in both volume and value of the product. Additional shipping opportunities are available through the state's ports, but many industries are not fully aware of them or do not know how to capitalize on these foreign markets.

Significant opportunities exist for development of the state's secondary forest industry—through further manufacturing of the products prior to shipment to other states or countries. Comparison of value added and volume removed can be used to identify these opportunities:

“Value added in manufacture is considered to be the best value measure available for comparing the relative economic importance of manufacturing among industries, geographic areas, and states. It is determined by subtracting from the value of the final product when shipped (to its next destination), all the cost of the “things”...the materials, supplies, fuel, power, containers, and contract work...used to make the product. The resulting value added

figure represents money available for, and generally attributable to, wages for labor, salaries for management (technology), interest on borrowed capital, profits (whether distributed as dividends or not), taxes, and depreciation and depletion of equipment...In short, it is, directly or indirectly, the life blood of a community's, region's or state's economy. Value added represents benefits in the form of employment, payrolls, profits, and general economic prosperity. The greater the value added, the greater these benefits.

In terms of natural resource-based products, such as wood-based products, regions...or in this case, states...can be value added gainers or value added losers. The gainers, let's call them “value adders.” are those states which account for a greater proportion of total national value added than they do of the total national volume removals. The losers, i.e., “value losers” are those states which account for a smaller proportion of total value added than they do of volume removals.” (3)

South Carolina ranks tenth among the 43 contiguous states in volume of timber removed, and twenty-fifth in value added. As a percentage of the U.S., South Carolina accounts for 3.5 percent of volume removed and just 1.9 percent of value added—making South Carolina a value loser. (3)

When South Carolina ships raw forest products instead of manufactured forest products to other states or countries, the state is exporting opportunities for jobs and economic growth. The state is shipping both raw products and primary forest products to other states and countries. Forty percent of the pulpwood harvested in South Carolina is exported—primarily to mills in Georgia and North Carolina. The state is clearly not fully benefiting from its forest resource and stands to gain from more intensely manufacturing its own raw material into higher-valued final products, thus increasing employment, payrolls, and general economic prosperity.

GOALS

- Increase the value of manufactured forest products in South Carolina, primarily through expanding secondary forest industry.
- Expand shipment of forest products through the state's ports.

ACTION NEEDS

- The State Development Board should continue its activities in attracting secondary forest industry to the state.
- The Forestry Commission and the State Development Board should identify those secondary forest industries which exhibit the greatest growth potential.

- The Legislature, State Development Board, and the Forestry Commission should study and develop incentives for establishing additional secondary forest industry in the state.
- The State Development Board, Forestry Association, Cooperative Extension Service, and the Forestry Commission should develop a publication explaining what South Carolina has to offer to secondary forest industries, for distribution through each of these organizations and consulting foresters.
- The Cooperative Extension Service and the State Ports Authority should educate forest products industries on the opportunities available through exporting their products.



Labor intensive manufacturing processes - such as furniture making - can provide additional employment and payrolls, improving the general economic prosperity of the state.

NONTIMBER RESOURCES

South Carolina's forests provide a multitude of benefits in addition to timber—including recreational opportunities, wildlife habitat, clean water and air, and soil protection. Each individual acre may not provide all of these amenities, but under multiple-use management areas can be managed to provide different dominant uses. The key to multiple-use lies in balancing timber and nontimber products, maximizing total benefits.

