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United States  
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Forest Service

Miscellaneous  
Publication No. 1463

# Proceedings of the Policy and Program Conference on 'The South's Fourth Forest: Alternatives for the Future'

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In designing the parameters of the "southern timber study," the Forest Service called on experts from the university and industrial sectors for guidance. An executive group of these supporters met in Atlanta in March 1987 to evaluate the review draft of the study published in 1988 as Forest Resource Report No. 24, "The South's Fourth Forest: Alternatives for the Future."

This proceedings documents the final meeting of the executive group.

For a free copy of "The South's Fourth Forest" or any of its several stand-alone supplements, please write to the USDA Forest Service, Southern Forest Experiment Station, U.S. Postal Services Building, 701 Loyola Avenue, New Orleans, LA 70113.

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July 1988

# Proceedings of the Policy and Program Conference on "The South's Fourth Forest: Alternatives for the Future"

Jerry P. McIlwain, USDA Forest Service, Staff

The provisional policy and program alternatives were presented by the panel chairmen to a plenary session of the conference for consideration by all participants. The policy and program alternatives developed during the panel and conference discussions and shown here in the proceedings were put into final form by the following drafting committee:

Benton H. Box, Dean, College of Forest and Recreation Resources, Clemson University (Chairman)

John E. Alcock, Regional Forester, Southern Region, USDA Forest Service

J. Lamar Beasley, Director, Southeastern Forest Experiment Station, USDA Forest Service

Tal C. Duvall, Director, Cooperative Extension Service, University of Georgia

David C. Guynn, Jr., Professor, Forest Wildlife Management, Clemson University

B. Jack Warren, Executive Vice President, Forest Farmers Association

Leonard A. Kilian, Jr., State Forester, South Carolina

J. Charles Lee, Head, Department of Forestry, Texas A. & M. University

William F. Milliken, Milliken Forestry Company

R. Neil Sampson, Executive Vice President, American Forestry Association

Donald F. Smith, Region Manager, Boise Cascade Corporation

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## **Policy and Program Alternatives**

### **Panel on Protection--Fire, Insects, and Disease**

#### *Southern Pine Bark Beetle*

1. Reduce losses from the southern pine bark beetle by incorporating into management and funding strategies the principles described in two recent Forest Service publications--"Managing Southern Forests To Reduce Southern Pine Beetle Impacts" (USDA Forest Service, Southern Region 1986) and "Optimal Level of Expenditure To Control the Southern Pine Beetle" (J.E. de Steiguer, Roy L. Hedden, and John M. Pye 1987).
2. Increase public awareness and support for efforts to control the southern pine beetle. Consider the use of programs similar to those used for fire prevention and presuppression. Stress the importance of control efforts when pine beetle populations are at endemic levels and for appropriate control efforts on all forest land, including wilderness and other reserved areas.

#### *Other Pests and Diseases*

3. Reduce losses from other pests, especially gypsy moth, fusiform rust, and cone and seed insects, through continuing research and control actions.
4. Expand technical assistance on pest and disease control to meet the needs of new and expanding southern tree nurseries.

#### *Fire*

5. Increase understanding and public support of prescribed fire as a management tool.
6. Improve smoke-management technology and the effectiveness of smoke-management programs.
7. Maintain adequate rural cooperative and community fire-protection programs, including the supporting technology.

#### *Wildland/Urban Interface*

8. Develop and initiate programs for the protection of forest resources, homes, and people in areas where the intermix of woodlands, homes, and people is expanding. The wildland/urban interface initiative for fire management could serve as a model.

### **Panel on Research, Education, Technology Transfer, and Technical Assistance**

#### *Research*

1. Develop closer cooperative relationships and partnerships among the three principal contributors to research (USDA Forest Service, industry, and universities) and research users to focus research efforts, to capture highest priority opportunities, and to maintain a balance of research activity among forest resources and uses.

2. Improve the timeliness and usefulness of the inventories of forest resources by shortening the inventory cycles and providing more precise and detailed resource data.
3. Expand research on growth and yield and other physical responses of forest resources to changes in management practices and on the associated economic returns.
4. Increase research on low-cost ways of naturally regenerating pine and other desirable species, including ways of reducing the time lag between harvest and stand establishment.
5. Increase research in biotechnology, forest ecology, and tree physiology, to increase the productivity of forest trees.
6. Intensify research efforts on the economic returns to forestry investments for public, industrial, non-industrial private, and institutional investors, using methods accepted by the financial community.
7. Increase research, education, and technology transfer programs, to improve wood utilization and quality control of manufactured products.
8. Conduct research to quantify the effects of the mechanical properties of fast-grown species on wood and fiber products.
9. Conduct research on the prospective role of southern forest products in international trade and the potential impact of global fiber production and marketing on the southern forest-products industry.

### *Education*

10. Improve the effectiveness and expand, as needed, education programs conducted by Federal and State agencies, forestry schools, and forest industries on the benefits of good resource management for forest landowners, loggers, processors, and the general public.
11. Improve the effectiveness and expand, as needed, continuing education programs for foresters and other resource managers.
12. Improve the effectiveness and expand, as needed, educational programs concerned with integrated resource management.
13. Increase training of reforestation contractors to improve quality and survival of planted trees. Consider requiring certification of reforestation contractors.
14. Encourage the establishment of formal and informal institutional relationships at the State and local level made up of the providers of professional forestry assistance, including State service foresters, consultants, industry, extension, and others, to identify local problems, develop educational programs, inform forest landowners of the options available to improve the productivity of their forest lands, and encourage them to seek technical assistance in forestry matters.

### *Technology Transfer*

15. Build technology transfer and research incentives into the research process and emphasize the need to disseminate research results effectively.

16. Assist U.S. producers of forest products to compete more effectively in foreign markets through marketing research, technical assistance, and coordinated efforts of Federal and State agencies. Use the USDA Forest Service and National Association of State Foresters' "National Marketing Initiatives Plan" as a model.

### *Technical Assistance*

17. Improve the effectiveness and expand, as needed, technical assistance programs of State forestry agencies, forest industry, and consultants, to provide personal assistance by a professional forester to private landowners before harvest decisions are made and at other critical points in the management process.
18. Include information on lower cost regeneration techniques such as natural regeneration and direct seeding when presenting management alternatives to timberland owners. Provide necessary technical assistance.

## **Panel on Management Incentives--Direct and Indirect**

### *Tax Laws*

1. Support amendments to Federal and State income tax laws to allow reforestation costs to be expensed (deducted from income in the year paid) rather than capitalized.
2. Support amendments to Federal and State income tax laws to allow the full amount of management costs to be expensed. (The 1986 Tax Reform Act imposed some limitations on the amount of these costs that can be deducted in the year paid for certain classes of taxpayers.)
3. Support amendments to Federal and State income tax laws to restore the lower effective tax rate for long-term capital gains from the cutting or sale of timber.
4. Support amendments to Federal and State income tax laws to establish a tax credit for free forestry assistance provided to nonindustrial landowners by forest industries and other interests.
5. Support amendments to State property tax laws to exempt standing timber from taxation in those States where standing timber is still included in real property assessments.

### *Cropland Conversion Programs*

6. Revise cropland set-aside programs (Acreage Conservation Reserve) to consider set-aside tracts planted to trees as planted acreage for base allotment purposes for 10 years.

### *Forestry Incentives Programs*

7. Expand Forestry Incentives Programs.

## **Panel on Multiple Use**

### *Soil, Water, and Air*

1. Support and promote the application of "best management practices" on all forest lands and forestry operations by providing technical assistance and demonstrations to landowners and loggers.
2. Actively work toward developing State and/or county systems for voluntary logger certification.
3. Provide active leadership for proper forest management and prevention of nonpoint source pollution on groundwater recharge and wetland areas in cooperation with State water quality agencies.
4. Focus research on economic methods of site preparation that minimize soil erosion and site damage.
5. Encourage the use of low-intensity silvicultural methods on lands where they are biologically and economically feasible to achieve increases in productivity while protecting the land.
6. Support research to quantify the adverse effects of air pollution on forests and other renewable resources, and support efforts to reduce identified sources of pollution.

### *Range*

7. Support current efforts to develop, demonstrate, and promote sound and practical range management on the South's forest land.

### *Bottomland Hardwoods*

8. Reestablish, protect, and manage bottomland hardwoods for timber, wildlife, and other renewable resources by coordinating efforts of timber and wildlife interests.
9. Explore using Farmers Home Administration conservation easement and inventory land disposal programs and Corps of Engineers mitigation authorities to stimulate reforestation of bottomlands and other eligible lands.

### *Wildlife and Fisheries*

10. Develop effective programs to identify, protect, and manage critical wildlife habitats, with particular emphasis on private lands.
11. Give wildlife and fishery resources equitable consideration with timber in public and private forest plans.
12. Develop more effective ways of assessing wildlife and fishery resources, including their economic values.
13. Establish at all colleges offering a Bachelor of Science degree in forestry or wildlife management a minimum requirement for training in the basic elements of each profession.
14. Assist timberland owners in realizing the economic and access-control opportunities of leasing recreational rights on their lands.

## **General Alternatives**

A number of policy and program proposals received support from more than one panel because of their potential impacts on many aspects of management of forest resources. These proposals are listed below.

### **Coordination and Cooperation**

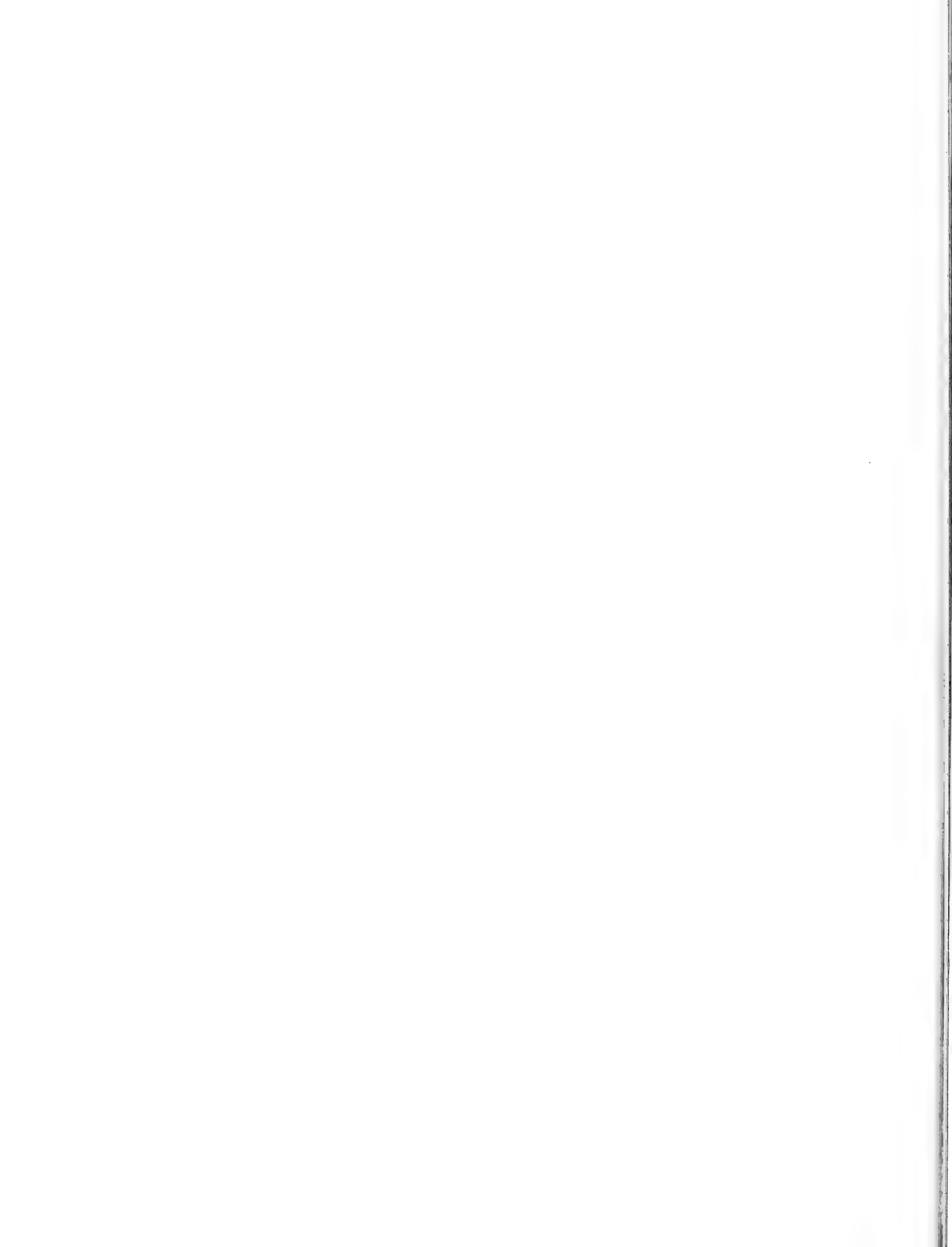
1. Initiate or expand State-level and county-level forest resource planning committees, with participation from all forest resource interests and State and community leaders, to promote and coordinate forest-management policies and programs.
2. Improve cooperation and coordination among State and Federal agencies, industry, and consultants and increase technical assistance to landowners on how to manage their timberlands for timber, wildlife, and other benefits.
3. Encourage the involvement of timberland owners in the planning and conduct of technology transfer, education, and research programs.

### **Recognition and Support**

4. Provide public recognition for timberland owners demonstrating good management practices and the use of modern technology.
5. Increase efforts to obtain support for forestry programs from the highest State officials, including governors, trade and economic development departments, and State legislators.
6. Increase efforts to obtain support for forestry programs from the U.S. Congress, particularly the forestry-related committees and subcommittees and the Forestry 2000 task force made up of members of the U.S. House of Representatives.
7. Increase public awareness of the forest resource and forest industries and their contributions to State and local economies and community well-being.

### **Cropland Conversion and Incentives**

8. Fully implement the Conservation Reserve Program for the 5 years authorized under the Food Security Act of 1985 and expand the eligible land base for the program to include highly erodible pasture, highly erodible forest land, and flood-prone bottomlands, to encourage reforestation on these sites.



## Statement of Purpose for the Conference

John M. Bowen (1)

Ladies and gentlemen, we are gathered here at a critical time in the history of forestry in the South. In recent decades it has been a history of great success. There have been large and continuing increases in timber growth and inventories. Timber is now the most important agricultural crop in the South. The forest industries lead all other manufacturing industries in number of employees and in wages and salaries paid to workers.

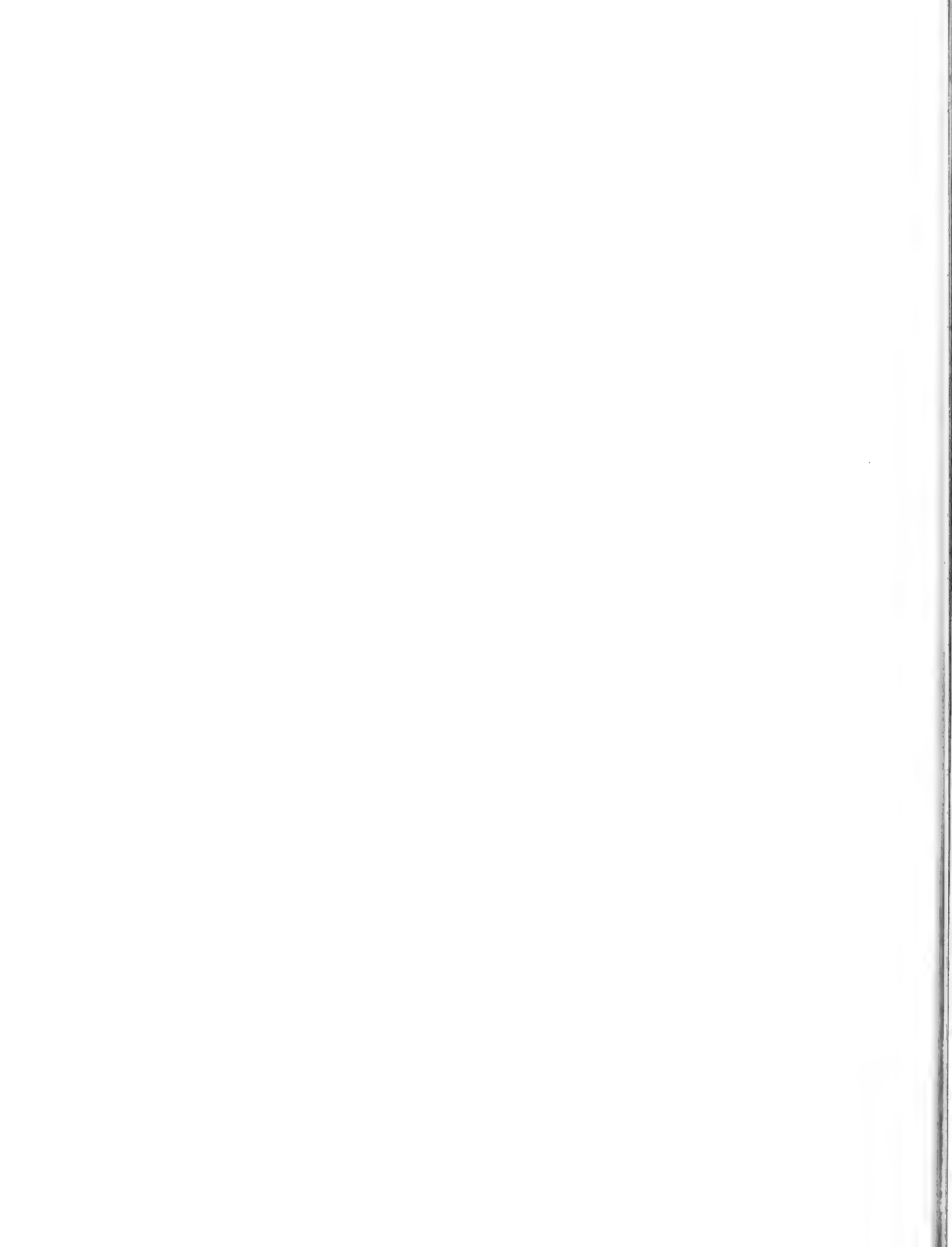
But there are changes of great significance underway. The most recent surveys of our forest resources show that net annual timber growth has

begun to decline. It seems clear that unless we take action to sustain increases in timber growth and inventories, we will be facing a future in which the economic importance of the forestry sector will decrease, to the detriment of forest owners, forest workers, and in the end to our entire society.

So, we're going to work here today and tomorrow to consider ways of continuing the great progress that has been made in the past. Our program this afternoon is directed toward establishing a broad understanding of the present and prospective forest situation; the implications for forest owners, forest industries, State and local governments, and the economy of the South; and the opportunities to increase forest productivity in economically acceptable ways to sustain continued growth in our forestry sector.

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(1) John M. Bowen is past president, Forest Farmers Association, Atlanta, GA.





# The Prospective Timber Situation in the South and its Economic, Social, and Environmental Implications

F. Dale Robertson (1)

## Introduction

I am pleased to be back in the South. I grew up in Arkansas, went to school there, and learned my basic forestry tromping around southeastern Arkansas on Crossett Company land.

Reading the review draft on the South's fourth forest brought back a lot of memories about the early part of my career here in the South. I worked on two Ranger Districts where the "first forest" had been clearcut by large lumber companies in the teens and twenties. In fact, as a practicing, on-the-ground forester, I had a set of 1936 photos that I used regularly in Texas, and I could go into the woods and very vividly see the "second forest" and how it developed over time.

I spent part of my career trying to manage that second forest and, at the same time, grow the "third forest." Many of the timber sales were designed to increase the future productivity of the forest, not to make money, and were probably below-cost timber sales. I also had huge reforestation crews and timber-stand improvement crews. They really made a difference and deserve much of the credit for the third forests we enjoy today, on the national forests. The same experience happened on privately owned woods all over the region.

Today I have the honor of presenting the findings of the study report entitled "The South's Fourth Forest: Alternatives for the Future." One of the honors of being Chief is that I get to make speeches about great things other people do. The southern timber study has really been a cooperative effort, with many, many people making important contributions. I want to express our thanks and appreciation for the excellent support and assistance from the State Foresters, forest-products industry, southern forestry schools, Forest Farmers Association, American Forestry Association, and the executive group

that helped guide this study. I think it is a landmark study and, hopefully, as we look back on it and this conference 10 or 15 years from now, we can truly say it was the curve-bending event that helped make a difference.