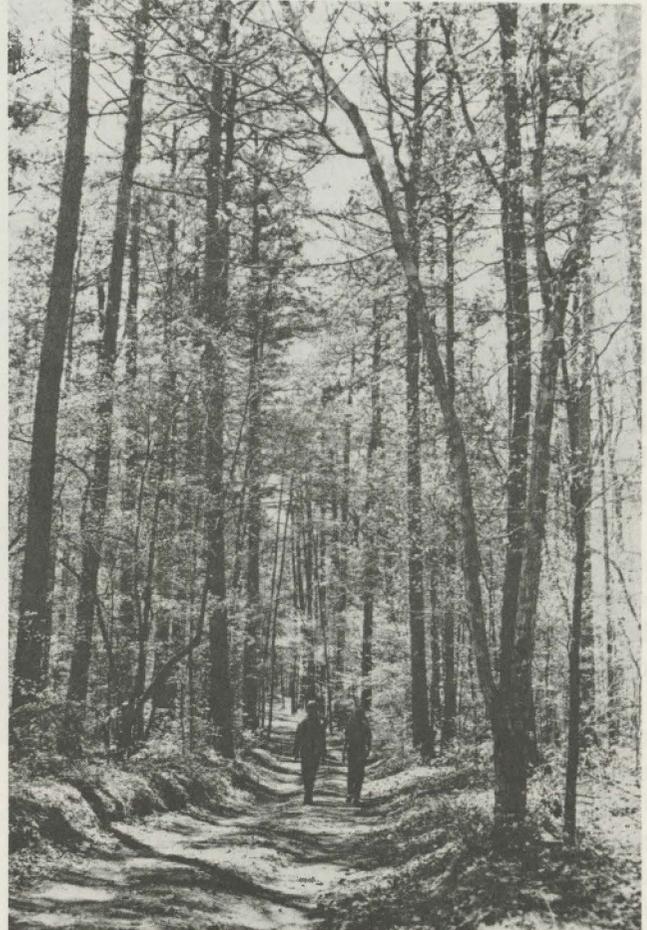
RECREATION

Forest based recreation has more than doubled since 1970. Both consumptive and nonconsumptive users create economic activity. In 1980, 834,513 visitor days of campers generated over 7.7 million dollars of revenue in South Carolina. (5) Demand for additional recreation areas will grow as crowding and conflicts between alternative types of recreation increase, placing more stress on the declining forest land base.

Both public and private lands are needed to continue to provide sufficient quality recreational opportunities. Conditions that currently limit the amount of land available for recreation include: lack of economic incentives for private landowners to allow public recreation on their lands; inadequate landowner liability protection, conflict between types of recreation, and maintenance problems from recreation users. Special management areas offering outdoor recreation are being set aside from timber management. Over 149,000 acres of public and private land have been set aside as special management areas—used primarily for hiking, camping, horseback riding, and canoeing. (5) More recreation areas will be needed as outdoor recreation activities escalate.

WILDLIFE

South Carolina's forests provide the diverse habitat required by the state's abundant fish and wildlife populations. Forests can be manipulated through silvicultural treatments to favor particular wildlife species by providing the desired food and cover conditions. In the past, efforts to increase wildlife populations have focused on game species, and little is known about habitat requirements of most nongame species.



Forest based recreation has more than doubled since 1970. As demands for recreation and other forest products escalate, forest managers must find ways of meeting these demands without diminishing the quality of the recreational experience.

Fish and wildlife bring millions of people to South Carolina's forests each year. Game species support a multi-million dollar business; hunters alone contributed 213 million dollars to the state's economy in 1980. (2) Demand for hunting and fishing areas is increasing, while the forest land base is expected to decrease. The Game Management Area Program administered by the S.C. Wildlife and Marine Resources Department opens 1.5 million acres of government, corporate, and private land for hunting, fishing, and nonconsumptive recreation. Wildlife management programs such as this will have to be intensified in order to maintain current wildlife populations and to continue providing multiple forest benefits.

SOIL

Forests enhance soil development—through addition of organic matter, protection from soil erosion, and relatively long time periods between disturbances. Forest management activities such as harvesting, site preparation and drainage may alter site productivity favorably or detrimentally. The impacts of these activities are most evident in terms of erosion, nutrient displacement, compaction, and aeration.