The study deals basically with three points: (1) It describes the kind of forest that is evolving in the South, if present trends continue. (2) It discusses the implications of this evolution to the economy and society. And (3) it identifies our opportunities to change things and create the kind of forestry future that we want to have in the South. I will discuss the first two points; Deputy Assistant Secretary Doug MacCleery and other speakers this afternoon will address the third point: how to go about growing a fourth forest that will permit forestry to continue as a growth industry in the South.

## Timber Demand

First, let's look at the prospective changes in the timber demand and supply situation. In the future, as in the past, demands and supplies of timber will be largely determined by such things as growth in population, income and economic activity; changes in timberland area; and management intensity and associated timber yields. The population of the United States has nearly doubled in the last 50 years, rising from 123 million to 241 million people. The latest estimates of the Bureau of the Census show the population continuing to grow, with the midlevel projection reaching 305 million by the year 2030. Since 1929, the gross national product in constant dollars has increased by more than five times. The 1930's saw a major depression, and a number of recessions have occurred; however, in each case, the economy recovered. The basic forces that brought about longrun growth are still in effect. Projections show that economic activity will nearly triple by the year 2030. Total income available for spend-

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(1) F. Dale Robertson is Chief of the USDA Forest Service.

ing is also projected to nearly triple by the year 2030: per capita income is projected to increase almost 2.3 times.

When you add all of this up, it means only one thing. We have got to have more timber to meet the needs of not only another 64 million people but the demands of 305 million people with purchasing power 2.3 times that of today. We all know that there is some uncertainty associated with economic projections. However, in spite of uncertainty, one thing seems clear--the consumption of most timber products has been rising and is expected to continue to rise. Total demand for timber is projected to rise from 16.7 billion cubic feet in 1984 to 21.1 billion in the year 2030. This is about a 25-percent increase in demand over the next 45 years, but the rate of increase in demand slows down in comparison to increases of the last 20 years.

## Timber Supplies

Timber harvesting was not a major factor affecting the forests in the South until after the Civil War. At that time, timber harvesting accelerated as railroads were extended into the vast pine forests on the Coastal Plain. Technology for sawing large volumes of timber was put into practice, and huge markets for lumber developed in the Midwest and Northeast. From about the 1880's until the 1920's, very large areas were harvested. Some of this land was used for crops and much bigger areas for pasture. Because of such use and the uncontrolled fires that burned over large areas each year, only a part of the cutover lands came back to forests.

Some did, though, and the early 1900's marked the beginning of what became the South's second forest--the forest that supplied the wood for the expansion of the pulp and paper industry in the 1930's and on into the 1960's.

As the second forest was developing, several trends took hold. By the early 1920's, the use of land for crops and pasture peaked and began to decline. Forest industry and Federal/State forestry agencies became concerned about the future timber supply and the lack of regeneration of cutover lands. This concern led to early forestry programs of fire protection, technical and financial assistance, research and education, and management of public, industry, and some private forests. Fire prevention and protection were especially effective, and a large part of the cutover land and idle crop and grazing land

regenerated to forests naturally. Research developed ways to protect and regenerate forests and utilize southern pine timber for products such as pulp and plywood. This brought about major changes in forestry and forest industries.

These same forces continued to affect the timber situation for several decades. The area of land used for crops and pasture continued to drop through the 1950's, sometimes at rapid rates, and much of the area regenerated naturally.

This scenario led to what is surely a great achievement in the history of forestry, the regeneration and growth of the South's third forest. This forest is now a major land use, with forests accounting for 2 or 3 out of every 5 acres in all Southern States except Texas and Oklahoma. There are more acres in timberland than in cropland and pasture combined.

In 1984, this third southern forest was the source of two-thirds of the Nation's pulpwood and close to half of all plywood, two-fifths of the hardwood lumber, and one-third of the softwood lumber produced in the country. The total value of the timber harvested--sawlogs, veneer logs, pulpwood, and other round products--at local points of delivery in 1984 was \$6.1 billion. This figure is twice the value of the soybeans or cotton harvested in the South. For every \$3 worth of agricultural crops harvested, there was \$1 worth of timber harvested. The forest products industry is the #1 manufacturing industry in the South. It employs one out of every nine workers in the manufacturing industries and pays \$1 out of every \$10 in wages and salaries.

## Supply Outlook

Although the timber situation in the South has shown great improvement in recent decades, and timber is now of great economic importance, there are trends underway that will affect the future in some major ways. The most recent surveys of forests in the South show that net annual timber growth, after rising for decades, has leveled off or begun to decline. If current trends for hardwoods continue, timber removals will exceed growth by the year 2000.

In the case of softwoods, we are already at or near the break-even point where timber removal is about equal to growth, and we are facing a declining inventory of softwood timber. There are four major causes for reduced softwood growth. One is

the lack of adequate regeneration of pine stands after harvest on private lands other than those owned by forest industry. The natural succession in most of the pine stands after harvest is to mixed hardwoods and pine, or to hardwoods. Many private owners are accepting whatever species nature provides. As a result, the latest cycle of forest surveys shows a 30- to 50-percent decline in the number of pine saplings on private lands in nonindustrial ownerships. This trend has been going on long enough to be reflected in net annual growth.

A second factor reducing growth of softwood is an increase in mortality. Over the last 10 years, for example, annual pine mortality has increased from 9 percent to 15 percent of the gross annual growth. Much of the increase in mortality can be attributed to outbreaks of pine bark beetles.

The third important factor is a significant drop in radial growth of pine trees in the Piedmont and mountain regions of Georgia, South Carolina, North Carolina, and Virginia. In these areas, average annual radial pine growth has been some 20 to 30 percent lower during the last 10 years than in the preceding 10-year period.

At this point, we do not know the reasons for the decline in radial growth, but our researchers are working on the problem. Some possible contributing factors are changes in stand density and stand age, drought or other weather factors, the loss of fertilizers in old fields that came back to pine, increased hardwood competition, and acid rain.

The fourth factor affecting both hardwood and softwood growth has been the conversion of timberland to other land uses. Since the early 1960's, the area of timberland in the South has declined from 197 million acres to 182 million. About one-third of the loss is due to the conversion of hardwood bottomlands to cropland, especially in the Mississippi Delta. Most of the loss, however, was from pine forests.

During the period in which net annual timber growth has leveled off or begun to decline, timber removals have increased rapidly. This picture reflects increased timber harvests to meet the rapidly expanding demands for timber products that I described earlier. As a result, softwood timber removals are now about equal to net annual growth for the South as a whole. However, in many areas of the South, softwood removal now exceeds growth.

Both growth and timber removal trends are the result of many forces that are not easily or quickly changed. Thus, these trends are likely to persist for

some time. How long they persist, however, depends upon what actions we take to increase the timber supply and how soon we do it.

## Implications

The base projections in the study assure a continuation of these trends in net annual growth and removals, resulting in a declining inventory of both hardwood and softwood timber over the next 30 to 50 years. Among the economic consequences of continuing existing trends and the base projections are rising real prices for stumpage. Between 1984 and 2000, for example, softwood sawtimber prices are projected to rise at an annual rate of 3.1 percent in the South Central region. Softwood pulpwood stumpage prices rise more slowly than sawtimber prices in the early part of the projection period and more rapidly in the latter part.

Hardwood stumpage prices show much different trends than those for softwoods. They decline until around the year 2000, which reflects the availability of large and increasing inventories of hardwood timber. After 2000, as timber removals rise above net annual growth and inventories begin to decrease, prices begin to rise again.

Rising real prices of stumpage have important economic, social, and environmental implications. In the highly competitive markets in which nearly all timber products are sold, rising prices act to constrain demands or result in losing market share to other parts of the country or to substitute products, such as concrete, steel, aluminum, and plastic. In addition, the mining, industrial processing, and power generation associated with the production of wood substitutes are likely to cause more air and water pollution. The increases in harvest are too small to sustain employment in the forest industries. By 1990, employment is projected to drop. By 2030, total employment in the lumber and wood-products and pulp and paper industries is projected to be 25 percent, some 108,000 people, below the employment level of 1983. Total wages and salaries also decline in the latter part of the projection period. The effects are multiplied as they spread through the trade, service, transportation, and other parts of the southern economy providing goods and services to the forestry sector. Ultimately, consumers will be affected by rising real prices, with home buyers bearing most of the increased cost.

## **In Conclusion**

In closing, let me repeat that most of what I have said today is based on the projection of current trends into the future. But I do not believe that trends are the same as destiny. We simply cannot avoid inventing the future, and it starts with a good understanding of the present situation and deciding what

kind of future we want. I am convinced that the best is yet to come in southern forestry, if we just decide to do it and put forth the necessary effort to make it happen. I pledge the Forest Service's support because we want to be a cooperating partner, working side-by-side with other members of the forestry community in shaping the future of southern forestry.

# The Opportunities for the South's Fourth Forest

Douglas W. MacCleery (1)

## Introduction

I appreciate the opportunity to speak before this conference on the opportunities for the South's fourth forest.

In *Julius Caesar* Shakespeare wrote:

There is a tide in the affairs of men,  
Which, taken at the flood, leads on to fortune;  
Omitted, all the voyage of their life  
Is bound in shallows and in miseries.

The tide is at the flood for forestry in the South. Timber growth, after rising for decades, has peaked and may now be beginning to decline. This makes for a very exciting time--full of problems, as well as challenges and opportunities. We have the opportunity to influence the course of events in ways that can substantially increase the real wealth of the South and of the Nation. Timber can continue to be the highest valued agricultural crop. The forest products industry can continue to lead other manufacturing industries in providing income and employment. The key is to find ways to capture the extensive opportunities to increase forest productivity that exist on forest lands, as well as on agricultural lands not needed for crops or pasture. The key is also to find ways to build on the Federal, State, industry, forestry consultant, and landowner efforts that in the past have brought about great increases in timber growth and inventories.

## Opportunities Identified in the Study

The southern timber study described very well the kind of future we are facing in the South today--a future of rising demands for timber and rising prices for stumps and timber products; a future that also could include declining southern timber growth and declining employment and income in the forest industry.

There are significant opportunities to change that last aspect of the possible future--to have a fourth forest that will sustain continued increases in timber growth and in employment and income.

The South has abundant, economically attractive forest-management opportunities that will yield 4 percent or more real return on the investment (net of inflation). Capturing these opportunities will increase net annual timber growth by 3.2 billion cubic feet. The most productive opportunities will yield over 10 percent real return on investment. There is an additional potential to grow 800 million cubic feet on cropland and pasture where pine planting will yield higher rates of return to owners than would crop or forage use. There is also potential to grow 1.2 billion cubic feet of timber on highly erodible cropland.

If all the economic opportunities are utilized and the highly erodible croplands are planted to pine, net annual timber growth could be increased by 5 billion cubic feet. This would nearly double current net annual softwood growth in the South.

## Potential Benefits of Seizing the Opportunity

Achieving the potential increase in timber growth would have very positive benefits for the South. The increase would provide enough timber to assure continued growth in employment and in wages and salaries in the forest industry. It would also be a powerful stimulus to the general economy of the South. The effect of increased forestry-sector employment would be multiplied as it works through the trade, service, and transportation sectors, and other parts of the economy. Currently it is estimated that total employment is increased about 2.5 times for each additional job in the forest industry sector.

Achieving the full potential for greater timber growth would also have important national impacts. Consumers would pay less for timber products. Because everyone consumes forest products, everyone in society would benefit. Export sales of forest products would be stimulated and imports reduced--therefore exerting a favorable influence on the national balance of trade. The use of substi-

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(1) Douglas W. MacCleery is Deputy Assistant Secretary for Natural Resources and Environment, U.S. Department of Agriculture.

tute materials such as steel, aluminum, and plastics would also be constrained. There would be related environmental benefits, particularly from reduced erosion and sedimentation from crop and grazing land converted to forest. Air and water pollution from mining, industrial processing, and power generation associated with the use of wood substitutes would also be reduced.

The analysis of economic opportunities to increase timber growth in the South assumed that stumpage prices would continue to rise. But even with constant stumpage prices, the opportunities are still large--amounting to over 3 billion cubic feet of annual growth on timberland. So the opportunities are largely risk free insofar as price changes are concerned--because prices are not likely to fall below recent levels in real terms.

## **Potential for Conversion of Cropland to Timber**

Price expectations for most field crops and for red meat are quite different from those for timber. Given the outlook for increases in agricultural productivity throughout the world, it is projected that relative prices for these commodities will remain unchanged or perhaps even decline in the future. Forage supplies will increase, largely in the West, as Conservation Reserve contracts expire after 1995. Thus, constant or even declining relative prices, along with the crop surpluses that currently exist, indicate that there will be a shift away from the use of land for field crops and pasture. The Conservation Reserve is now facilitating that shift. USDA has now accepted about 20 million acres for the long-term Reserve, mainly in the western grain States. The target is 40 to 45 million acres by 1990.

The analyses in our study indicate that there are now about 8 million acres of cropland and pasture in the South where the owners could obtain higher rates of return if planted to pine. There are also an additional 11 million acres of highly erodible cropland suitable for trees. Most of this cropland and pasture is open land and can be easily planted with machines. There are no site preparation or other related costs. As a result, the cost of establishing a pine plantation on cropland and pasture is much below that on harvested timberland--\$62 per acre compared to \$129 per acre. It is also below the \$94 per-acre cost of converting timberland stocked with low-quality trees to pine plantations.

Under the Conservation Reserve Program of the 1985 Farm Bill (Food Security Act of 1985), up to 3 million acres of the highly erodible land could be planted to pine in the South by 1990. To date, USDA has accepted about 2.2 million acres for the Conservation Reserve in the South (excluding Texas and Oklahoma). Half of that area, or about 1.1 million acres, is to be planted to pine.

## **How To Capture the Opportunities**

The opportunity for southern timber growth is there. The problem, of course, is how to capture the opportunities. The basic infrastructure is in place. We have the transportation network, the trade and service industries, and a large and efficient forest industry. The necessary institutions are in place--State forestry organizations, forestry consultants, and the USDA agencies of the Forest Service, Extension Service, Soil Conservation Service, and the Agricultural Stabilization and Conservation Service.

We also have the southern forest experiment stations and 15 southern universities providing professional forestry training and carrying out research. Southern financial institutions have established their interest in forest investments. Their portfolio of forest investments has been growing. State policy officials have deepened their awareness and interest in the role of forestry and forest industries in their economies. Some have lent their leadership to the Statewide forest resource planning and development efforts of the State forestry agencies.

We have what is needed--the economic opportunities, the infrastructure, the institutions, and the awareness and interest to grow a fourth forest to assure the continued growth of the forest industries. The challenge is how to marshal and deploy these institutions and interests effectively. We need to focus on concrete goals in terms of investments made on the ground, on how to integrate our efforts in each State to reach the landowners who could initiate the needed investment and management. This is a task that cannot be achieved by any one institution alone. Integrating our efforts collectively, will greatly increase our overall effectiveness and produce a synergism that can multiply our productivity in increasing forest growth.

The investment needed to implement the economic opportunities on privately owned timberland is \$6.2 billion. The minimum rate of return on these

investments is 4 percent, net of inflation or deflation. This approximates the longrun average rate of return on capital in the private sector. The bulk of the investments would yield more than 4 percent. Nearly half would yield 10 percent or more and some would yield real rates of return on investment above 15 percent. These rates are very attractive when compared with most other investment opportunities. In addition, the real property nature of these investments offers protection from inflation.

About \$500 million would be needed to plant pine on marginal cropland and pasture. Average rates of returns on these investments are about 11 to 15 percent above inflation on higher sites, 8 to 12 percent on medium sites, and 5 to 9 percent on low sites.

The capital investments needed to plant pine on the highly erodible cropland would total about \$700 million. The financial returns on these investments would range from 11 to 15 percent across the South. These rates do not reflect the added benefits of cost-share payments if the lands were to be put under the Conservation Reserve Program.

The investment opportunities to increase timber supplies are attractive in their own right. The bulk of these investments must come from the private sector. In reality, only a small fraction can come from the Federal Government. Federal contributions under the Forestry Incentives Program have averaged \$9 million a year in the South; that is only 2/10 of 1 percent of what is needed. State and industry incentives have been rising in recent years and will likely contribute substantially in the future, but investments by private individuals must be relied upon for the bulk of the capital needed.

## **Potential for Nonindustrial Private Lands To Respond to the Challenge**

Approximately 122 million acres, or about two-thirds of the timberland in the South, is owned by private individuals or firms other than the forest industries. Nearly *three-quarters* of the economic opportunities to increase timber growth are on these nonindustrial ownerships. Nearly half of the economic opportunities on these private forestlands are for pine stand regeneration following harvest. Most of the owners do not manage their harvested lands effectively for pine regeneration. They generally accept whatever species nature provides, to their economic detriment and that of the South.

Generally the natural succession of existing stands of pine or of mixed pine and hardwoods advances to pure hardwoods following pine harvest. This natural succession process is one of the major causes of the decline in net annual softwood growth. In addition to regeneration following harvest, there are substantial opportunities to increase timber growth on these nonindustrial private ownerships by releasing adequately stocked stands that have competing vegetation and by clearing low-grade hardwood stands and planting to pine.

There have been many conferences and forums and much handwringing about what needs to be done to improve the management of nonindustrial private lands. In typical bureaucratic fashion, these landowners have even been given their own acronym--"NIPF"--which stands for "nonindustrial private forest" landowners.

The barriers usually cited as to why it is so difficult to address this class are several:

1. A large number of people with diverse ownership objectives.
2. A low level of technical expertise among landowners.
3. Apparent low interest or even noninterest of many landowners in managing lands for timber production.
4. Absentee landownership problems.
5. Problems associated with attracting capital for forestry investments.

There is no doubt that improving management of these lands will be associated with many problems. But the picture may not be quite as bleak as it is sometimes portrayed.

Let's take a closer look at the data on these nonindustrial landowners in the South. As I have already mentioned, these ownerships offer three-quarters of the total economic opportunities for forest-management investment in the region. In 1978 there were some 3.5 million private owners of timberland in the South. Of these owners, 92 percent own less than 100 acres of timberland. Only 8 percent, or 276,000 owners, hold tracts large than 100 acres. But collectively, these larger timberland owners hold 73 percent of all the nonindustrial timberlands in the South. So 8 percent of the landown-

ers hold three-quarters of the privately owned non-industrial forest land base.

Although the data have not been prepared by size of ownership, most of the economic opportunities to increase timber supplies in the South are on the larger nonindustrial ownerships. I would estimate that at least 60 percent of the total economic opportunities in the South are on these larger nonindustrial holdings.

This does not mean we should ignore owners with less than 100 acres—we need to provide services to them according to their needs and opportunities. But we need also to understand the timberland ownership profile in the South to be most effective in marshaling and deploying our institutional resources. Such information is essential to better understand the opportunities and respond in ways that put our limited resources to best use.

The larger ownerships represent the better economic opportunities. Their properties have lower logging costs, so loggers naturally seek out these landowners. These owners also have a stronger economic interest in management and are more receptive to information on opportunities to improve management. This situation exists whether we do anything or not. The data suggest that these larger parcels have been and will be logged. In fact, our data indicate that nationwide about 85 percent of the logging on nonindustrial lands occurs on ownerships greater than 100 acres.

How are we doing in terms of forest management on these nonindustrial lands? Not too well, by almost any measure.

We know that large numbers of private owners in the South are not getting professional assistance. Nearly two-thirds of the land in these ownerships is harvested without any professional help—either before or after harvest. We see what this has meant in terms of lack of efforts to get successful pine regeneration. This fact holds the key to capturing economic opportunities on these critical ownerships.

Whether we like it or not, on nonindustrial lands, most forest management decisions out on the ground are not being made by professionals, not by consulting foresters, industry foresters, or public foresters. They are not even being made by the landowners themselves in most cases. They are being made by loggers. And they are being made from a logger's perspective—keep logging costs down and cut the biggest and best and most valuable trees first. The need for successful regeneration after harvest is not seen as a priority by most loggers.

We do know that professional assistance can be very effective in increasing the income of timber owners and increasing timber supplies. It is also efficient in terms of the cost and benefits. A recent study in the Georgia Piedmont done by Fred Cubbage showed large differences in earnings and future forest productivity between professionally assisted landowners as compared to those receiving no assistance. Professionally assisted owners received prices for their timber that averaged 50 percent higher per thousand board feet than prices received by unassisted owners. The assisted owners also had less pine timber removed, more pine volume left after harvest, and more pine seedlings for another crop. The greater immediate financial returns to the owners receiving assistance created large benefit-cost ratios for the assistance. All in all, landowners are foolish *not* to get professional forestry assistance.

People who would not think of going to a plumber to get root-canal work done will accept advice from a logger on the proper way to manage their forest property. As long as this continues, we will have problems getting needed investments made.