Forested areas in South Carolina are not a significant source of erosion. Erosion losses of 1 to 5 tons per acre per year are “tolerable” from cultivated fields, while erosion losses from forests average only a fraction of a ton per acre per year. (11) Most forest land erosion occurs on disturbed areas, but only 8 percent of the state’s forest land is disturbed each year. Harvesting—through logging, logging roads, and skid trails—accounts for over half of all forest land erosion in South Carolina. (9) The higher erosion rates that are associated with forest disturbance are only temporary and return to a low level as the area is reforested.

Soil compaction, due to traversing by harvesting and site preparation equipment, is most severe when soils are saturated. Compaction can disrupt drainage, lengthen the time soils are saturated, and ultimately reduce site productivity.

Erosion and compaction are preventable; planning, techniques minimizing site disturbance, erosion control measures, and field supervision are required. Specific field practices to reduce the impact of silvicultural operations have been developed for South Carolina and are described in the “Voluntary Forest Practice Guidelines for South Carolina” and the Best Management Practices of South Carolina’s “Water Quality Management Plan.”

Silvicultural practices may be used to improve soil conditions. Disking reduces compaction (in addition to reducing competing vegetation), while bedding and drainage improve aeration. All of these improve conditions for root development, thus enhancing tree growth. Effective wildfire control activities minimize the amount of soil that is exposed by burning of the litter layer. Reforestation of harvested forest land and forestation of other land are widely used for controlling erosion.

WATER

Forests control runoff, reduce erosion, contribute to uniformity of stream flow, and assist in maintaining desirable water temperatures. Silvicultural activities in-

fluence both the quantity and quality of water yields from forested lands. Harvesting increases water yields, but reforestation or natural regrowth decreases yields by increasing transpiration. The increased water yields and altered timing associated with harvesting are rarely harmful and seldom last more than a few years. On watersheds, partial cuts are sometimes made to increase water yields.

Sediment is the primary nonpoint source pollutant from forest land. The access system, harvesting, and site preparation are the major sources of sediment, but only 4 percent of the state’s forest land is harvested or site prepared each year. (9) Like erosion, most sedimentation is preventable. Up to 90 percent of the sediment produced following logging comes from temporary and permanent roads due to bad roading, and stream channel damage by equipment. (11)

Water quality can be protected during forest disturbance through use of “Voluntary Forest Practice Guidelines for South Carolina” and the Best Management Practices of South Carolina’s “Water Quality Management Plan.” The same field techniques that minimize erosion will minimize sedimentation. Elevated stream temperatures which endanger cold water fisheries may be avoided through retention of buffer strips along streams. But most important are the millions of acres of undisturbed forest land that filter rainwater as it percolates through the soil, providing a vast supply of clean water.

AIR

Forest vegetation produces oxygen, vital to human and other animal life. But when forests burn, the smoke can impair visibility, creating safety hazards. Wildfire particulate emissions are estimated to be 436 pounds per acre, while prescribed fire emissions average 50 pounds per acre. Wildfires, which are often intense, consume about 3 times the fuel of prescribed fires. Particulate emissions per ton of fuel consumed in wildfires are about 3 times that of prescribed fires. (10)

Prescribed fires produce fewer emissions, reduce fire hazards, and can be conducted under favorable smoke dispersion conditions. Therefore, prescribed fires should be used to reduce hazards caused by smoke. Wildfires generate 90 percent of the annual particulate emissions from forest land burning in the southeast. Only 10 percent of the emissions are from prescribed fires, although these fires account for over half of the acreage burned. (10)



Forestation of bare soil is an effective means for controlling erosion and topsoil movement.

Prescribed burning can reduce forest fire emissions by decreasing wildfire acreage and by reducing emissions per acre burned. Forest and agricultural burns can both be accomplished with minimal smoke hazard if managers follow the "Voluntary Smoke Management Guidelines for South Carolina," as developed by the S.C. Forestry Association and the Forestry Commission.

GOAL

Protect the quality of the environment while effectively managing South Carolina's forests for the balanced production of timber and nontimber resources.