Decades ago, programs of fire protection and prevention were the key to the regeneration of the cutover timberlands in the South. These were low-cost and very effective ways to increase timber supplies.

Information and education are most likely the next lowest cost and most effective ways to increase timber growth. Nonindustrial timberland owners need to know how to market, harvest, regenerate, and manage timber and timber stands. Most of these owners simply don't know how to do these things. Most importantly, they need to understand the value of obtaining professional forestry assistance, *before* harvest operations begin. So today, perhaps professional assistance is similar to fire protection and prevention at an earlier time—it may be the best and lowest cost way we have to get nonindustrial private owners to take advantage of existing economic opportunities.

## Opportunities on Other Ownerships

Significant opportunities also exist for improving timber outputs from industrial and Federal ownerships. Nearly a third of the timberland in industrial ownerships, or 13 million acres, offers economic opportunities to increase timber supplies. There are



an additional 7 million acres on public forest lands with such economic opportunities.

Clearly, we have large, capturable opportunities in all ownerships. If we are to make use of these opportunities, our existing institutions must work together. The evidence suggests they are generally not doing so now. Otherwise, why does the performance on nonindustrial lands leave so much to be desired? The need is for leadership to focus the efforts of all forestry interests.

## **USDA Efforts**

USDA intends to do its part in this effort. In the Department, the Natural Resources and Environment Committee coordinates natural resource policies. Within that Committee, we have recently established a State and Private Forestry Issues Working Group of nine Departmental agencies cochaired by the Forest Service and the Extension Service. This committee is designed to coordinate policy, identify responsibilities, and increase the visibility of State and private forestry issues among the agencies of USDA. The working group has been charged with identifying and eliminating duplication of effort among the agencies. It will thoroughly review policies and interagency agreements and recommend changes as necessary to improve our efficiency in forestry matters.

## **State and Local Efforts**

There is a need for State and county-level organizations to help mobilize and target efforts to owners who have recently made, or who are likely in the near future to make, harvest decisions. We do have an example of how this might be done.

In the early 1970's, the State of Virginia recognized it was facing a softwood timber supply problem. With support from the forest industries and the Virginia Forestry Association, the Virginia legislature enacted severance taxes to be used for regenerating pine timber. The severance tax receipts are matched by appropriated State funds and supplemented by funds available from Federal sources.

Another important part of the Virginia system is the public or area foresters who provide information on financial and technical assistance, including the availability of private forestry consultants and vendors.

Significant success has been the result of this program. Virginia's cooperative effort has worked and is working. The State is regenerating about three-quarters of its pine after harvest--as opposed to the Southwide average of only 30 to 40 percent. The Virginia system serves only as an example. There are undoubtedly other ways to achieve the same result. The point is that with cooperation and coordination, we have demonstrated proof that it is possible to effectively use State, industry, and local organizations to increase timber investments.

## **All Interests Need To Work Together To Get the Job Done, and We Need Performance Goals.**

Capturing the large opportunities we have to increase southern timber supplies requires that all the forestry interests work effectively together and develop cooperative arrangements. Our experience indicates that this is much easier said than done. But we have learned that it works best when the integration effort has the direct interest and support of a State's policy leadership, the governors, and State legislatures.

The measure of success must not be the establishment of programs or cooperative arrangements but investments out on the ground. States should have quantified goals to track their performance over time.

## **Summary and Conclusion**

The Forest Service projects that timber demands will grow faster than southern timber inventories and growth in the next several decades, assuming current management trends continue. The South can capture the economic growth opportunity offered by this outlook if it can increase timber growth and inventories to satisfy growing demands.

I would like to summarize a number of significant pieces of information that I believe are relevant to capturing these opportunities:

- First, three-quarters of the potential opportunities in the South are on nonindustrial private forest lands. These lands are absolutely key to the forestry future of the South.

- Second, these lands are not now generally being managed under any reasonable level of professional forest management. They are the only major ownership class that is not--the others being industrial private, State and other public, and Federal.
- Third, when nonindustrial landowners avail themselves of technical assistance, they are better off financially, the timber resource is left in better condition, and investments in improved growth are made. The job is primarily one of selling the advantage of getting professional forestry assistance to landowners.
- Fourth, the data show that the difficulty of addressing the nonindustrial problem may not be quite as great as often assumed. That is because most of the opportunities are on the larger ownerships held by relatively few landowners.

--A whopping 60 percent or more of the total economic opportunities to increase growth in the South are on nonindustrial private ownerships greater than 100 acres in size.

--These owners have the greatest economic incentives to invest and are *least* likely to have ownership objectives incompatible with timber production.

--There are only 275,000 of these owners Southwide--as compared to 3.5 million total owners--that's only 8 percent of the total.

--With only 275,000 of the larger owners, spread out Southwide, and only a portion of them making harvest decisions in any year, we ought somehow to be able to marshal our collective resources to get to them more effectively than we have been able to so far.

- Fifth, the problem of addressing the nonindustrial issue is a multifaceted one in which all forestry interests have a part. Forestry consultants have a key role with the larger landowners. State service foresters also have a key role--to provide assistance to the many and important smaller landowners, and to be present to help the owners of forest holdings of all sizes to understand that it is in their economic self-interest to get professional assistance. State service

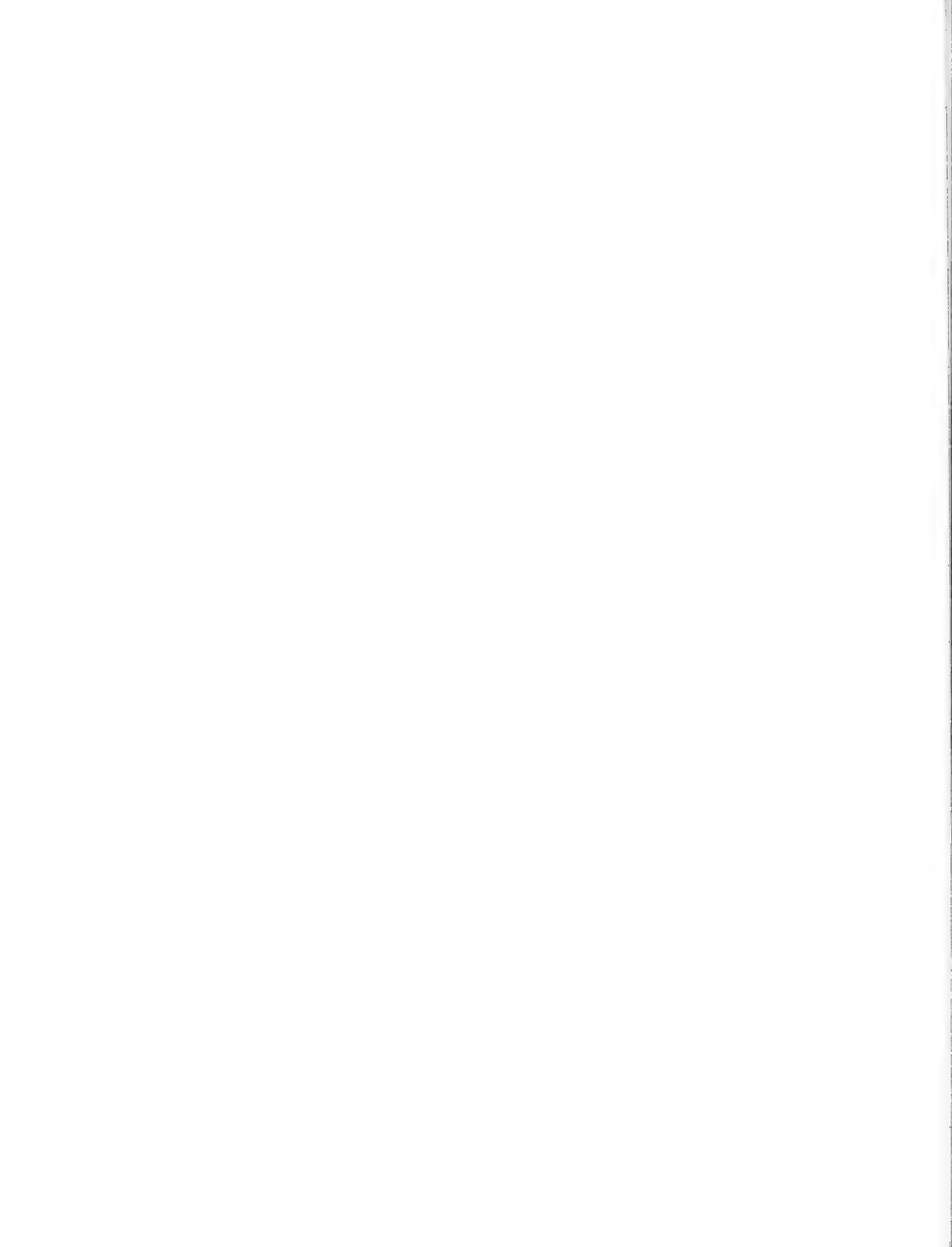
foresters can also alert larger landowners to the services of forestry consultants. Extension has an important role as well, in alerting all forest landowners to the importance of getting professional help. So do the other Federal agencies and the forest industry. A key element in any approach to capturing opportunities to increase timber growth must be the establishment of formal and informal institutional relationships at the State and local level. The purpose of such institutional relationships would be to coordinate the efforts of all forestry interests to assure that forest landowners are apprised of management and investment opportunities *before* timber harvest commences.

- Sixth, some States have been more successful than others in capturing the opportunity presented by private forest owners. Virginia, for example, is regenerating three-quarters of its harvested area to pine, as opposed to the one-third that is common in many other Southern States. If that performance were to be transferred to other States, our problems would be significantly diminished. States like Virginia show that the job *can* be done.
- Seventh, we need to develop State-level performance goals. Goals should not be just for the number of landowners contacted. Targets should be for acres successfully regenerated after harvest, for timber-stand improvement accomplished, and similar concrete measures of performance and investments made out on the ground. The data from the South's fourth forest report could form the basis for such State-level goals.

The bottom line is that significant low-risk, high-payoff opportunities exist to increase timber supplies in the South. Capturing these opportunities will pay large dividends for regional economic development and jobs, for the national welfare, and for the environment. Whether these opportunities are realized depends on the leadership of State policy officials and on how well the various forestry interests work together to achieve it. The key to success is not massive programs or budgets, but good communication and cooperation among all interests. The Federal Government will do its part as evidenced by existing programs, and by research efforts such as those done to support "The South's Fourth Forest" report. But a large part of the respon-

sibility for success must fall on the other interests--the State leadership, State Foresters, forestry consultants, industry, and others.

I would like to return now to where I began. We have a flood tide. If we sail with that tide, we can move on to fortune. If we don't, the forestry sector in the South will surely decline, to the detriment of our society and the economy. At the very least we will have missed a golden opportunity that will be much more difficult to capture at a later date. The time to set sail is now!



# Introduction to Opportunities To Increase Forest Productivity

J. Lamar Beasley (1)

I am pleased at the opportunity to be with you here today and to introduce the speakers, who will discuss in detail the opportunities to increase forest productivity. Before I do that, however, I would like to give you a little background on the southern timber study.

In the early 1980's, we became concerned about the rapidly changing timber situation in the South and, after consultation with the major forestry interests, got the study underway. Its basic purpose is to determine what kind of forest is evolving, what its economic and environmental implications are, and what opportunities we have to grow the forest that will be of greatest benefit to the South and the Nation.

In analyzing the economic implications of the evolving forest, we looked at a number of things such as product output, prices, trade, employment, and wages and salaries in the forest industries, and investments in plants and equipment. Over a long period of time we have developed analytical systems to deal with such economic implications. When we began to look at the environmental implications, however, we faced a different situation. Changes in timber resources, and associated changes in management, start a complex system of changes in the forest environment and on all the products and uses of forest land and associated

waters.

Because of limitations on time, data, and analytical systems, it was impossible to deal with all these changes in a meaningful way. However, we did undertake to quantify the impacts on forage production, wildlife abundance, fish abundance, and water quantity. We developed the necessary data base and analytical systems, but we were not able to do this in time to put the results in the review draft. We now have the preliminary results, and these are out for review. They will be published in our final report.

We think we have taken a big step forward. For the first time, we have quantified the impact of changes in timber resources and timber management on some important parts of the forest environment. We are working to build on this. We will have a much more complete analysis in the Assessment of Renewable Resources that will be completed in 1989 in response to requirements in the Forest and Rangeland Renewable Resources Planning Act.

We have made some other major improvements in our analysis of the timber situation, especially in the analysis of prospective resource changes. We have been able, again for the first time, to prepare realistic projections at the State level.

We have also made great progress in our analysis of the economic opportunities to increase timber supplies. I want to turn to that now. The purpose of this afternoon's in-depth discussion of the opportunities is to give you material you can use in developing policy and program alternatives tomorrow.

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(1) J. Lamar Beasley is Director of the Southeastern Forest Experiment Station, USDA Forest Service, Asheville, NC.



# What We Are Doing in Georgia and the South Today

John W. Mixon (1)

The greatest opportunity to increase forest productivity in the South today lies in increasing the number of managed forested acres. We need to plant trees on nonproductive agricultural and pasture lands. By means of either natural regeneration or replanting, we must do a better job in regenerating our harvested stands. At the present, we are harvesting more acres than we are planting in the Southern States. For example, in 1985, 2.1 million acres were planted while 3.6 million acres were harvested. Industries currently regenerate 92 percent of the acres they harvest, but the nonindustrial private landowners regenerate only 50 percent of the acres they harvest. We must work to close this gap.

Southern State forestry organizations are responding to this need in various ways. Several Southern States now have effective State incentive programs. Mississippi plants 50,000 to 60,000 acres per year under its program. North Carolina, South Carolina, and Texas also have outstanding programs. Virginia has a seed tree law that has increased the number of acres of natural regeneration in that State.

## Georgia's Regeneration Program

The latest forest survey by the USDA Forest Service, which was conducted in 1982, revealed that Georgia was harvesting nearly as much timber as was being grown each year--a fact that led to the formation of our ambitious regeneration program in the State. Next to protection from fire, the goal to reforest every harvested acre quickly became our top priority.

We asked forestry leaders from State and Federal agencies, forest industry, private consulting firms, and other forestry-related interests to meet with us and determine ways to regenerate more pine timber in Georgia. This group became Georgia's Forestry Development Committee, which meets four times a year to discuss progress and

plans for continued regeneration efforts. As in the entire region, the nonindustrial private landowner is the target of Georgia's regeneration efforts.

Through the Forestry Development Committee, we are working to identify and assist the nonindustrial private forest landowner in various ways.

### 1. County reforestation committees

In every county throughout the State, service foresters, county forest rangers, USDA Forest Service personnel, county extension agents, Farm Bureau representatives, Soil Conservation Service technicians, soil and water district supervisors, Agricultural Stabilization and Conservation Service executive directors, Tree Farm chairmen, consulting foresters, industry procurement foresters and landowners meet to identify landowners who have harvested pine stands within the past 2 years and those who own marginal and submarginal farmland. These identifications are made with aerial surveys.

In the next step, someone from the county reforestation committee contacts these landowners and encourages them to plant trees. The one-on-one contact is a must to get the landowners to leave seed trees for natural regeneration or plant seedlings. The committee members emphasize not only the economic benefits of forestry but also opportunities for recreation, wildlife habitat improvement, and other goals that may be important to the landowner and society. The committees advise landowners about the programs available to assist them in planting their land. Finally, the committees publicize the advantages of planting pines through demonstrations, workshops and conferences, and, of course, the press.

### 2. Reforestation foresters

In 1984, Governor Harris and the Georgia General Assembly approved adding 12 reforestation foresters to the staff of the Georgia Forestry Commission for Statewide service. The foresters now coordinate reforestation efforts in their districts, including the activities of the county reforestation committees, publicizing reforestation information through the local media, investigating seedling

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(1) John W. Mixon is director of the Georgia Forestry Commission.

problems, helping landowners locate reputable vendors, coordinating the distribution of tree planters, establishing demonstration plots, plus training foresters, vendors, and landowners in all phases of reforestation.

### 3. Landowner conferences

A large number of Georgians who own forest land make their homes in urban areas, often some distance from their rural property. In order to apprise these absentee owners of the economic importance of regeneration, the value of sound forest management practices, and the various services offered by the Georgia Forestry Commission, landowner conferences are held each year in several of the State's large cities. These conferences are cosponsored by the Georgia Forestry Commission, Cooperative Extension Service, Forest Farmers Association, Georgia Forestry Association, and forest industry.

### 4. Vendor workshops

A series of 18 workshops was held around the State. They attracted more than 1,100 participants, 50 percent of whom were landowners and 26 percent vendors. The workshops are conducted to help improve site preparation and planting techniques.

### 5. Seed-tree demonstration plots

To increase the use of natural regeneration and encourage landowners to plan for the future before they harvest, we have established 65 demonstration plots throughout the State to show landowners various low-cost regeneration alternatives.

### 6. Herbicide demonstration plots

To show landowners how herbicides can increase forest productivity, we have established research and demonstration plots in 100 of Georgia's 159 counties, using materials donated by chemical companies.

### 7. Direct seeding demonstration areas

Because direct seeding can provide landowners with some regeneration when more successful methods of tree planting and natural regeneration are not economically feasible, the Commission pro-

vides seed and various seeders to landowners who request this aid.

### 8. Conservation Reserve Program

More than any other single effort, the initiation of the Conservation Reserve Program in 1986, through the efforts of Senators Nunn, Cochran, Hefner, and others, has boosted reforestation efforts in Georgia and throughout the South. This is the first year since the Soil Bank days of the 1950's that nonindustrial private forest landowners' planting efforts have exceeded those of industry. We expect this trend will continue for the duration of the program.

Through the mutual cooperation of the Georgia Forestry Commission, Cooperative Extension Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, and other groups, 135,000 acres were approved to be planted in trees in Georgia during the 1986 signup periods. This figure comprises 30 percent of the total national acreage to be planted in trees. Furthermore, nearly 98 percent of the Conservation Reserve Program acres in Georgia will be planted in trees.

For 1987, 168,000 acres have been tentatively accepted in Georgia thus far, and a total of 518,710 acres have been tentatively accepted throughout the southern region.

### 9. Nurseries

Together, the Conservation Reserve Program and the Georgia Forestry Commission's reforestation efforts have increased the demand for tree seedlings.

At present, forest industry in Georgia owns seven nurseries that produced 178 million tree seedlings in 1986. In addition, the Georgia Forestry Commission's four nurseries produced 156 million seedlings.

In 1987, industry nurseries will produce approximately 180 million seedlings. The Georgia Forestry Commission will establish a fifth nursery with a capacity of 50 million seedlings. The Commission is planning to produce a total of 200 million seedlings this year, although as recently as 1976, the production was only 39 million seedlings.

This year's total seedling production of 390 million will help us achieve our goal of regenerating an acre of trees for every acre harvested in Georgia. We anticipate another record-breaking planting season. Since the Forestry Development Committee was formed in 1983, a total of 1,235,000 acres of



trees have been planted in Georgia--337,000 in 1984, 433,000 in 1985, and 425,000 in 1986.

With the continued cooperation of all our forestry groups, we project that a new record of 450,000 acres will be planted in our State during the 1986-87 season.

#### 10. Landowner assistance programs

Several forest industries have effective landowner assistance programs. Many will regenerate a harvested tract for cost if they are given first option on the timber. For example, Stone Container Corporation has planted 27 million seedlings on private landowners' property during the last 3 years. Continuing these programs will promote good rapport between the landowner and harvester and result in more replanting.

All of these are ways in which we assist the private landowner and, thereby, achieve the goal of Georgia's regeneration program.

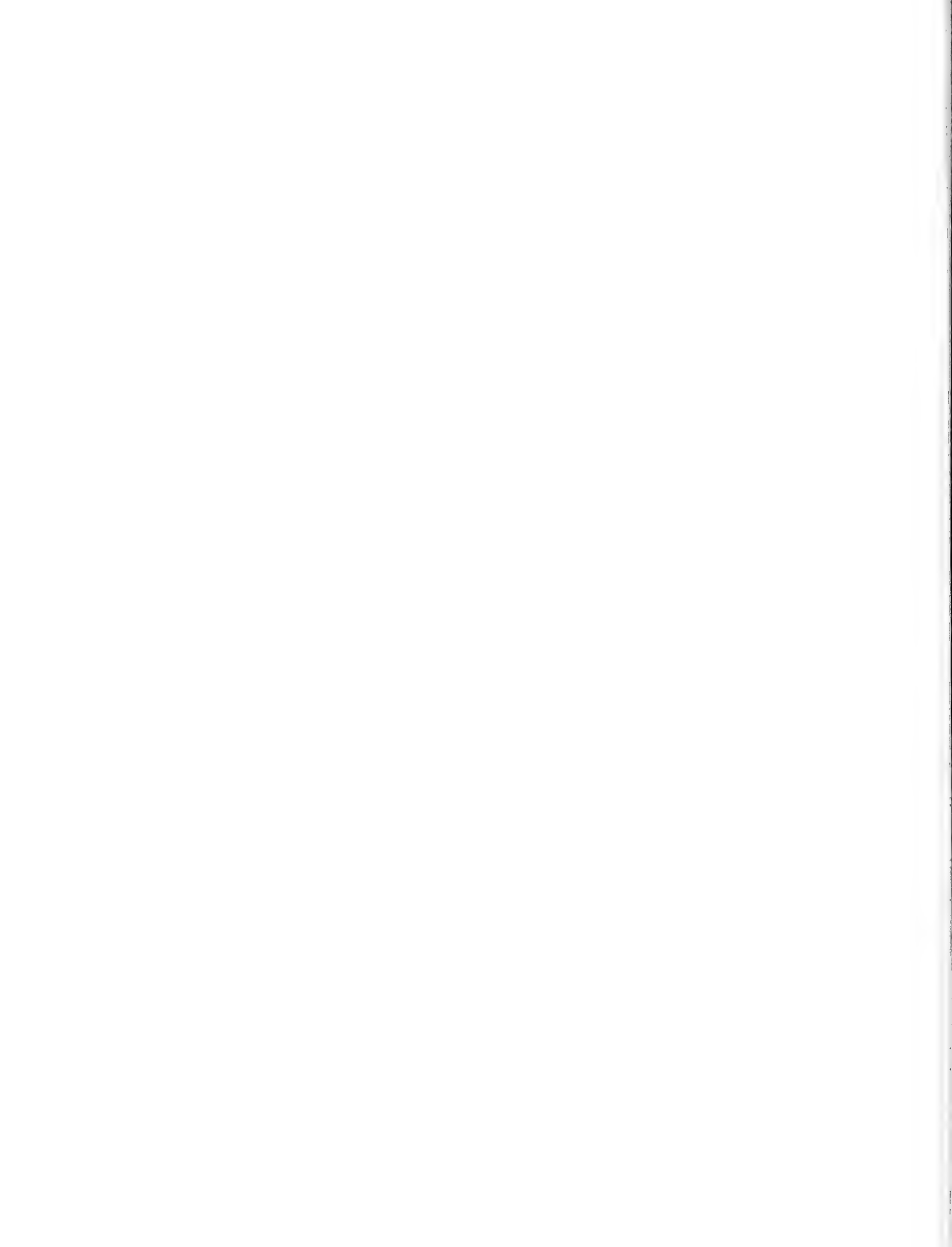
### **Future Opportunities**

As we map our course for the future, we will seek further research on natural regeneration meth-

ods. We need more information on genetically improving resistance of slash and loblolly pine to fusiform rust. We need to develop new markets, especially for underutilized hardwoods. In Georgia, for example, hardwood timber harvest is currently only 48 percent of hardwood timber growth. Throughout the South, we need to explore markets that can better utilize our hardwoods. We need to devise proper smoke-management techniques for safe prescribed burning. We need to work for the expansion of the Conservation Reserve Program so that it will include marginal pastureland.

### **Conclusion**

We have tremendous opportunities ahead of us in working with the private forest landowner. The Georgia Forestry Commission, as well as the other State forestry agencies in the South, has accepted this challenge and is working to get more pine stands regenerated and more acres planted on marginal lands. The changes we all hope for will not happen tomorrow, but many active programs are underway today.



# Economic Opportunities on State and Private Lands

Leonard A. Kilian, Jr. (1)

"The South's Fourth Forest" paints an uncertain picture of our future. Annual timber growth is now falling short of removals, and unless something is done, this trend will continue. Are we to accept the chance of a future of declining timber supplies or at least reduced growth and suffer the economic consequences? Are we willing to allow our timber resources to be continually harvested without adequate regeneration? Are we satisfied with a future of higher stumpage prices and erosion of our position of advantage here in the South? We must not be complacent: the current outlook does not have to become a conclusion. Rather, we must take action now to form the South's next forest in the strong image we want. We must increase our timber productivity and protect our resources in order to sustain our position in the forefront as a supplier of wood. But how?

"The South's Fourth Forest" offers us many opportunities to change the forestry scenario to one that not only preserves economic activity but even helps our region to grow in national and world importance. Let me outline a few views and a few actions that can change the outlook. My emphasis is on State and nonindustrial lands throughout the South.

## What Are the Opportunities To Enhance Forest Production?

Many opportunities exist on timberlands and croplands to augment forest productivity on State and private lands, according to chapter 5 of "The South's Fourth Forest." As defined in the study, opportunities to earn a 4-percent return on additional timber investments exist on an estimated 53 million acres of nonindustrial private forest land or other public timberland in the 12-State region. These 4-percent return treatments would cost more than \$5 billion but would produce an added 2.5 billion cubic feet of timber annually. This is 75 percent of

the treatment opportunities on all ownerships. Nearly 26 million acres have treatment needs that can produce returns of at least 10 percent. The cost for the 10-percent treatments is \$2.1 billion. These 10-percent treatments could increase timber supplies by almost 1.3 billion cubic feet annually. Although we might quibble about some acres here or there, the story is that there are very many acres that could be managed to produce more timber and a handsome profit as well. I would like to paint the larger picture of economic opportunities on State and private lands in the South.

Nonindustrial private forest landowners control 67 percent of the timberland in the South. Their lands, more than 121 million acres, offer the greatest opportunities for increasing timber supplies in the region, by far. According to the report, timber productivity can be increased by at least 50 percent on these lands by making investments that would return at least 4 percent above inflation.

The greatest opportunities are in reforestation of nonstocked or poorly stocked stands. In the South, there are 24 million acres of nonindustrial private land that need reforestation. While these areas comprise only 47 percent of the economic treatments on nonindustrial private ownerships, managing these acres better could increase timber growth by 1.1 billion cubic feet each year. (By the way, a billion cubic feet of timber is enough wood to lay 2 x 4's around the earth at the equator more than 80 times.) Although the average cost of these treatments is \$131 per acre, average productivity would go up by 48 cubic feet per acre each year if all acres were treated. The cost to boost yields by a cubic foot annually from these treatments is \$2.75.

Opportunities to harvest and regenerate overmature stands, salvage and regenerate damaged stands, and convert stands to preferred species where needed exist on 12 million acres in nonindustrial private ownership. These opportunities, if taken, can produce 613 million cubic feet of additional wood annually for a cost of \$1.2 billion. The cost of an additional cubic foot of wood annually from these options is about \$2.00.

Intermediate treatments such as precommercial thinning, timber-stand improvement, and commercial thinning of overstocked stands offer a third

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(1) Leonard A. Kilian, Jr., is State Forester for South Carolina.

group of timberland investment options. These treatments, taken together, exist on 14.5 million acres of nonindustrial private forest land. These stocking control treatments cost an average of \$47 and gain about 40 cubic feet of merchantable volume annually per acre. About \$1.16 invested in stocking control is needed to produce an annual volume increment of 1 cubic foot.

Economic opportunities exist in all Southern States. By forest type, the greatest opportunities are on upland hardwood sites, with 21.5 million acres. Economic treatments exist on 10.3 million acres of natural pine stands, 7.4 million acres of pine-hardwood, and 7.6 million acres of bottomland hardwood. There are 2.5 million nonstocked acres that could earn at least 4 percent. Most pine plantations are already highly productive, and only about 1 million acres have economic opportunities for improvement through management.

Most, but not all, economic opportunities have the potential to increase timber supplies. Some of the treatments identified in this study will be done. Financial returns for many treatments, such as regeneration, are due to increased total production. For some others, such as intermediate cultural treatments, financial returns come from gains in product quality, acceleration of timber rotations, or elimination of unmerchantable competing vegetation. Although treatments such as timber-stand improvement and commercial thinning may not produce much more biomass, the cost is modest, and they can focus growth on higher valued crop trees, effectively increasing timber supplies. For overmature stands with slower growth rates, replacement with a more vigorous forest is highly productive.

Marginal crop and pasture lands offer perhaps the greatest opportunity to augment timber supplies in the South. Acres that are highly erodible or marginal for agricultural crops are candidates for tree planting. Although the estimate of how much cropland area could be converted to trees depends on whom you ask, perhaps as many as 20 million acres would earn more from timber than from crops. These are some of the most cost-effective acres to treat. Not only can we gain timber supplies, but tree planting on these acres is likely to produce more income than crops and can reduce soil losses. While returns from planting agricultural lands to timber are generally very high, the problems of a long production period and an asset that does not pay off annually still exist.

The Conservation Reserve Program has been very effective in converting croplands to timber in

most Southern States, and enrollment rates favor tree planting over grass by as much as four to one in some places. Although I have not seen published data, informal reports from forest economists suggest that the average return from planting an acre to trees under the Conservation Reserve Program can easily exceed 100 percent, with even modest payments. Even if cropland acres cannot qualify for this program, the low cost of establishing pine plantations on many cropland sites can yield a 15-percent return above inflation in some active market regions of the South. Of all the economic opportunities to increase timber supplies, converting marginal agricultural lands is by far the best. In some areas, equivalent net annual earnings are as high as \$65 per acre--not a bad return when some bare land can be had for less than \$500 per acre.

Compared to other regions of the United States, there is relatively little land owned by States or other government entities. State and other public lands make up only about 4 percent, or about 7 million acres, of the timberland base in the South. There are treatments capable of earning 4 percent on about 2.9 million acres of other public lands. The patterns described above hold for these lands, too. If other public acres were treated, the total cost would be \$285 million, and an additional 122 million cubic feet could be added annually.

## **Why Do These Opportunities Exist?**

The many opportunities to increase timber productivity in the South on nonindustrial private and State forest lands exist for several reasons. Timber stumpage prices have increased substantially and faster than inflation in many parts of the region. Because higher stumpage prices can be expected, higher investment returns are likely. Another reason for economic opportunities is that the productivity of our forests has been reduced by past management, and stands are now in a condition where major productivity gains can be made. In places where timber stands are already highly productive, few additional opportunities exist, regardless of the potential returns. Unfortunately, there are few areas where economic opportunities are lacking.

As timber stumpage prices increase, landowners generally do not respond by planting and growing additional forests. This market failure is often cited as the cause, but there are several valid reasons why landowners do not respond to market

signals. The message is clear, however: we cannot rely solely on market incentives to maintain timber supplies in the South.

## What Can We Do About It?

The first thing that comes to mind here is, will the problem fix itself? Perhaps it seems absurd to ask that question, but we must if we are to realize that change is needed now. The past has molded the behavior patterns that will form the future. I see nothing happening now to suggest that the past patterns of nonindustrial private landowner investment in timberland have suddenly changed. I see nothing to indicate that softwood inventories on nonindustrial private lands are building. I do see a recent past where owners have felt increasing pressure to harvest, where the public programs that worked effectively in the past are being weakened, and where the economic climate for long-term capital investments has been exiled. No, the problem will not fix itself; we must do the fixing.

We must make it a regional priority and a priority in each State to sustain and enhance the productivity of our forests. The first step is to work vigorously to improve the economic climate for forest management investments where markets are weak. Although we cannot expect landowners to respond fully to better market expectations, the effectiveness of many programs to boost forest management is enhanced greatly by strong markets for timber and other forest outputs. This means that we must take all possible steps to enhance markets where they are weak now. Attracting industry to areas with underutilized timber supplies is essential. States must recognize the multiple benefits of enhancing employment and income in these often less developed counties. We should work to attract smaller wood-using firms, encourage the use of biomass for fuel, and help to develop more effective timber supply networks. We must also assure that the competitiveness of the region is not fettered by a regulatory overburden that does little to contribute to long-term productivity.

It is clear that even these steps are not enough to assure adequate timber supplies for the future. Specially targeted public programs are needed for nonindustrial private forest lands. We should strengthen the programs that have worked well in the past and do our best to develop new, innovative methods. The benefits of public programs to en-

hance forest productivity are known, and landowners are not the only gainers. We all gain economic and environmental benefits in the process.

## Financial Incentives

For many landowners, little capital is available to increase investments in forest management. For too long, we have expected landowners, some barely able to keep financially solvent, to make high-cost investments to keep their timberland productive. It is constantly surprising to me that we ask why landowners do not manage their timber better. Many simply do not have the extra money it takes to keep timberland producing near its potential. Others do not have the time to wait until a profit is earned. The Forestry Incentives Program, Agricultural Conservation Program, Conservation Reserve, and State cost-share programs, among others, have been demonstrated effective. In some cases, they might be targeted or administered more effectively, but they work to get trees in the ground.

For most goods and services in our economy, increases in price always have the effect of expanding production. Producers are willing to produce more if the market is willing to pay more. This economic rule holds for practically all goods, except forests. Given the real price increases that have been sustained for pine timber generally across the South, economists would normally expect landowners to plant and grow more timber. However, almost the opposite is true. Landowners are clearly willing to cut more when stumpage prices rise but not necessarily to put the land back into production. The current base of timberland owners do not adequately respond to price.

We must broaden the investment base and expand the sources of capital flowing into forest management. There is no question in my mind that it is exceptionally difficult to motivate landowners to invest more in forestry when they do not have the money. We must find more effective ways to draw additional capital into forest management and production. The private syndicates have been doing some of this, but Federal tax reform has muddied their water.

## Technical Assistance

It is incumbent on each of us in every sector--Federal, State, private industry, and forestry

consultants--to provide the highest qualified assistance to every potential timberland investor. We must find better mechanisms to deliver the message that forest management and timber investment can be profitable. The effectiveness of technical contacts to influence landowners is well documented. Landowners receiving technical assistance get better prices for their timber and manage their forests more effectively. We must develop better ways to deliver technical assistance to landowners through State and private channels. Because the average acre changes hands every 7 to 10 years, we have a constantly changing crop of landowners to inform and assist.

### **Tax Policies**

The Nation needs tax policies that encourage the formation and maintenance of timber capital. The loss of capital gains taxation for timber is devastating. I have heard of landowners who have virtually withdrawn from active forest management primarily because of the recent Federal tax changes. Furthermore, Federal tax reform has significantly complicated the picture for many landowners. Nothing is yet clear about who is active or passive and what the differences are between trade or business and investment. The uncertainty surrounding tax reform is already clouding the picture for forest owners. At least for small, nonindustrial owners, the 7-year amortization provisions and reforestation tax credit have not been eliminated.

We must be certain that current use taxation is available to all landowners to avoid unnecessary speculative clearing of timberlands. Also, we should make the case for favorable State income tax treatment where long-term benefits result.

In another form, positive laws to tie financial incentives, such as preferential tax treatment, to forest management goals are possible and would be effective.

The financial community must have help to understand the value of forest assets. Few financiers fully understand the value of forests, and many refuse to help landowners put money into timber. We must make certain that bankers know that forests can be valued and that risks are not unbearable. Foresters well versed in the financial jargon must do this selling job. Long-term interest rates do not always favor long-term timber investments, but when rates are low enough, the financial markets

should not discriminate against forestry because bankers lack experience in this area.

In my opinion, one of the greatest tragedies is that the financial lending mechanisms that work so well to change cash-flows from less desirable to more desirable patterns are not applied in forestry. Private timber stands are often cut when people need money, rather than when stands are financially mature. If only we can develop the methods to use timber regularly as collateral, we can avoid forcing some landowners to cut timber stands before their time.

On the other hand, timberland owners sometimes hold stands much longer than they should for financial reasons. I do not dispute the many valid nontimber reasons for doing this. Nevertheless, we fail when landowners hold overmature stands simply because they do not realize they are losing money by not harvesting.

We must tell the story of forestry as an investment in our future. We can no longer be complacent and expect private landowners to reforest their land because it is the right thing to do. They must gain from their actions, and professional foresters must be able to show them just how much they gain. I believe that many foresters out there contacting landowners need to know more about economics.

Programs of investment on State lands are another way to enhance our forest future. Some State lands are not managed as economically as they could be. There are many noneconomic objectives for public lands, but forest management on most State lands is sorely underfunded by legislatures. States and their taxpayers may needlessly suffer a low return on their assets. Often, this occurs because we have not been as effective at promoting the economic and social gains to be made from programs of accelerated investment in these lands. I challenge each of my counterparts in other States to examine the potential gains from increased investment in State-owned timberlands.

Forest protection is a major concern of State foresters and timberland owners alike. We have made great strides in protection over the years, but we still have problems. Although average losses are modest for whole States, we still have hotspots of fire, insects, or diseases. Better identification of high-risk areas and limitation of these losses is our primary concern. This will take research, money, and innovative approaches.

Selling legislators annually on budget increases is neither easy nor always the most effective method of gaining resources for needed investment pro-

grams. Missouri, as a model, has one of the most innovative programs: a percentage of sales tax receipts goes directly to fund resource conservation programs. There, the taxpayers put in their 2 cents each day at the grocery store as a vote for future forest resources.

None of the remedies identified above is the silver bullet that will continue our growth or save it from decline. I suggest that not one but all of us must be responsible for making the future successful. We must be individually and collectively committed to doing whatever is necessary to sustain our timber supplies and enhance our forestry future. We must target our efforts at the most effective places. This means that we must take our best shots at the places where gains are likely to be the greatest.

## What If We Do Nothing?

Failure to respond to the challenge posed by this study will continue the policies and programs of the past. It seems apparent that we must do something different now if we are to effect the changes needed to increase timber supplies. The actions we collectively have taken in the past have been effective but inadequate. Those actions, aimed at stimulating forest management and productivity, have built our growth but have also led us directly to where we are now, harvesting more than we are growing. This report signals a need for new vigor and new actions to increase timber potential.

For decades, timber supply studies have been calling wolf and declaring future timber famines. Historians will point out that the outcome has never proven as dismal as presented in any of these earlier studies. In reality, these studies evoked a response that has led to enhanced forest resources. Now this study, "The South's Fourth Forest," points once again to a decline in the outlook for the southern forest resources. Are we to believe that this is another wolf cry? I think not.

Consequences of the projections outlined in the southern timber study are not certain, but the possibility that timber supplies may fall short of growing needs in the region is alarming. Softwood stumpage prices will probably continue to rise faster than inflation, and rates of growth in timber harvests will undoubtedly be lower. These expectations alone may restrict growth of the forest economy and may lead to decline. Ultimately, the economic activity due to wood products in our region may stagnate or even

decline. We can lose our market share to substitutes as needs for fiber and solid wood products are met from other regions. Increases in prices for consumer products such as lumber and paper may eventually result. In any case, the great strides of the past seem to be threatened now.

We should not be complacent that this scenario cannot happen here. The forest products industry has a long history of following the resource from one region to another. Should timber supplies decline as a result of excessive removals, we may find that mills can no longer compete for an increasingly scarce resource. Perhaps in the next round, we here in the South may fall prey to the lure of wood supplies coming from other U.S. regions, or perhaps Brazil, New Zealand, Pacific rim nations, or even the vast forested regions of eastern Siberia. As long as we fail to fully recognize our potential and work vigorously to achieve it, our forestry economy is threatened by others. Some of these competitors may possess comparative advantages, but most have only greater vision for what the future can hold for them at our expense.

In the 1920's, much of the South's original pine sawtimber was cut with reckless abandon and little concern for the future. The vigorous lumber industry eventually collapsed. There is not much chance that the scenario of a cutover South will return. Today's industry is different and, I believe, much more resilient. Industry itself is doing a significant part to maintain supplies on its own lands. However, those supplies are clearly not enough. Productivity must be increased on State and private lands to sustain our current levels of growth.

## A Vision and a Challenge

My vision for the State and private forest lands in the South is an ambitious one. These forests must produce many timber and nontimber outputs for their owners. However, many acres can be more effectively managed to produce greater outputs of both kinds.

I see forests where landowners fully recognize the financial potential along with the environmental potential of their property, where land management decisions are made with knowledge of all the trade-offs.

I see a southern forest economy where the value of timberland and the productive assets on it are honestly recognized by producers and consumers,

where timber and other goods and services of forests are traded freely.

I see a region where landowners and investors are joined together in mutually beneficial productive ventures, where information about forestry as an investment is freely available, where forestry capital is actively traded without the need to cut trees at inopportune times. We cannot always expect forest capital to flow as freely as on Wall Street, but we can work toward greasing the skids a bit by providing information on the opportunities for gain through better forest management.

I see forests that are adequately protected from fire, insects, and diseases so that landowners need not fear the common risks we can mitigate.

I see a South where the incentives, financial and otherwise, favor management to sustain and increase productivity, rather than encouraging landowners merely to cut and walk away.