ACTION NEEDS

- The Southeastern Forest Experiment Station, Clemson University, and the S.C. Department of Parks, Recreation, and Tourism should research the carrying capacity of forests in terms of recreation users, and develop methods to prevent

crowding and overuse. These actions should be geared toward maintaining the quality of the recreational experience and protection of the physical site.

- The Forestry Association should promote legislation strengthening the liability protection of landowners who permit recreation on their lands, particularly to include cutting, gathering, and removing firewood.
- The U.S. Forest Service and the S.C. Department of Parks, Recreation, and Tourism should develop forest recreation sites near urban areas.
- The Forestry Commission, forest industry, consulting foresters, and the U.S. Forest Service should strive to maintain aesthetic qualities through the use of landscape management techniques in planning and laying out harvest and site preparation areas.

- The Forestry Commission, Cooperative Extension Service, consulting foresters, and forest industry should encourage landowners to maintain a diversity of forest types, including those species and conditions most beneficial to forest wildlife, both game and nongame species.
- The S.C. Wildlife and Marine Resources Department should expand its Game Management Area Program and forest industry should be encouraged to increase hunting leases, in order to provide more opportunities for hunting.
- Clemson University, the Southeastern Forest Experiment Station, S.C. Wildlife and Marine Resources Department, and forest industry should research the effects of forestry practices on wildlife, soil productivity, and water quality.
- The Forestry Commission, Cooperative Extension Service, consulting foresters, and forest industry should encourage acceptance and use of the Best Management Practices outlined in South Carolina's "Water Quality Management Plan" and the "Voluntary Forest Practice Guidelines for South Carolina" developed by the Forestry Association.
- Clemson University, the Southeastern Forest Experiment Station, forest industry, and other appropriate organizations should develop and promote cost effective erosion prevention techniques for erosion sensitive sites.
- The Forestry Commission, Cooperative Extension Service, consulting foresters, and forest industry should educate loggers and site preparation contractors on techniques to minimize site damage.
- The Forestry Commission, Cooperative Extension Service, consulting foresters, and forest industry should educate landowners on the use of including provisions in timber contracts to minimize site damage.
- The Forestry Commission and the Forestry Association should promote use of the "Voluntary Smoke Management Guidelines for South Carolina" to mitigate visibility hazards associated with prescribed forest fires and agricultural burning.
- Organizations concerned with the protection of unique areas should work together to identify, designate, and protect areas which contain unique physiographic and geologic features, unusual plant communities, threatened, endangered, and rare species, and cultural resources for lasting public benefits.
- State owned lands should be managed for multiple benefits, both to provide these benefits and to serve as demonstration areas in multiple-use management for landowners.



Prescribed burning can reduce the hazards of forest fire emissions by decreasing wildfire acreage and by reducing emissions per acre burned.

FOREST EDUCATION

LANDOWNER EDUCATION

Future forest resource demands can be met only through motivating and assisting the 109,100 nonindustrial private woodland owners of the state to fully utilize the productive potential of their forest land for multiple benefits. These landowners control 73 percent of South Carolina's forests and exhibit a diversified background and interest in forest management. Many are not aware of what assistance is available. Through education in economics, marketing, intensive and extensive management, and multiple-use concepts, timber and non-timber benefits of the state's resources can be significantly increased.

PUBLIC AWARENESS

Every person's existence and quality of life is dependent on forest land resources—water, air, timber, soil, wildlife, and recreation. Therefore, people need to be aware of the value of forest resources and of the interrelationship of man and the forest. Individuals' attitudes and interests influence the management and development of forest resources through planning, legislation, and regulation. Informing citizens will lead to a sense of public stewardship of the state's forests, stimulating wiser use of the forest—for both timber and nontimber resources.