Finally, I want a forest where we all see the future as it can be and work together to make it happen. But my vision will not come true without three things: capital, cooperation, and commitment.

We must gain access to capital needed to increase the productivity of our forests. It is clear that

a major infusion of new money is needed, from whatever sources are available. Sustaining our forests means that we must stop draining their value without replacing some of it. We can pay for productivity gains now, or we can pay later in the form of lost jobs, lost income, and lost opportunities.

We must cooperate to achieve our collective goals for the future. The diverse owners of the South cannot be reached nor the diverse forests saved by any one organization or any one program. We all have a role in the job of increasing the productivity of our State and private lands. Each of the remedies cited above can lead us closer to a stronger southern forest economy. We all must work together in a unified front to assure that each acre of forest land is managed to produce the greatest good for the greatest number for the longest time.

Finally, we must be committed to making it happen. We must examine all our choices for action and then commit ourselves and our organizations to the selected path. Only by fully embracing a set of goals as a common vision can we keep the future green. I challenge you to accept the commitment.



# Forest Industry Opportunities in Management and Assistance

Donald F. Smith (1)

I appreciate the chance to discuss with you forest industry opportunities in forest management and assistance in the South.

The base case of the southern timber study indicates there is an opportunity to increase softwood growth and yield on industry lands and a need to expand assistance to nonindustrial private landowners so that they can also increase forest productivity.

Based on my review of the study, I have reached several conclusions:

- First, there are no incremental economic opportunities relative to the base case for industrial timberlands.
- Second, like steel, automobiles, television, apparel, shoes, woolens, cigars, and musical instruments, the pulp and paper industry has a high potential to migrate away from the United States, and there is nothing in this report that says that this potential will be reduced.
- Third, the most economically efficient "program" for working with nonindustrial private landowners is forest industry and other private landowner assistance programs.

## Industrial Timberlands

Now, let's go back and talk about opportunities for industrial timberlands. To begin with, a real "opportunity" must be both (1) economical, and (2) incremental. Then the question is, "Incremental to what?" The incremental opportunity numbers reported in chapter 5 of the draft report can be misunderstood. They are only incremental to the 1985 inventory.

I looked at the incremental opportunity question for industrial timberland two ways. First, I compared it to the base case in the draft report; second, I

compared it to my idea of the average industry "program" of intensive forest management.

For the base case, it doesn't take much analysis before you will come to the conclusion that the level of management of industry lands is different, and higher, than that shown in chapter 5. My back-of-the-envelope calculation shows a conservative level of intensive management that already covers at least 87 percent of the base case. This means that if industry follows its normal level of management with only those treatments listed, the numbers reported in the economic opportunity section will cover around 87 percent of the reported "potential."

Additionally, the base case is more conservative for industrial timberland than for any other ownership category. This is because (a) there are no genetic gains based on anything except first-generation improved stock; (b) there are no fertilization gains; and (c) there are no vegetative control gains. If 87 percent is already "programmed" potential, then the remaining 13 percent would be marginal in some manner or not part of the opportunities shown in the analysis of intensive management. An example of this would be deliberate natural regeneration where the base case opportunities assumption is for plantations. Another example might be an assumption that plantations are to be thinned when some industry landowners do not thin.

Adjusting for these differences relative to the base case, I believe there are no additional "economic" opportunities on industry lands because they are already "programmed." In other words, the base case plus the reported potential is equal to or below normal levels of management on industrial lands.

## Industrial Management Incentives

What about the real incremental economic incentives on industrial timberlands? We should start by realizing that the management of industry lands is "normally" distributed. There are companies that practice very intensive and sophisticated management on their lands. And there are those on the other end of the spectrum that practice very exten-

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(1) Donald F. Smith is Region Manager, Boise Cascade, Florian, LA.

sive management, meeting only the absolute minimum needs.

There are few additional *known* gains for the companies that practice intensive forest management, and they do not need additional help or incentives. Their biggest concern is that the Government--both State and Federal--stay out of the way and not hinder them by changing the tax rules or writing poor regulations or punish them for being profitable.

For the other group of companies, the question then becomes, "What is the ideal incentive that would motivate owners to capture the growth potential of their timberlands?" Not surprisingly, this is essentially the same question we have been asking about nonindustrial private landowners for many years.

As I watch people try to answer this question, two fundamental schools of thought seem to emerge.

The first is that the free enterprise system is not sufficient to adequately allocate resources and therefore has to be subsidized with government "programs." A corollary to this concept is that the more money spent on government programs, the more trees.

The second school of thought is that the free enterprise system is the most efficient method for allocating resources; and the closer it is to being pure, the better it works. Incidentally, the basis for the timber assessment market model which formed the base case is the specific idea of free markets in action with a downward sloping demand curve. The purpose of government "programs" in this context is to make sure the buyers and sellers know as much as possible about the resource and make informed decisions.

So as I try to answer how to capture these opportunities, I realize there are some big philosophical gaps in what should be done.

Here are my ideas of some attributes of an ideal "program":

1. The "program" should be consistent with the business at hand. This means that it would quickly expand and contract with business cycles. It would provide financial incentives for being successful and punish the inefficient. It should also be treatment- and county resource-specific in order to get the maximum impact.

2. The purpose of the "program" should be strategically significant to not just local but also world

markets. It should create exportable volumes and products. I do not believe the issue we have to deal with is one of supplying enough timber to mills in the South. The base case clearly shows that this will happen even without the real "incremental" potential. Incidentally, I believe there is no way that forest productivity can outrun labor productivity in either the solid wood or paper business.

The purpose of any "program" should be to create cost efficiencies clearly greater than those of our overseas competitors.

3. The "program" should be politically attractive to politicians, governmental officials, and others without a stake in timber. This means it would be low cost or free, synergistic with nontimber uses, and measurable.

During this meeting, you will hear a lot of Chicken Little tales. Most of you remember the Chicken Little fable, where an acorn fell on Chicken Little's head, and he went around crying, "The sky is falling, the sky is falling!" For us in the forest products business, the parallel to that is, "We are running out of trees." The sky isn't falling, and we are not running out of trees. What may be a more realistic danger is that the chicken will leave the forest because of poor and inconsistent government policies, the growing cost of doing business, and deteriorating infrastructure.

Using this ideal "program" model and a scoring system from 1 to 10--1 being the worst, and 10 being the best--let's look at some ideas. The capital gains tax benefits for timber is a good example. It is a tax incentive and directly related to profits--score 1 point. It is not a direct incentive to regenerate because it occurs at the end of the rotation, but it still favors intensive forest management--so score another 1 point. It is better than most foreign countries' tax systems--add another 1 point. It is obviously not politically attractive--no points. Also, it is not directly measurable--no points.

The total score for capital gains is 3. Looking at some other programs, I came up with the following scores:

Forestry incentives program	3
Forest regulation laws	3
Regeneration tax credit/ amortization	6
Export trading bank/companies	6

It is easy to see that it will be difficult to find one program that meets all the tests and scores a 10.

## The Federal Role

If the United States is truly moving rapidly to a service economy (fast food, automatic bank tellers, and biotechnology), then there is a strong argument that the government has a strategic role to play in the timber supply situation.

The days of the big trade surpluses in the United States are gone, and we not only have lower cost oil and gas and lower inflation but we also have growing agricultural surpluses. There are free world countries--Japan, Korea, Brazil, and even China--that are intensely competitive in the world markets and are gaining on the United States. These countries work as partners with their industries rather than as adversaries. Imagine what kind of timber management program Japan would have if it enjoyed the same southern timber situation as the United States.

Industry analysts will quickly point out that the pulp and paper industry has nearly all the same attributes of steel, autos, and other "smoke-stack" industries that we have lost to foreign countries. These include heavy capital investments, overpaid labor forces, high no-return environmental costs, and low flexibility.

Now add to this the one predicted change in the overall forest resources picture for the first time in the past 100 years: a real rate of price increase for pulpwood.

The only real difference that I see in the pulp and paper industry and those industries we have lost is that a major part of the total cost of the finished product is a renewable resource--wood! Keeping this resource inexpensive, high quality, and readily available has to be considered a beneficial strategic goal for the United States. I also believe that we will reach a point of diminishing returns on reforestation before such a goal is totally reached. Therefore, I believe that we will need a breakthrough, for example, a new kind of tree to grow. This could be an appropriate long-term goal for the government.

## Opportunities for Incremental Gains by Other Owners

### Government

Whether you use a back-of-the-envelope calculation or the most sophisticated model, you will quickly see that forest industry lands alone cannot grow enough fiber to meet consumption needs. Other landowners have to be part of the picture. In the Northwest, it is the USDA Forest Service. The per-acre potential there, and in the South on our own government timberland, is as great as for the nonindustrial private landowners. We need better policies for the management of Forest Service lands.

A change in Forest Service policies would be by far the least expensive and the most cost-efficient way to change productivity of *any* of the alternatives we could discuss. The Forest Service is not only by far the single largest owner of timber in the United States; it has the expertise in place to act quickly if directed.

The largest stake-holder is still the nonindustrial private landowner. What can industry do to improve the productivity of lands in private hands? We are already doing a lot of things in this regard: support of associations such as the American Forest Council and State forestry associations, sharing our technology, and, of course, landowner assistance programs (LAP's).

### Industrial Landowner Assistance Programs

Looking at the different landowner assistance programs available from industry, we see that they too are "normally" distributed. There are programs that are extremely well managed and others that have been on-again and off-again. From a government point of view relative to other "assistance" programs, industry landowner assistance programs have the potential of being highly cost effective and offer private landowners some real advantages. For example:

- o Since the companies and owners know about harvests in advance, the industrial landowner-assistance forester has time to talk to the landowner about reforestation before low-cost alternatives are lost. This is a critical advantage

and one that has even more undeveloped potential.

- Landowner assistance foresters have access to the full scope of contractor help available to the landowner.
- These contractor services are usually available to the private landowner for silvicultural work at volume discount rates.
- Landowner assistance foresters have access to or are highly trained in the latest silviculture, harvesting, and land management methods.

So, then the question becomes, "What can be done to expand or improve landowner assistance programs?" The most cost-effective way is to eliminate some of the government competition. At a landowner meeting in southwestern Louisiana, there were a total of 11 presentations to the landowners with each trying to induce landowners into some form of "program." There was one consultant and one industry LAP forester, with the remaining presentations on local, State, or Federal programs presented by different employees of the government.

There have to be some cost efficiencies available by combining and consolidating these programs. Perhaps one step would be to let the private

sector (industry and consultants) deal with the larger landowners, who have a better opportunity to improve productivity. Government service foresters could then focus on the needed protection programs and the servicing of smaller landowners, where timber production is often a secondary concern to wildlife and recreation.

The continued reduction of government funds will force changes in traditional programs. We need to be out in front and manage those changes to get the most effective programs possible out of what is left.

Given an opportunity to deal on an equal level with other vendors, the LAP's can grow and fulfill their potential. With the intensely competitive pressure to be efficient, most companies will not fund LAP's in areas where the government is already heavily involved.

In summary, I believe that the lack of incentive problem for low-productive industry lands with a higher potential is the same one we have faced for years with the nonindustrial landowners. The best solution to this is not more government programs but consolidating the ones we have for more efficiency, to inform the landowners rather than control and regulate them and to let the market reward the successful.

Additionally I believe that private landowner assistance programs are the most cost-effective alternative for helping nonindustrial landowners.

# Opportunities To Enhance Southern Forest Productivity Through Research, Education, and Technology Transfer

J. Charles Lee (1)

## Introduction

The great progress made in forestry during the past 20 years must be attributed in part to the research and action programs of Federal, State, and industry or industry-related forestry organizations. When the 1969 Southern Forest Resource Analysis Committee published "The South's Third Forest," evaluating the region's timber resource, it made several recommendations. It recognized that the development of technology, its dissemination, and the human factors involved in the transfer would be critical to achieving the goals that the Committee set. There has been significant progress since the "third forest" report was issued. I have been asked to reflect on what has been accomplished and to outline some opportunities for the "fourth forest."

Since the third forest report, publicly supported programs have grown and are much better equipped to accomplish their missions. The private sector responded by increasing its historical participation in technology transfer and by expanding its commitment to educational activities. Several industrial firms established research organizations and technical service divisions to accelerate technological innovation and adoption of new machinery and methods. The addition of new participants in these functions led to the need for better coordination and interaction to achieve maximum results with the limited resources available. Even at the highest level of overall effort, forestry lagged behind major agricultural commodities in public investments in research, education, and technology transfer across the region. This imbalance persists, in spite of an increasing body of evidence that confirms a very favorable rate of return for public and private investments.

However, the emergence of several organizations in the past decade has served to bring more focus to regional needs, to enhance collaboration, and to advocate increased support for public and

private programs. I am much encouraged by the activities of the Forest Industry Training and Education Council and the Southern Industrial Forestry Research Council. In the public sector, the National Association of Professional Forestry Schools and Colleges, the National Association of State Foresters, the USDA Forest Service, and the Regional Extension Forestry Office are increasing their cooperative efforts with each other and with other organizations, including the Association of Consulting Foresters and the American Forest Council. Through such developments, forestry continues to be of primary importance in the economy of the South.

The scope, vitality, and value of the fourth forest will be even more dependent on contributions from research, education, and technology transfer. Is our present level of research and our information delivery system capable of addressing the critical needs of the next generation of forests? Will we be able to ensure a competitive forest economy within a sustainable environment? There is no shortage of emerging technologies which can be further developed to enhance forest and forest-products productivity, but recent trends in the capability of research and information delivery systems deserve serious examination in any discussion of forest policy alternatives.

## Achievements in Research and Education Since the "Third Forest" Report

First let's reflect on what has been accomplished. Some specific subject areas in which we can see benefits derived directly from research and education are:

- Tree improvement
- Nursery production
- Forest nutrition
- Vegetation management

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(1) Charles Lee is head of the Department of Forest Science, Texas A. & M. University, College Station, TX.

Pest management  
Growth and yield projection  
Multi-resource interactions  
Taxation/investment analysis  
Wood protection  
Composite wood products

Many of these developments were intended to provide a competitive advantage to the region, but the advantage is soon lost as other regions adopt the generic aspects of the technology or otherwise increase their commitment to technology development and adoption. Thus, there must be a continual commitment to the pursuit and development of new ideas.

The results of research on the impact of forest practices on water quality in Arkansas, Texas, and Florida have formed the basis for critical regulatory decisions. Credible data and a well-informed workforce are essential to maintain or enhance the public trust.

When public funds are involved, there is an obligation to return the benefits to the public domain. Therefore, it is appropriate that we find that the fruits of technology are widely dispersed among landowners, communities, consumers, and corporate stockholders, as well as the citizenry who collectively own public lands. For example, any buyer now has access to genetically improved seedlings for reforestation, and every category of forest landowner gets some benefit from the use-value system of taxation. Pressure-treated southern pine lumber is extending the life of residential, industrial, and commercial structures. Nor are the benefits of research and education confined to economic gain. In addition to more productive sites and more useful products, we see gains in soil conservation and water quality. Wildlife populations thrive. A better understanding of the overall forest ecosystem is resulting in more knowledgeable resource managers.

## Goals for Research, Education, and Technology Transfer

The rapid urbanization of the South portends an escalating conflict between economic and environmental interests. The South's traditional advantages of desirable species, favorable growing and harvesting conditions, and an understanding public

are currently being challenged by dissatisfaction with product quality, competition from new products developed elsewhere, monetary and fiscal policies, and increased wood and fiber supplies in the Third World Nations. By the end of the century, the South will no longer be able to boast of being the most prolific woodbasket in the world. Its position as a low-cost wood producer is already threatened by Brazil and Chile. This situation presents a challenge that can best be met by region-specific technology.

I have outlined several ways in which technology can help us meet the challenge:

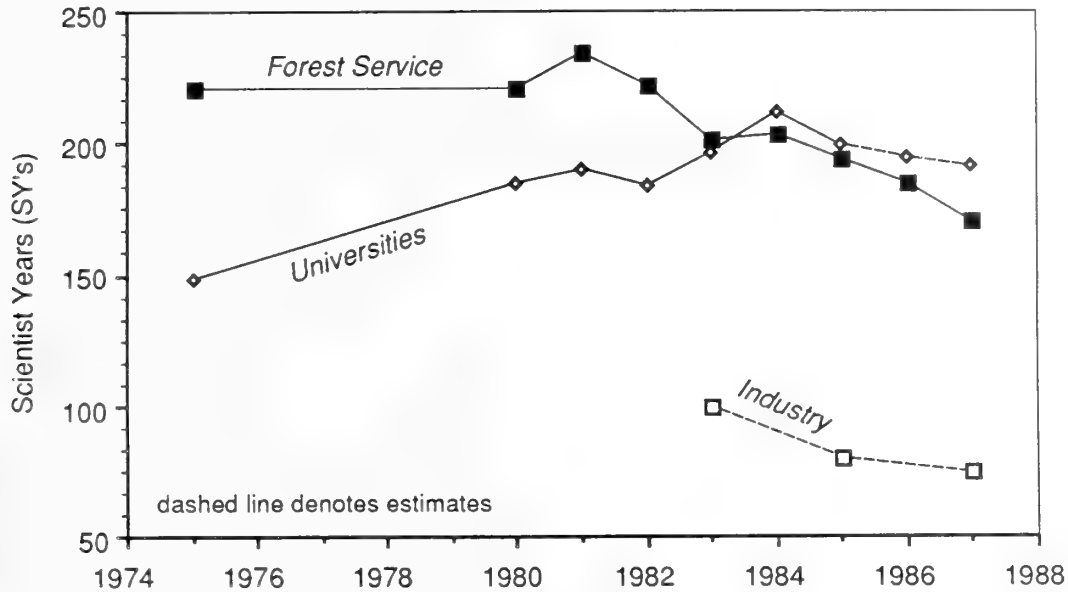
1. By reducing production costs,
2. By increasing returns to landowners (through improved yields, multiple revenue sources, and economic analyses),
3. By conserving resources (through protection from fire, pests, and atmospheric pollutants; through soil retention and clean water),
4. By resolving public policy concerns,
5. By improving product quality and expanding existing markets,
6. By introducing new products based on unique properties of southern resource, and
7. By developing human expertise (in degree programs, continuing education, and professional training).

## Our Capability To Address Goals

Although our collective capability exceeds that available for the third forest, some of the organizations that perform research, education, and technology transfer functions have experienced reductions which are diminishing their effectiveness.

Research staffing for the USDA Forest Service and forest-products industry reached its peak in 1981 (fig. 1). Although staffing of forestry programs in southern universities increased slightly to an all-time high in 1984, it too shows a pattern of decline in scientist years. The pattern of decreasing numbers of scientists is contrary to our present needs. When most of the obvious opportunities for gains have already been exploited, an increase in research intensity and investment seems prudent. A particularly insidious aspect of this trend is the difficulty in employing scientists skilled in the emerging technologies.

Figure 1. Forest and Forest Products Research Capability in the Southern U.S., GS-11 or equivalent.



Sources: USDA Forest Service, Cooperative State Research Service, Southern Industrial Forest Research Council.  
 The Forest Service total includes 25 percent of the SY's at the Forest Products Laboratory, the estimated proportion devoted to southern tree species.

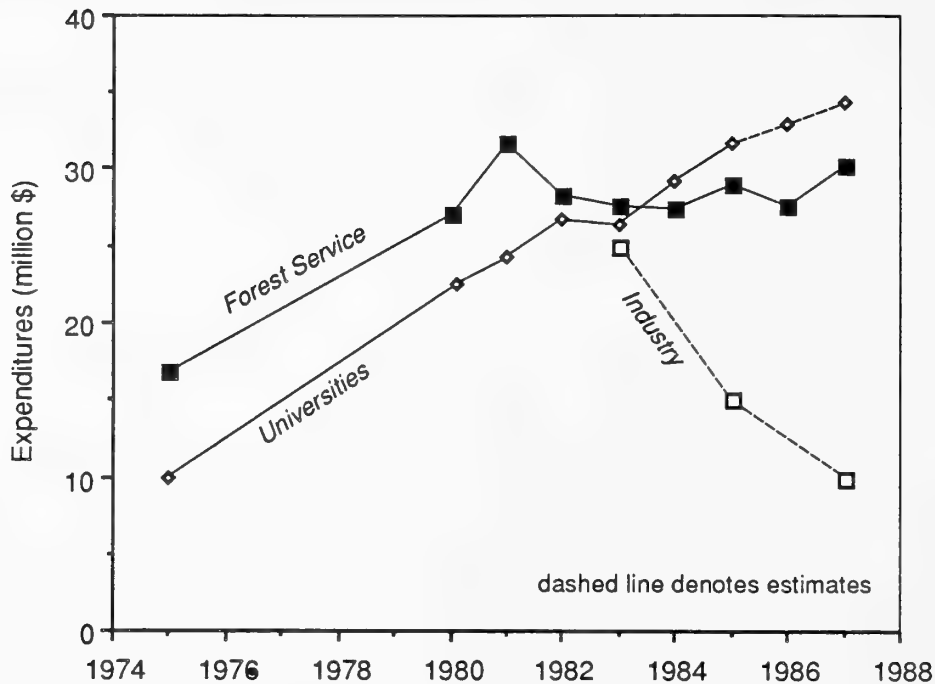
A similar pattern of decline is seen in annual expenditures for southern forest research (fig. 2). The cost of employing and supporting a scientist has risen for all fields of science. Only the university sector has been able to partially respond in terms of current dollars. However, when adjusted for inflation, all sectors, including universities, show a declining trend. It is important to note, however, that some universities and industrial firms are providing sustaining support for their scientists. There is also evidence that the South is absorbing a slightly disproportionate share of the Federal reduction in research (fig. 3). Within the universities, both undergraduate and graduate education are being adversely affected by this general reduction because of shared faculty appointments between teaching and research, and deteriorating laboratory equipment.

An encouraging trend since the "The South's Third Forest" is the increase in Cooperative Extension Service personnel (fig. 4). The 90-percent increase in 10 years can be attributed principally to

the Renewable Resources Extension Act of 1978. Although the Federal funds provided through this Act for forestry have been modest, they have served to encourage further investment by the individual States. But once again, the data indicate that the South has lagged behind the rest of the country in increasing its extension capabilities and is far short of meeting regional needs.

We see indications that the private sector is playing an increasingly active role in the transfer of technology. Figure 5 indicates that forestry consultants are now the largest facilitators of technology transfer in the South. State agencies grew by 73 percent over the decade, but the Federal role was reduced by 66 percent.

**Figure 2. Annual Expenditures for Southern Forest Research (not adjusted for inflation).**



Sources: USDA Forest Service, Cooperative State Research Service, Southern Industrial Forest Research Council.

### Strategic Issues Affecting Future Achievements

Some of the most pressing research and education issues that must be addressed on behalf of the fourth forest are:

1. Importance of research and education in enhancing the competitiveness of southern forestry and forest products;
2. Public perceptions of forestry, its practices, and its economic and social contributions to the region;
3. Improved collaboration within and among public and private sectors in addressing regional issues;
4. Appropriate balance among Federal, State, academic, industry, consultants, and other groups in mission and funding; and
5. Adequacy of expertise available.

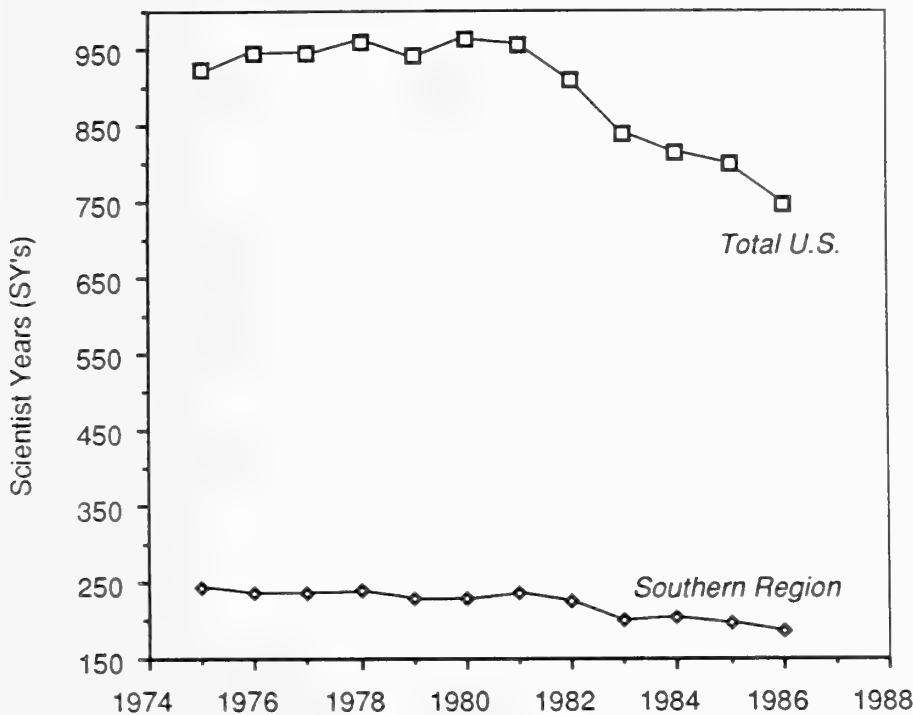
Research, education, and technological innovation have been important contributors to the third

forest, the first "managed" southern forest. Its management was based largely on empirical data. The fourth forest will require a shift to a knowledge-based system of deriving the means to improve the productivity of the forest and the goods and services it can provide. For example, an understanding of soil/tree/water relationships can lead to more cost-effective regeneration systems, as well as an understanding of the environmental impact of the recommended practices. Emerging technologies in biology, chemistry, engineering, materials sciences, decisionmaking, and telecommunications have tremendous potential for application to the forest and to forest products. Exploitation of these opportunities is essential to the competitiveness of the South's fourth forest. Knowledge development, transfer, and adoption must be regarded as a step-wise process beginning with basic inquiry and culminating in the widespread use of innovations.

There is also a need to be more quantitative in defining the benefits and beneficiaries of research and education programs. Virtually every analysis to date indicates substantial underinvestment by both the public and private sectors. Solid analytical data



Figure 3. Regional and National Trends in USFS Scientific Capacity.



Source: USDA Forest Service. Southern Regional total includes 25 percent of SY's at Forest Products Laboratory, Madison, WI.

are essential to guide investments to the best opportunities, and as a basis for enhanced funding of both public and private efforts.

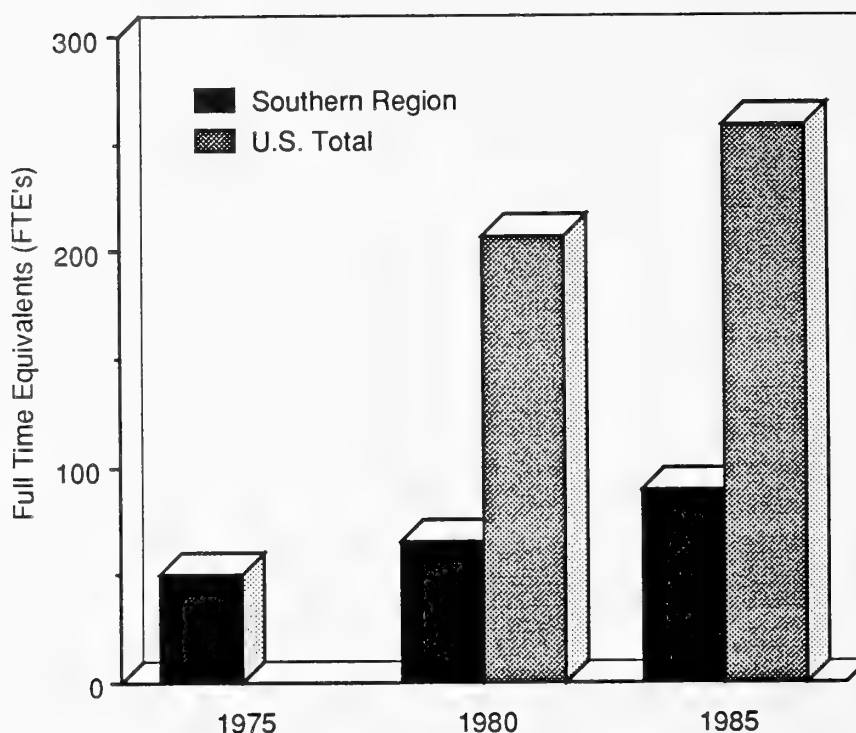
There is little doubt that there will be more public debate over how the fourth forest will be managed than was true for the third forest. The urbanization of the South and growing concerns about water resources and biological diversity will necessarily accelerate the employment of contemporary techniques for generating and analyzing scientific data, and for greater quality control in forest practices. This means that forest workers and forest managers will have to be sensitive to environmental effects, be informed, and be responsible in the deployment of new or existing technology. Many of these concerns, such as forest health, will require much greater investments in basic inquiry than have been made in the past.

There is continuing need to develop better mechanisms for addressing regionwide issues. The continuing consolidation of the forest products industry across State lines and constrained budgeting in the public sector are influencing the political

base for programs and the vitality of those programs. Large multi-State firms are encouraging a shift of public resources to basic research and are expressing some concern that there is unnecessary duplication in the delivery of new information. Smaller firms, State organizations, and most landowners favor a more broad-based research effort within their respective States and seem to be less concerned about excessive duplication.

There is a need to build on the joint planning and program development that has emerged in the research and extension organizations, with input from user interests. The Southern Commercial Forest Research Cooperative, which is currently addressing forest health, is an excellent example of a coordinated regionwide effort. It is also important to be able to address critical State needs, particularly since the individual States provide by far the dominant share of resources for the development and deployment of technology. While some organizations in the private sector have established very credible research programs, the cyclical and meager funding for most of these programs makes it

Figure 4: Regional and National Extension Forestry Capability.



Source: USDA Extension Service. Data for 1975 for the United States are not available.

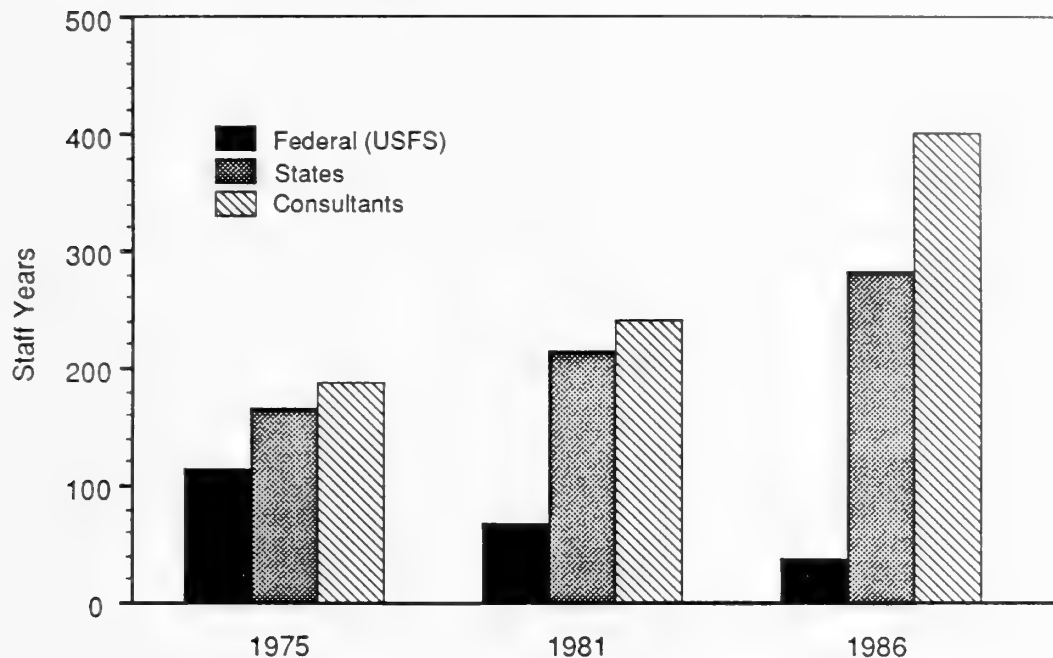
unlikely that they can replace public efforts. Only the consulting community appears to be steadily growing. Furthermore, the private sector is not likely to address environmental or other nonmarket research issues.

A broadly distributed and publicly supported system of research, extension, and technology transfer, based on a Federal-State partnership, has been critical in responding to national, State, and regional needs. The private sector has contributed on a more sporadic basis. Over the past 5 years the Federal role has declined in every category except extension. Furthermore, the South appears to have borne a disproportionate share of the national decline. This situation has weakened the fabric of the national and regional systems and placed more responsibility on the States. Many interests are encouraging more merging of human and financial resources from State origins to address regional needs, a role that will be increasingly difficult as individual States view their investments as a means of achieving a competitive advantage over one an-

other. There is a critical need to restore the strategic Federal role in national and regional needs through targeted, cost-effective programs. The South also needs to develop coordinated efforts to ensure an appropriate share of any Federal appropriations for research, education, and technology transfer.

No technology can be exploited without understanding. Every regional baccalaureate degree program in forestry is now professionally accredited, and several institutions have added both traditional and innovative graduate degree programs since the third forest report. These programs have provided an adequate number of professionals in most specialties and have helped provide much of the justification for university research. But undergraduate enrollments in forestry have declined by more than one-third in the past decade. This shift will soon result in a dramatic decline in numbers of graduate students from undergraduate professional forestry and wood science programs. Graduate students contribute a great deal to university research efforts and, upon graduation, provide the talent for all pro-

**Figure 5. Estimated Technology Transfer Capability for Forestry in the Southern Region.**



Source: USDA Forest Service, Mr. Harry Murphy (personal communication).

grams of research and extension and much of the expertise in technology transfer. Adequate human capital, skilled in the application of emerging technologies to forest resources, will likely become a limiting factor in research, extension, and technology transfer over the next decade. Exceptional students must perceive improved career opportunities if they are to enter professional forestry programs. Likewise, institutions must perceive opportunities in forest resources if they are to nourish quality degree programs.

## Summary

Public and privately supported programs in research, extension, and technology transfer have made significant contributions to the third forest. A broad-based capability is essential to realize the full potential of the fourth forest through the exploitation of emerging technologies. However, the declining Federal role in technology development and transfer has important implications for the continued effectiveness and coordination of public programs

and for the capability of addressing regional issues. The private-sector role tends to be cyclical and lacks the distribution of benefits that are provided by public programs. Better mechanisms are needed to address regionwide issues, but not at the expense of State support, which is currently the principal source of funds for public programs. Given present enrollment trends, human capital will likely become a critical factor in achieving the full potential of the South's fourth forest. These issues must be a part of any policy discussion that addresses the needs and opportunities inherent in the fourth forest.

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- Southern Forest Resource Analysis Committee. 1969. The South's third forest...how it can meet future demands. [Place of publication unknown]: Southern Forest Resource Analysis Committee. 111 p.



# Increasing Timber Productivity on the National Forests

John E. Alcock (1)

I want to thank Dr. Bowen, Jack Warren, and the Forest Farmers Association, and all the sponsors for hosting this conference. It can be an important milestone in forestry in the South.

It is a privilege for me to represent the men and women who manage the national forests in the South. Most of you who are familiar with the history of these forests know that they were not the most productive forest lands in the South before they were acquired for national forest purposes.

Yet, thanks to the efforts of many Forest Service people and our cooperators over the years, their productivity has greatly improved. In 1930 the income from the national forests in the South was about \$950,000, mostly from timber. In fiscal year 1986, income from timber alone exceeded \$96 million, and the productivity of these lands for other resources has also increased dramatically. Our watersheds are in good condition, wildlife and fisheries populations are generally excellent, and over 27 million people used the national forests in the South for recreation last year.

It took a lot of teamwork to get where we are today. If I stray momentarily into State and Private Forestry programs or into Research, it is because the combined efforts of all these folks were needed to increase our productivity over the years. And the same will be true in the future.

There are many opportunities to increase national forest timber harvest while meeting our other multiple-use objectives. These opportunities are partially spelled out in the 17 land management plans that have been recently completed for each national forest in the South as required by the National Forest Management Act. These plans will guide our management of the national forests over the next 10 to 15 years.

Let us briefly look at the land base we are working with. There are 12 1/2 million acres of national forest land in the 13-State Southern Region. Of that, 8,750,000 acres, or 70 percent, are classified "suitable" for sustained-yield timber production. Of the suitable acres, 38 percent are pine sites, 17 percent

are mixed pine and hardwoods, and 45 percent are hardwood sites.

About 3 million acres of national forest land are classified as "unsuitable" for timber production. These lands include:

- Lands allocated to other uses that preclude sustained-yield timber production--for example, wilderness (614,000 acres in 69 areas totaling 5 percent of national forest land), National Recreation Areas, Wild and Scenic Rivers, developed recreation sites, and administrative sites.
- Lands where our resource protection requirements under the National Forest Management Act cannot be met. For example, areas where we have highly erodible soils.
- And, lands that are understocked, or lands so low in productivity that they are not economic for timber production at this time. This category includes lands not needed to meet demand over the next 10 to 15 years. Approximately 725,000 acres fall into this designation. They are primarily low-quality hardwood stands in steep or isolated conditions.

These lands in our mountain forests offer some interesting potential. They are currently uneconomical because they are either difficult to access, too fragile or steep to log, poorly stocked, or a combination of these factors. However, if the right markets and demands should develop, these lands could be brought into the "suitable" land base and made available for timber management. If the small roundwood market improved or if, for example, local mills expanded or new mills were established, growing and harvesting timber on these lands could become economical.

Most of the lands acquired for national forest purposes in the South were cutover timberland or depleted farmland. Our reforestation and timberstand improvement efforts prior to the 1960's aimed at improving understocked or poorly stocked stands. We concentrated on producing a better tree and a better forest. These successful results are

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(1) John E. Alcock is Regional Forester, Southern Region, USDA Forest Service.

part of the amazing story of what has been known as the South's "third forest".

Only within the last 15 years have we begun to approach the land's potential, managing it from stand establishment until harvest. We estimate that some of our forests will reach their long term sustained-yield capacity within 50 years. For others, it may take longer.

In fiscal years 1981 and 1985, our annual timber sales averaged 203 million cubic feet. Our studies indicate that the land could produce over 650 million cubic feet per year by the year 2030 if we were concerned only with timber production, and if we enjoy adequate markets (especially for hardwoods) and adequate capital investments such as access roads. Clearly, we are only capturing about one-third of the land's capacity to produce timber.

We will never reach the land's full capability for timber production because, by law, we manage the national forests for multiple use and consequently do not maximize the production of any single resource. However, our new forest plans do call for an annual sale quantity for the next 10 years of close to 258 million cubic feet. That is a respectable 27-percent increase over recent years.

How are we going to sustain that increase and capture more of the land's productive capability over time?

Four main areas provide opportunities for increased production: insect and disease control, reforestation and timber-stand improvement, genetic tree improvement, and hardwood marketing.

Reducing the damage from insects and diseases offers one of our greatest opportunities to improve productivity. As the timber study cited, the pine mortality rate has almost doubled over the period 1976-84, going from 19 percent of growth to 36 percent.

The primary culprit is the southern pine beetle (SPB). We treated 25,000 acres of national forest land for SPB last year. This pest affected 272 million board feet; we were able to salvage about 75 percent of that volume. Because of other resource needs, such as endangered species and wilderness, we tend to have longer rotations and older stands. Older trees are more susceptible not only to SPB but to disease.

We have recently developed both long- and short-term strategies to reduce losses to the SPB. The strategies spell out many opportunities for both management and research. For example, we have the opportunity to manage stand density to increase vigor and lower susceptibility to the beetle.

There are just under a million acres of national forest land in need of thinning over the next decade. There is also a need to manage species composition. Mixed stands, as you know, are less susceptible to SPB and at the same time more valuable for wildlife and esthetics. We have a special need to develop mixed stands adjacent to wilderness areas to prevent the spread of the beetle from the older stands contained in many wildernesses to adjacent, managed stands.

These silvicultural practices, plus more intensive detection and treatment even during periods when the beetle is not epidemic, coupled with additional research, could help us reduce our losses. We have also proposed setting up several demonstration areas in Texas, Mississippi, Louisiana, and Georgia to display the best available technology for prevention and control of the SPB.

In the area of hardwood protection, we are battling the gypsy moth, which is moving into Virginia, Tennessee, and North Carolina from the North. There is also a problem of oak decline. Once we know the cause of this decline, there may be management opportunities to reverse the trends toward lower growth rates.

The second opportunity to increase timber productivity is through reforestation. To produce the 258 million cubic feet of timber to be cut annually, we need to increase our reforestation to 110,000 acres annually, compared with about 88,000 acres in 1986, and we need to increase our timber-stand improvement to about 64,000 acres per year.

We need to do a much better job of getting into our stands about every 10 years in order to control stand density. In the past, the SPB and sometimes the lack of funding have prevented us from getting into the stands of our Coastal Plains forests as frequently as we should. In the mountains, we need to concentrate our improvement work on the better sites. That is where a great deal of the 27-percent increase in timber harvest that I mentioned earlier will come from.