EDUCATION FOR PROFESSIONALS

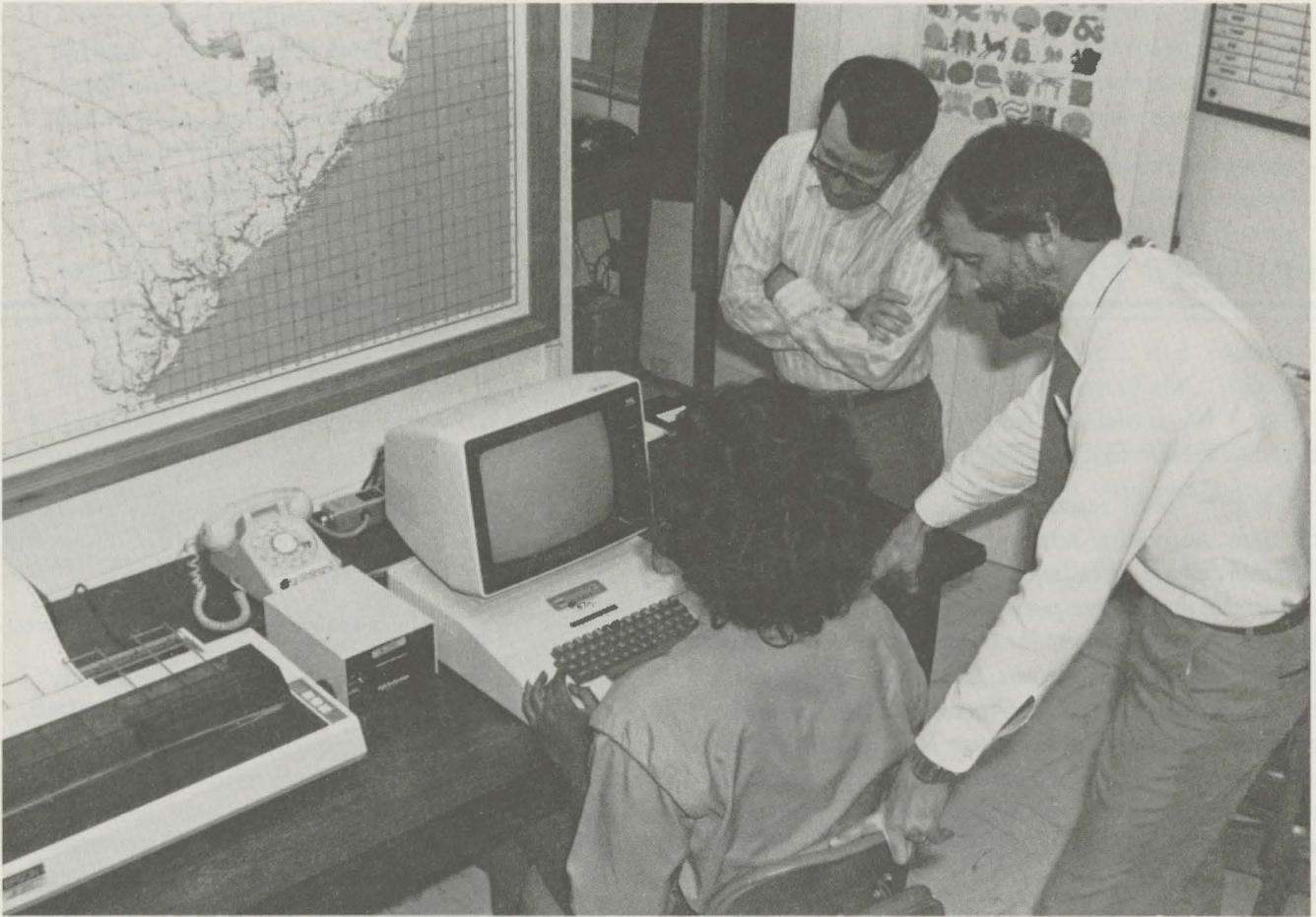
To keep landowners and the general public informed concerning forest management, foresters and technicians will need to update their technical knowledge and improve their communication skills. Professionals must employ the most effective methods of communication to sell forestry to landowners and the general public. Professionals responsible for informing landowners of advances in forest management must keep abreast of current research.

GOALS

- Inform and motivate forest landowners to manage their lands for increased productivity of timber and nontimber resources.
- Develop public awareness of the value of forest resources.
- Equip professionals to accomplish these goals.

ACTION NEEDS

- The Forestry Commission and the Cooperative Extension Service should intensify their efforts to inform and motivate landowners, emphasizing forest management, economic incentives, and multiple-use.
- Agencies such as the Forestry Commission, Cooperative Extension Service, U.S. Forest Service, Soil Conservation Service, and the Agricultural Stabilization and Conservation Service should cooperate to inform landowners on the types of assistance available and on the roles of the various agencies, urging landowners to utilize available professional assistance.
- The Cooperative Extension Service should support local forestry organizations for landowner education and exchange of ideas, and should promote their affiliation with the Forestry Association.
- The Forestry Commission and the Cooperative Extension Service should increase public awareness of the benefits of forest resources through radio and television spots, news releases, feature articles, and radio and television appearances.
- The Forestry Commission and the Cooperative Extension Service should assume a more aggressive role in promoting forestry.



In order to keep forest landowners well informed, professionals must be kept abreast of advances in forest management technology.

- The Forestry Association should conduct tours for the media, legislators, planners, and policy makers involved in land-use decisions.
- The Forestry Commission should be actively involved in planning efforts of local Councils of Government.
- Public land, particularly state-owned lands, should be aggressively managed, setting examples of sound forest management techniques and promoting multiple-use where practical.
- The Cooperative Extension Service, with the cooperation of the Forestry Commission, should develop and maintain demonstration areas exhibiting applied research. The sites should be dispersed throughout the state for individual and group tours. When properly signed and easily interpreted, the areas can inform both landowners and the general public.
- The Cooperative Extension Service and the Forestry Commission should continue to provide short courses for continuing education of professionals, keeping them abreast of new technologies developed through research.
- The Cooperative Extension Service and the Forestry Commission should increase training and workshops for professional personnel in public speaking, media contacts, and news format.
- Interested organizations should participate in Southeastern Forest Experiment Station supervisory reviews, to learn about current research and to assist in planning future activities.
- The Society of American Foresters' activities in landowner education, public awareness, and professional continuing education should be increased.
- Clemson University, Horry-Georgetown Technical College, and Orangeburg Calhoun Technical College should continue to educate professionals in forest resource management and utilization.



REFERENCES

- (1) "Disposal of Residue at Primary Wood-using Plants in South Carolina, 1981, from All Products." Clemson University Cooperative Extension Service and Southeastern Forest Experiment Station, 1981. Unpublished data.
- (2) "Fact Sheet." Columbia, South Carolina: South Carolina Wildlife and Marine Resources Department, 1980.
- (3) Foster, Bennett B. "Some Interesting Comparisons Among States." *Southern Lumberman*, 242(3016), 15 December, 1981, pages 93-96.
- (4) Knight, Herbert A., and Joe P. McClure. *South Carolina's Forests*. Asheville, North Carolina: Southeastern Forest Experiment Station, 1979.
- (5) *Report of the Forestry Study Committee of South Carolina*. Columbia, South Carolina, 1980.
- (6) *Report of the State Commission of Forestry*. Columbia, South Carolina: South Carolina Forestry Commission, 1950-1982.
- (7) South Carolina Department of Labor, 1982. Unpublished data.
- (8) United States Department of Agriculture, Forest Service, Southeastern Area, Cooperative Fire Protection Unit. Unpublished data.
- (9) United States Department of Agriculture, Forest Service, Southeastern Area, River Basin Planning Unit. Unpublished data.
- (10) "Wildland Fires, Air Quality, and Smoke Management," *Journal of Forestry*, Volume 78, Number 11, November, 1980.
- (11) Yoho, Noel S. "Forest Management and Sediment Production in the South—A Review." *Southern Journal of Applied Forestry*, February, 1980.

APPENDIX AVAILABLE ON REQUEST.