Additional effort in the area of tree improvement also offers a great opportunity to increase timber yields. Currently, nearly 100 percent of our regeneration is done with improved planting stock from seed orchards. These seedlings are more resistant to disease and grow to maturity in a shorter time. We are now in our second generation of genetic improvement. Much more could be done to accelerate this effort. This single program could result in a 15- to 25-percent increase in productivity.

Another opportunity to improve production on the national forests lies in developing hardwood markets. We are already selling close to our potential for softwood from the Coastal Plains forests, but our hardwood resource is underutilized. Large areas of hardwood stands are reaching economic and biological maturity.

About 5 years ago, we began a small, unfunded effort to improve both domestic and foreign markets for the hardwood resource. Fortunately, research has provided new processes that make better wood utilization a real possibility. We developed some in-service expertise and worked with State Foresters and others. Several States put out first-class marketing packages on the availability of hardwoods. This opportunity ties nicely into the Nation's efforts to improve our balance of trade problems. We join the State Foresters, Tennessee Valley Authority, Extension Service, and others who believe much more can and should be done to market the hardwood resource.

Some opportunities to improve timber productivity on the national forests exist; however, as I mentioned earlier, timber is only one of the multiple uses for which we manage.

Wildlife is an integral part of our forest management and is closely integrated with timber management. In fact, timber harvesting is our primary method of diversifying and improving wildlife habitat over large areas of land. Our new forest plans place a great deal of emphasis on biological diversity and maintaining healthy ecosystems. Fish and wildlife interests played a strong role in the development of these plans. We have the opportunity to increase timber production while improving habitat for fish and wildlife species, including the 46 federally listed threatened and endangered species that are found on national forest land.

I believe many landowners in the South have this same opportunity, and many have habitat improvement as one of their management goals. More and more private landowners are realizing that the

growing hunt club and recreation business can make integrated forest management profitable. And beyond that, there are great personal satisfactions in managing a forest that will live as a family legacy from the strong stewardship values held by many folks.

Our plans call for more intensive management and protection of riparian areas, setting objectives for the number of nut-producing hardwoods (mainly oak, hickory) that are needed by wildlife in both hardwood and mixed softwood stands, managing some old stands, and protecting unique plant communities.

We project that the populations of huntable species, such as white-tailed deer, wild turkey, gray squirrel, and bobwhite quail, will be maintained. Specifically during the first 10 years, most national forests should see an increase in deer populations. Wild turkey populations are projected to be maintained on all national forests and on some, will increase about 10 percent.

Of course, fisheries populations depend on water quality and quantity. We know water issues, such as wetlands, ground-water recharge, and in-stream flow, are growing issues in some parts of the South. We need to pay more attention to all of these important resources, but doing so will require more intensive land management, including more expertise on the ground, and additional research. We do know from long experience that these resources can be productively managed together.

In closing, because of over 50 years of protection, management and investment, the national forests in the South have improved their productivity. They have the potential to produce a much higher level of multiple-use public benefits. Our ability to capture those benefits will depend on public understanding and support, professional expertise, and continued strong cooperation with our partners in management, which is one of our real strengths in the South.





## Concluding Remarks to the Discussion of Opportunities To Increase Forest Productivity

J. Lamar Beasley (1)

The four panels concerned with the development of policy and program alternatives will meet at 8:00 a.m. tomorrow. The panel discussions are open and you may participate in the discussion of the panel of your choice.

The basic task of each panel is to develop a provisional set of policy and program alternatives for their subject area. Each panel chairman will present these alternatives for consideration and discussion at the plenary session of the conference which begins at 1:00 p.m. tomorrow. We want to develop in

the plenary session a consensus on policies and programs to increase forest productivity and sustain continued growth in the forestry sector of the economy in the South.

At 3:30 p.m. tomorrow a drafting committee will meet to begin to put together a draft of the policy and program alternatives that come from the plenary session.

This draft, along with the background papers you have heard today, will be sent to you for written review and comment. After review and the necessary revisions, they will be published as the proceedings of this conference.

We hope that these proceedings can be used to inform the public about the forestry situation and to mobilize support for increasing the forest wealth of the South.

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(1) J. Lamar Beasley is Director of the Southeastern Forest Experiment Station, USDA Forest Service, Asheville, NC.



# Forest Protection Policy and Programs-- Fire, Insects, and Disease

Christopher Risbrudt and James McDivitt (1)

## Introduction

The review draft of the southern timber study report illustrates that the forest resource has a significant impact on the economy of the South. Forests occupy 181.5 million acres, or 36 percent of the total land area. Of the South's timberlands, 90 percent are privately owned. The timber inventories of the South exceeded 220 billion cubic feet and produced 7.5 billion cubic feet of products in 1984. The stumpage value of timber harvested was over \$3 billion, and the value added by harvest and transport was another \$3.1 billion in 1984. The 1982 Census of Manufactures shows all forest industries with value added of \$19.7 billion. Employment exceeded 550,000 persons, who received \$8.5 billion in wages and salaries.

This major industry has shown great achievement in the history of forestry, but the situation is changing. Net annual timber growth has leveled off or begun to decline. One of the reasons is an increase in mortality. Base projections from "The South's Fourth Forest" show removals exceeding net annual growth and declining inventories in the 1990's. This scenario forebodes rising stumpage and product prices, lowering rates of increase in harvests, and declining forest industries' employment. To sustain employment and vigor in the forest industries of the South, we must exercise the opportunities to increase forest productivity.

One of the basic mechanisms to achieve the economic potential of the South's "fourth forest" is protection. Protection is the vital step upon which the success of all other forest management depends.

The purpose of this paper is to review the history of public policy and programs for protection in the

South and assess their current effectiveness. The paper will also provide a point of departure for discussion of options for protection policy and programs of the future at this symposium.

## History

The passage of the Weeks Act in 1911 provided the first legislation in Federal-State cooperative fire protection. It approved up to \$10,000 per year in Federal fire-protection funds to match State funds where the State had an administering agency. Section 2 of the Weeks Act authorized cooperative agreements with States to organize and maintain a system to protect from fire the lands in navigable river watersheds. In response to the Weeks Act, Southern States began passing legislation to protect State forests from fire and to institute fire-control systems. Virginia and North Carolina were the first to pass such laws (1915) and Arkansas (1933) the last.

As a result of the post-World War I decline in the southern lumber industry, the Senate requested and received a status report on the industry. One recommendation was increased cooperation with the States in fire protection. In 1924 the Clarke-McNary Act expanded Federal aid for fire protection to forested watersheds of navigable streams and authorized \$2.5 million annually for fire protection.

In the early 1900's most fires were intentionally set, for a variety of reasons. Annual burning of forest lands was a southern tradition; in 1927 a monumental reeducation effort was mounted to attempt to reverse it. Arson was also used to seek revenge upon forest landholders for grievances real and imagined. While acres burned in the 1980's were but 10 percent of the acres burned in the 1920's, over 97.5 percent of the fires were still person-caused in 1986, a percentage that has stayed nearly constant over time. This rate represented slightly over one fire per thousand population in 1986, and a reduction of about 17 percent over the last decade.

Fire protection grew in importance and was aided by the Rural Community Fire Protection Act of

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(1) During preparation of this manuscript, Christopher Risbrudt was director of Policy Analysis, USDA Forest Service, Washington, DC. He is presently Deputy Regional Forester in the Forest Service's Northern Region, Missoula, MT. James McDivitt is branch chief of Policy Analysis in Washington.

1972. This act provided training funds for rural fire companies. Multi-State fire compacts increased the level of cooperation between the States for fighting fires.

The funding of fire protection had modest beginnings in the second decade of the century and grew consistently until the 1970's. Table 1, from the review draft, shows that funding for fire protection in current dollars increased until about 1982. Federal dollars peaked in 1979 with an expenditure of \$9.5 million. While funding has decreased, acres protected have increased, and no noticeable trend in total acres burned has emerged. Acres burned and timberlands burned have stayed below the 1950's and 1960's levels with only slightly higher real dollar expenditure levels during the 1970's and 1980's.

Cooperative fire's mix of funding between Federal and State expenditures has also changed over time. From the program's beginning to the 1950's, the Federal share of costs was consistently over 30 percent of the total fire-protection program. By the 1960's, the Federal share was approximately 20 percent. The 1970's saw Federal funding decrease to about 15 percent and continue to decrease to about 5 percent in the 1980's. This reduction in Federal fire-protection funds accounts for the trends observed above; State expenditures have stayed nearly constant in real dollars during recent years.

A review of the history of fire-protection programs in the South shows many successes. Initial increases in programs and funding significantly reduced the acres burned, due to increased suppression capability. However, acreage burned stopped going down around 1965 and has held steady to the present. Less success has been achieved in reducing the percentage of human-caused fires.

Unlike fire protection, where the first measures were actions and research came later, insect and disease protection started largely with research. Insect and disease research is supported by industries and universities as well as government agencies. It involves a multitude of different projects. The principal Federal cost-share legislation supporting cooperative insect and disease control is the Forest Pest Control Act of 1947. This act authorized Federal cost-share funding for State specialists and cooperative suppression.

Combating the southern pine beetle has consumed the greatest share of southern program expenditures, particularly in the South Central region, where most infestations are found.

Insect and disease protection is important in light of the southern timber study's finding that mortality is increasing and contributing to the reduction in net timber growth. The report cites insects as causing 35 to 40 percent of the softwood mortality in the Southeast. Fusiform rust, littleleaf disease, and annosus root rot are the leading pine diseases.

The history of pest management and pest protection is less glamorous than that of fire. Most efforts were independent actions to suppress pests after a crisis. But the most effective insect and disease protection prevents the crisis from occurring, through timely thinnings and harvests or other silvicultural activities that modify the forest.

The insect and disease program funding history is far shorter and much smaller than that of cooperative fire. In 1980 expenditures for pest programs nearly doubled those for 1979. But after the 1980 peak, expenditures fluctuated in constant dollars from 40 to 70 percent of the 1980 level (table 2).

**Table 1--Federal and State expenditures for protection<sup>(1)</sup> from wildfire, total acres protected, total acres burned, and acres of timberland burned on non-Federal protected lands<sup>(2)</sup> in the South for selected years 1916-83**

Year	Total		Expenditures Federal <sup>(3)</sup>		State <sup>(4)</sup>		Acres		
	Current dollars	1982 dollars <sup>(5)</sup>	Current dollars	1982 dollars <sup>(5)</sup>	Current dollars	1982 dollars <sup>(5)</sup>	Total protected	Total burned	Timberland burned <sup>(6)</sup>
	------(Thousands)-----						------(Thousands)-----		
1916	12		6		5		(7)	9,892	6,624
1920	27		10		17		(7)	4,151	2,271
1925	288		108		180		(7)	23,375	21,325
1930	1,141	14,818	391	5,078	750	9,740	69,923	2,843	2,747
1935	1,008	11,200	444	4,933	564	6,267	73,658	1,584	1,514
1940	2,098	21,629	673	6,938	1,424	14,680	88,351	2,154	2,095
1945	3,986	33,780	1,417	12,008	2,569	21,771	89,031	1,301	1,204
1950	9,388	57,595	2,864	17,571	6,524	40,025	135,113	2,704	2,547
1955	14,661	71,170	3,419	16,597	11,242	54,573	157,296	1,946	1,850
1960	19,285	78,077	3,833	15,518	15,452	62,559	168,225	1,144	1,093
1965	25,339	90,174	4,989	17,754	20,350	72,420	183,709	658	557
1970	40,130	109,049	6,053	16,448	34,077	92,601	185,307	892	724
1975	59,996	99,003	8,663	14,295	51,333	84,708	218,582	613	469
1980	76,837	88,932	6,437	7,450	70,400	81,481	232,251	912	747
1981	90,820	96,310	5,461	5,791	85,359	90,519	232,651	1,784	1,405
1982	94,959	94,959	3,630	3,630	91,329	91,329	233,255	574	464
1983	88,997	87,855	3,638	3,591	85,359	84,264	233,255	334	279

(1) All fire protection activities: prevention, other presuppression, suppression, fuels reduction or modification and assistance to rural communities.

(2) Non-Federal protected lands are forest industry, other private, and State and local government lands under the jurisdiction of State fire protection programs. Some Federal lands protected by these programs may be included.

(3) All Federal expenditures for administration, technical assistance, cooperative projects, grants to States, and the value of Federal property given or loaned to States.

(4) State expenditures as reported to the Forest Service. State expenditures start from the year each State established its cooperative program: 1915-NC, VA; 1916-TX; 1918-LA; 1921-TN; 1924-AL; 1925-GA; 1926-MS, OK; 1927-SC; 1928-FL; 1933-AR.

(5) Converted to 1982 dollars by dividing the expenditures in current dollars by the implicit price deflators for gross national product for total Federal Government purchases of goods and services through 1971 and for nondefense Federal Government purchases of goods and services for 1972-83, as reported by the U.S. Department of Commerce, Bureau of Economic Analysis. There is no implicit price deflator for gross national product for years prior to 1929.

(6) Timberland data available from 1926 to present; prior to 1926 acres burned are for "forest land" with no distinction made between timberland and other forest land.

(7) Data not available.

Note: Data may not add to totals because of rounding.

Table 2--Forest Service and State expenditures for forest insect and disease management in the South for years 1965-84

Year(3)	Total		Forest Service(1)		State(2)	
	Current dollars	1982 dollars(4)	Current dollars	1982 dollars(4)	Current dollars	1982 dollars(4)
-----Thousands-----						
1965	615	2,189	484	1,722	131	466
1966	1,436	4,884	1,091	3,711	345	1,173
1967	1,551	5,085	1,195	3,918	356	1,167
1968	1,487	4,604	1,142	3,536	345	1,068
1969	1,687	4,991	1,139	3,370	548	1,621
1970	1,866	5,071	1,265	3,438	601	1,633
1971	1,848	4,643	1,312	3,296	536	1,347
1972	2,228	4,761	1,631	3,485	597	1,276
1973	4,471	9,143	3,419	6,992	1,052	2,151
1974	4,976	9,336	3,259	6,114	1,716	3,220
1975	5,696	9,399	3,282	5,416	2,414	3,983
1976	4,857	7,554	2,922	4,544	1,935	3,009
1977	5,347	7,738	3,192	4,619	2,155	3,119
1978	4,981	6,880	3,186	4,401	1,795	2,480
1979	5,232	6,708	3,717	4,765	1,515	1,942
1980	9,729	11,260	7,120	8,241	2,610	3,021
1981	7,843	8,317	5,701	6,046	2,142	2,271
1982	4,269	4,269	2,902	2,902	1,367	1,367
1983	6,476	6,393	4,044	3,992	2,432	2,401
1984	8,002	7,614	4,735	4,505	3,267	3,108

(1) Forest Service expenditures for technical assistance and control work on national forest, other Federal, and State and private lands.

(2) Expenditures by non-Federal agencies for State and private cooperative programs, as reported to the Forest Service.

(3) Fiscal year.

(4) Converted to 1982 dollars by dividing the expenditures in current dollars by the implicit price deflators for gross national product for total Federal Government purchases of goods and services from 1965-71 and for nondefense Federal Government purchases of goods and Services from 1972-84, as reported by the U.S. Department of Commerce, Bureau of Economic Analyses.

Note: Data may not add to totals because of rounding.

Source: "The South's Fourth Forest," review draft.

The funding for insect and disease management has been primarily Federal, perhaps in part because of control activities on Federal lands. In the 1960's, the Federal share was in the 80- to 90-percent range. This fell to the 60- to 70-percent range in the 1970's but stayed there during the 1980's because the States decreased funding as fast as the Federal Government.

Effectively combating insects and diseases requires an integrated approach to forest management that discourages the pests from reaching epidemic levels. Once an infestation begins, removal of the source is the most effective treatment. Continued research and more effective overall forest management may provide better solutions.

## **Description of Current Protection Programs**

Protection programs have a variety of components and perspectives depending on one's organizational viewpoint. The focus of this part of the paper is on cooperative Federal/State programs (USDA Forest Service 1986a, 1987) and on general State/local programs that exist in the South.

### **Fire Protection**

**Federal/State Programs--**The objective of the fire-protection program is to maintain and develop efficient and effective fire protection on non-Federal wildlands. The Forest Service intends to cooperate and participate with States in achieving the objective.

States and their political subdivisions are primarily responsible for fire protection on non-Federal lands. The Federal Government has responsibility for fire protection on Federal lands. The Cooperative Fire Protection Program provides technical and financial assistance to help the States efficiently and adequately protect non-Federal wildlands. It also provides trained, equipped crews that are available to cooperatively fight fires on Federal lands. The program emphasizes Forest Service participation in activities that result in a more efficient level of cooperative fire protection.

The Cooperative Fire Protection program provides technical and financial assistance for non-Federal wildlands through the Wildland Fire Protection program and through State Foresters' financial

assistance for fire protection in rural communities with less than 10,000 inhabitants under the Rural Community Fire Protection program. Federal excess personal property is loaned to the States to improve fire protection efficiency on non-Federal lands under the Federal Excess Personal Property program. A joint Federal-State-private effort (the Cooperative Forest Fire Prevention program) is designed to prevent human-caused wildland fires through the use of public service advertising, educational programs, personal appearances by Smokey Bear, commercial licensing of Smokey Bear items, and fire-prevention awards. Smokey Bear is featured strongly in all aspects of the program.

Nationally, the Cooperative Fire Protection program may include collecting data for planning and analysis, assessing accomplishments and opportunities for improved management, and doing efficiency studies; helping to use fire-protection resources efficiently and implement and maintain efficient levels of fire protection; helping develop and transfer new technologies between agencies; and developing and maintaining shared fire-protection resources among all government levels for more cost-effective operations. The Forest Service, in consultation with the States, is striving to develop cooperative fire-protection programs that will result in benefits across State lines. Priority is given to program efforts and projects that individual States would have difficulty undertaking if they had to act alone. A flexible program is intended. The Forest Service's office in the Southern Region is currently working with the States to develop a plan that will describe specific, high-priority, cooperative fire-protection programs.

**State/Local Programs--**State and local programs to provide fire protection take several forms. Most States are authorized to issue or deny fire permits under State burning laws. These permits provide control of fire activities based not only on fire conditions but on air-quality parameters as well. The State may cancel permits during periods of high fire danger and may require training and certification of burners before issuing permits. The enforcement of these laws is critical to program effectiveness. Virginia's effort has been cited as a successful example. The program is also strengthened where authority to collect reimbursement for suppression expenditures is available for illegal fires or fires improperly managed, and where forest wardens are granted policing powers.

Training programs and/or certification programs are also provided in many States to enlarge and retain the base of effective firefighters. Improved training and organization allows efficient use of available personnel and equipment. Training may include instruction in fire size-up, suppression tactics, air operations, fire weather, and communications.

Both Federal and State excess equipment is being effectively used for fire protection. A Florida program helps local fire departments acquire operational equipment by coordinating with the State prison system to have prisoners in a vocational training program modify chassis from regular trucks to fire-truck configurations. Rural communities in Georgia earned lower insurance rates by improving their fire organizations.

Other State programs include information, public awareness, and landowner training on hazard reduction and the use of prescribed fire. Georgia, North Carolina, and Arkansas, among other States, are currently involved in specific efforts to understand and reduce the threat of arson fires. The proliferation of second homes and suburban developments at the wildland/urban interface has greatly increased the fire threat to life and property. States in the South are active in programs seeking new ways to reduce this threat.

**Efficiency--**Fire-management programs are economically efficient when they minimize loss to the resource and also the costs of protection (Mills 1980). Program costs include both presuppression (training, equipment, fire roads) and suppression costs (labor, materials, overhead) (Althaus and Mills 1982).

Several economic analyses have been done on the effectiveness of fire protection. The first study that identified efficient levels of fire protection on non-Federal forest lands was done in the late 1950's (Swager and others 1958), so the means to determine efficient levels have been with us for 30 years. A 1983 nationwide analysis of fire protection on 877 million acres of non-Federal wildlands, using the cost plus net value change methodology, showed the efficient level of presuppression expenditures to be about \$327 million per year (USDA Forest Service 1983). At the efficient national level of protection, \$168 million in resource losses would occur, with 4.4 million acres burned. In contrast, the current level indicates presuppression expenditures of \$305 million, with \$325 million in resource losses and 5.6 million acres burned. Bringing expenditures

up to the most efficient level would lessen resource losses by \$157 million and 1.2 million acres. Proportional results can be expected for the program in the South.

Most of the Southern States have nearly completed economic analyses of their programs that will identify specific opportunities to improve efficiency. North Carolina (Roten and Shepherd 1986) demonstrated presuppression needs nearly 23 percent higher than budgeted funds. This analysis has successfully convinced the legislature to fund several specific program needs and will be used for future budget justification.

An evaluation of the presuppression, initial attack, and aviation program on six national forests showed that on most, the efficient level was unaffected by the severity of the fire year (Schweitzer and others 1982). The most efficient level was also insensitive to reasonable changes in either per-unit resource values or fire-effect estimates. The vast majority of the net value change was the loss of commercial timber and structures. This general result was also found in an efficiency analysis of the fire management program on 41 separate national forests (USDA Forest Service 1980), but in that study beneficial effects on wildlife outputs were also relatively large.

## **Forest Pest Management**

**Federal/State Programs--**The objective of forest pest management activities is to reduce the impact of pests on forests and trees to levels consistent with management objectives. The program includes survey and technical assistance and insect and disease suppression.

The objectives of the Cooperative Survey and Technical Assistance program are to maximize Federal and State efficiency in carrying out a coordinated pest management program; to detect and evaluate insect and disease outbreaks in their early stages, so that forest resource losses and suppression costs are reduced; and to provide technical assistance and coordination of pest management activities on State and private lands.

The Cooperative Forest Pest Action program provides financial assistance to the States for detection of insects and diseases, and for funding State professional pest management staff. The funds are used to evaluate insect and disease conditions throughout the South. These evaluations of pest-caused damage on non-Federal forest resources



give to managers of Federal lands that are intermingled with State and private lands the information needed to fulfill USDA pest management coordination roles. The information is available to State and private managers and is used to determine the condition of the Nation's forest resources with respect to pest-caused damage.

The program shares the cost of providing technical assistance and transferring research results to private forest landowners, helping ensure coordination of a sound pest management program. Coordinating pest management across all forest ownerships increases effectiveness and efficiency and minimizes damage to the environment and human health that can result from uninformed and uncoordinated pest-management activities.

In 1986, this program surveyed about 215 million acres of State and private lands in the South to detect pests. These surveys resulted in 714 evaluations of pest conditions. In addition, the program helped train 5,470 State personnel in insect and disease management and about 2,000 personnel in the management and coordination of pesticide use in 1986.

The objectives of Cooperative Insect and Disease Suppression are to reduce or prevent unacceptable forest resource losses on State and private forests by suppressing damaging forest insects and diseases with the latest integrated pest management techniques, and to facilitate the coordination of suppression projects on intermingled land ownerships.

In 1986, this program treated 58,000 acres of State and private lands, protected 1.3 million cubic feet of merchantable timber, and removed 79,000 cubic feet of infested merchantable timber through salvage operations in the Southern States. Program activities aimed almost entirely at helping landowners cope with southern pine beetle.

**State/Local Programs--**Many of the State/local pest management programs are designed to complement Federal/State programs. While Federal/State programs emphasize addressing Southwide problems, localized problems may escape Federal assistance. Broad-spectrum, multifaceted training and technical assistance would not be provided without State programs. State programs also supplement Federal activities to provide complete Statewide assessments of the insect and disease situation.

State programs include development of information systems, evaluations of nursery and regeneration diseases and seed orchard insects, monitoring, and pesticide studies. Many publications on pest problems are available to forest managers through State/local programs. Many States have personnel who provide training that leads to certified pest applicator status for forest managers and workers. State entomologists and pathologists respond to inquiries for pest identifications and pesticide recommendations for landowners and the general public.

**Efficiency--**In an analysis of the southern pine beetle problem (de Steiguer and Hedden 1985), the most efficient program for control was defined as that program which maximized dollar value of timber saved minus the costs of control. Depending on the discount rate used, program costs of \$6 million to \$9.5 million were optimal. The program costs for combined Federal and State expenditures for all insects and diseases (table 2) fall in the acceptable range.

Program effectiveness has been increased in several ways. Outbreaks of southern pine beetle can be predicted with far greater accuracy and damage minimized by quicker response due to improved information systems and models. Efficiency has also increased with improved aerial survey techniques and flight equipment.

## **The 1985 Resources Planning Act (RPA)**

The Forest Service's Resources Planning Act Program provides a useful point of departure for considering future protection policy and programs (USDA Forest Service 1986b). The RPA sets a national goal for protection and identifies a number of opportunities to respond to this goal.

The Recommended State and Private Forestry RPA Program is intended to help increase the productivity of private forest lands via pest management and fire protection.

The RPA Program is presented in two levels, a high bound and a low bound. Depending upon the level selected, the impacts on future policy and programs for protection are quite different.

## **Cooperative Fire Protection**

The RPA high bound is aimed at development of economically efficient State wildland fire-protection programs, improved efficiency through cooperation among States, and improved efficiency among States and Federal agencies. This approach was made possible by development of two new management systems: the Fire Management Analysis System, and the National Interagency Incident Management System. The Fire Management Analysis System applies economics to fire planning, fire suppression, and mobile suppression forces and permits assessment of efficiency. The National Interagency Incident Management System enables cooperating agencies to exchange suppression resources and to resolve jurisdictional and policy issues before fire crises.

Cooperative fire protection at the high bound is intended to be commensurate with the value of natural resources and products that could be damaged or destroyed by fire. The activities showing the greatest national benefit will receive highest priority. The Federal share of this funding will remain at 5 percent over the planning period.

At the RPA low bound, Forest Service involvement in the development of an efficient State fire-protection program will be lessened. Financial assistance to the States will be eliminated, and local units must be relied upon to fulfill their own fire-protection responsibilities. Less emphasis is placed on capturing the collective efficiency of all units involved in fire protection. Low-bound funding in the 1987-90 period will limit the Federal role to providing focus on critical issues and specialized technical assistance. After 1990, this activity will be increased commensurate with the increasing value of natural resources and products protected.

## **Cooperative Forest Pest Management**

The RPA high bound for pest management will increase funds for survey and technical assistance by 1990 but reduce suppression funding. The high bound provides for funding the States under the Cooperative Pest Action Program to support pest management activities essential to the Federal Government. It also includes technical assistance from Federal specialists over the entire planning period. Federal cost sharing for suppression on non-Federal lands will be limited to 25 percent by the year 2000 and discontinued after 2015.

The low-bound funding in the 1987-90 period will permit the Federal Government to purchase State-collected data on forest pest conditions to make national assessments. The Cooperative Pest Action program is eliminated at the low bound; no Federal technical assistance will be provided before 1993, and only limited assistance will be provided after that time. Federal funding for suppression on non-Federal lands will be discontinued, except on private lands intermingled with Federal lands, when necessary to protect the Federal lands.

## **Proposed Protection Policy and Programs**

Proposed protection should be based upon, and developed within, the management objectives for a forest. Protection activities must respond efficiently to direction developed to meet specific resource management objectives. Protection must be appropriate from the perspective of positive and negative effects that fire and pests may have on various resources and their outputs, the cost of implementation, the values involved, and the probabilities of impacts on those values. Efficient protection programs meet management objectives and over time minimize total cost plus net change in resource values.

The integration of protection and resource management requires that planned resource objectives realistically reflect both the constraints and opportunities that the fire and pest programs impose and provide. Proposed resource management programs and their outputs must be evaluated in terms of potential impacts from fire and pests. The level and cost of protection required to reasonably ensure those outputs should be identified.

Protection programs should provide an accurate view of the probable risks from fire, insects, and diseases. Protection should be commensurate with the probability of loss and with the efficiencies that can be achieved by preplanned, collective action of the private sector and the local, State, and Federal Governments.

A coordinated Federal/State/local response to fire protection will be essential. Successful cooperative efforts like the National Interagency Incident Management System and its training, equipment, and management standards make it possible for many organizations to come together to manage major fires and other incidents.

A significant portion of the projected reduction in forest growth rates can be attributed to mortality caused by insects and diseases. Pest-caused losses have been widespread for some time and will continue unless changes occur in forest-management attitudes and emphases. These losses should be factored into the planning process under a continuation of the "damage control" approach. If one believes that a change in forest pest management is needed and desired, then the focus shifts to considering possible changes.

A more aggressive pest-management stance through better loss and cost data, to illustrate the pros and cons of pest-management alternatives, is needed. Initiatives to establish or enhance assistance and protection programs must have as a requirement the cooperators' obligation to provide accurate pest impact and status information.

Improved pest management is needed if production of timber and other wood fiber is a goal. Given the limited land base on which trees can be grown, the limited productivity potential of some of the forest land included in that base, and the areas legislatively or otherwise withdrawn from forest production, obtaining increases from forestry requires producing more wood per acre. It is equally apparent that reducing losses from pests must be part of the strategy.

Responsibility for achieving these mutually agreed-upon objectives depends on where the potential benefits will accrue. The Federal, State, and private sectors share in the rewards of any initiative to reduce pest-caused impacts to forest production. However, assigning a responsibility commensurate with the benefits each receives is more difficult because the benefits are interpreted differently by each sector.

History provides a generous list of examples of how the leadership responsibility in pest management has been fulfilled by the Federal Government in the past. These examples are not germane today because previous Federal initiatives had a multitude of objectives, some of which were achieved while many were not. Government efforts to reduce pest-caused losses in wood fiber were among the less successful. Pest management was erroneously approached as an independent action instead of being integrated into forest-management planning and practices. Pest-management programs reacted to crises; little emphasis was directed toward avoiding crises. Forest pest management should emphasize prevention, not suppression, but both activities are expensive. Unfortunately, pest-management

funding is more responsive to requests for emergency help on visible problems than to requests for the investment capital needed to avoid those problems. The relative efficiencies of these two approaches are not factored into current decisionmaking.

Pest management should be included with other forest resource-management activities. Pest-management funds should be targeted to the more productive lands and protection of the more valuable resources. This strategy does not automatically ensure that the timber resource will receive first priority because of multiple-use considerations, but if pest-caused losses to timber resources are to be reduced, timber must be identified as a primary focus of the program.

It is obvious where stronger emphasis on pest management should take place--on the productive lands. Because every major forest pest situation has its own constituency, focusing on the most productive land will require negotiation between the forces who want to address the long-term outlook and those concerned with handling current outbreaks only. Pest-management resources will continue to be dissipated unless the public can be brought to a level of greater understanding about what pest control can achieve.

## Conclusions

The purpose of this conference is to discuss options or alternative policies and programs for future forest protection of the South's "fourth forest." It is important that future programs provide a clear and accurate view of (1) the probable losses to landowners and the general public from the occurrences of insects, disease, and fire; and (2) all the alternative means of coping with those losses. Future programs must provide for the integration of protection programs into planning for the management of forest land. Successful programs will provide economically efficient protection, commensurate with the values of the forest and the probability of losses, using the most efficient mix of prevention and suppression programs. The collective efficiency of protection through preplanned, coordinated action of the private sector and local, State, and Federal Governments needs to be continued and enhanced.

Fire-protection programs need to provide technology and the dissemination of technological infor-

mation for safe and efficient fire suppression, and smoke-management techniques for prescribed fire. Participation by the private sector and local, State, and Federal Governments in responding to fire situations with trained, mobile crews for all land ownerships remains important. Continual strengthening of the multi-State fire compacts deserves greater emphasis.

Pest protection can be improved with technology transfer to explain safe methods for applying approved pesticides. Future programs must provide (1) information on advance identification of pest outbreaks and (2) the technology for such early identification. Greater recognition of the importance of integrated pest management should be emphasized. To combat individual pests, programs need to provide for geographically comprehensive treatment strategies that protect all parties within intermingled ownerships.

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# Forestry Technical Assistance Programs: Research, Education, and Technology Transfer

Frederick W. Cubbage (1)

## Introduction

The southern timber study was performed to determine the current status and prospective trends in the southern forest timber base and industry. The study used historical and current forest inventory information and industrial production data to project future trends in the forestry sector to 2030, including those for timber growth and removals, land area changes, and industrial production of forest commodities. Projections were made using the econometric softwood Timber Assessment Market Model (TAMM), which is an equilibrium supply/demand model of the forestry sector. TAMM was used to determine the South's future regional timber growth, removals, and inventory levels, in conjunction with the Timber Resource Inventory Model (TRIM). Southwide trends were then divided among States via the use of a State Allocation of Regional Inventory Model (SARIM). Additionally, the southern timber study has identified the timber types and areas that are capable of producing designated rates of return given various levels of management intensity.

All of the above models were used to project the trends in the forest base, which was in turn used to determine industrial roundwood consumption, as well as employment and earnings in the forestry sector. These timberland area and volume projections are only base-level estimates, however, given the current status of macroeconomic conditions, returns vis-a-vis other investments, and public policies.

A principal reason for performing the southern study was not just to determine the trends in the resource base but rather to determine the possible public policy alternatives to change the trends, if so desired. This paper presents possible policy and program options in the areas of research, education, and technology transfer that can be used to improve the base-level projections made by the southern timber study. It will outline possible policy

alternatives and review the literature regarding their effectiveness in forestry so that policymakers can discuss possibilities for continuing, modifying, or extending current programs.

## Research

### Programs

Forestry research and education programs have expanded in the United States since the early 1900's. Research in forest management concerns was formally initiated at the Federal level when the USDA Forest Service established its Branch of Research in 1915.

In 1928, the McSweeney-McNary Act conferred legal status on regional experiment stations and reaffirmed a policy of cooperation between the research units and their various clients. It also enlarged the responsibilities of Forest Service research and called for a nationwide forest survey to inventory all ownerships. In addition, the 1928 act directed the forest experiment stations to determine (1) methods of reforestation and timber growing, managing, and utilizing timber, forage, and other forest products; (2) methods of maintaining quality water flow from forested areas; and (3) methods of protecting forests from fire, insects, and diseases. Research programs were also to address economic considerations necessary for establishing sound forest policies.

Forest Service experiment stations have since grown to represent all regions of the United States and perform research on a wide variety of topics of interest to all forest landowners, including forest management, pest management, utilization, economics, and inventory. The South is served by the Southeastern Forest Experiment Station and the Southern Forest Experiment Station. Currently, the annual budgets of the two southern stations total approximately \$28 million.

In the 1950's, most forestry schools also began to develop active programs in forest research, in addition to their traditional teaching responsibilities. Since that time, most southern schools have had

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(1) Frederick W. Cubbage is an associate professor in the School of Forest Resources, University of Georgia, Athens.

steadily increasing budgets and numbers of scientists devoted to research on forest management problems. They have been assisted by the 1962 Federal McIntire-Stennis Act, which authorized the Secretary of Agriculture to cooperate with State colleges and universities for the purposes of carrying out forest research, including the training of forest workers. In 1985, the 16 forestry schools in the 13 Southern States had total research budgets of almost \$12 million, which included \$3.5 million of McIntire-Stennis appropriations. The southern schools also employed about 90 full-time equivalent research scientists in forest management research.

Several State forestry agencies in the South also employ staff that perform research functions or that fund cooperative research projects with universities and consultants. Forest industry performs research at several locations in the South and cooperates with forestry schools and Federal experiment stations via individual contracts and numerous forest management cooperatives.

Public and private research efforts cover most areas of forest management, as well as forest products, recreation, and wildlife. Forest Service research dollars also fund the national forest inventory programs and publications. State and Federal research and education agencies also collect and publish general production and trade statistics, as well as perform supply and demand analyses such as the southern timber study. In fact, collection and dissemination of existing information has been an increasing role of public forest research/education programs.

## **Effectiveness**

Timber budgets, a greater scrutiny of public planning, and better analytical tools have led to several recent attempts to determine the value of public research investments. But evaluating the impacts of forest management research is problematic (Lundgren 1981). Detailed production and market data required for estimating production functions (inputs and outputs) from forestry research are often lacking. Additionally, forestry typically deals with production processes that involve many diverse inputs over time. It also has a stream of diverse, long-term market and nonmarket outputs. Assessing the value of research is even harder because timelags of more than 50 years may occur from when an innovation is adopted until its full impact is felt.

Despite the difficulties, several studies have evaluated the returns to investments in forest products research. Virtually all have found large benefit-cost ratios and rates of return. For example, Seldon (1985) reported rates of return of over 300 percent for southern pine softwood plywood research. Bengston (1984) reported excellent returns for structural particleboard research. Haygreen and others (1986) reported annual rates of return of 18 percent for all U.S. forest products, engineering, and marketing research and rates of 26 percent for return for aggregate timber-utilization research.

Forest management research--research directed at enhancing the biological or economic productivity of forest lands--is an area of evaluation that has more recently received attention. Forest management research evaluation comprises a larger percentage of total public research funding than products and utilization, but it has received considerably less attention in terms of its economic impact. This is due to several factors. First, unlike many areas of forest products research, innovations in the biological aspects of forest management lack direct consumer markets where they can be easily valued. Further, forest products research has an easily identifiable group of adopters--profit-maximizing companies who maintain direct, daily contact with researchers in their areas of interest. In contrast, a large percentage of forest management innovations are equally applicable to public, industrial, or private nonindustrial lands. Each of these ownership classes possesses different ownership and management objectives. Objectives also vary widely among the nonindustrial landowners. People or firms in different land ownership classes adopt management innovations at widely divergent rates. Finally, determining the actual impacts that are attributable to new technology rather than other variables (e.g., variations in climate, species composition, site, etc.) proves difficult at best. Thus the difficulties of identifying impacts solely attributable to research while controlling for divergent objectives and adoption patterns have discouraged many analysts from estimating the impacts of forest management research.

Regardless of these problems, some studies have evaluated returns to investments in forest management research. They have found positive returns, albeit less than those reported for evaluations of forest products and utilization innovations. Bare and Loveless (1985 unpubl.) estimated internal rates of return of 9 to 12 percent for the Regional Forest Nutrition Research Program at the University of Washington. The range of values reflects varying

assumptions on the percentage of total fertilized acres in the region attributable to nutrition research. An evaluation of biometrics research estimated a benefit-cost ratio of 16.3:1 for a recently developed growth and yield model for oaks in New England (Chang 1986). Similarly, investments in containerized forest tree seedling research were found to provide annual internal rates of return ranging from 37 to 111 percent, depending on the price differential between bare-root and containerized seedlings (Westgate 1986).

In the only econometric study trying to measure timber supply shifts (increases in timber supplies) related to forestry research, Newman (1986a unpubl.) found aggregate productivity increases at an annual rate of one-half to 1 percent for the entire region. If the benefits of these shifts were attributed to forest research, the resulting returns on research investments could range from \$1.2 million to \$12 million per year (Newman 1986b unpubl.). Newman noted that data were available for only the last few decades, and forest management impacts could take longer to affect inventory levels.

## **Education and Technology Transfer**

The results of forest research programs are disseminated by many sources, including the Forest Service, State extension personnel, State forestry agencies, universities, professional and trade associations, and private forestry consultants. Many recent studies have been performed evaluating some of these kinds of technical assistance.

## **Cooperative Forestry Assistance**

Federal efforts to provide forestry assistance to private landowners were initiated by Gifford Pinchot when he was chief of the Forest Service and continued on a modest basis for three decades (Robbins 1985). Cooperative efforts between the Federal Government and the States have officially provided technical, on-the-ground forestry assistance to forest landowners since 1937. The Cooperative Farm Forestry Act of 1937 (Norris-Doxey Act) first established a program of Federal funding for technical assistance to farm woodland owners, which was actually provided by State-employed foresters. Though the legislation authorized an annual Federal appropriation of \$2.5 million, the first appropria-

tion actually received was for \$300,000 in fiscal year 1940 (Dana and Fairfax 1980). The 1950 Cooperative Forest Management Act superseded the 1937 law and broadened the clientele served to include nonfarm private forest landowners, harvesters, and primary processors (Skok and Gregersen 1975). This was the first comprehensive program to provide substantial technical assistance to nonindustrial private landowners. Under the programs, Federal funds allocated to the States must be matched by State funds.

**Program Components--**In 1978, the Cooperative Forestry Assistance Act consolidated all previous cooperative legislation, authorizing the Secretary of Agriculture to provide financial and technical assistance to each State forester to produce seeds and seedlings; perform non-Federal forest planning; protect and improve watersheds; and provide technical and financial forestry assistance to private forest landowners, vendors, operators, wood processors, and public agencies. As such, the authority for management assistance under the Cooperative Forest Management program was superseded by the 1978 law, which is referred to as Private Forestry Assistance in some States and as Rural Forestry Assistance in others.

The programs provide direct, on-the-ground technical assistance to help private landowners manage their forests for multiple outputs. Funds from Federal and State Governments support State service foresters, who perform the field work. Currently every State in the Nation has private forestry assistance programs. However, large budget cuts have been made in several State forestry budgets, and Federal appropriations for State and Private Forestry in the USDA Forest Service are declining. Extension and service foresters also help disseminate to private landowners current timber prices that are published in Timber Mart-South and other sources. Some States have now instituted a fee system for forest-management assistance.

**Program Efficiency--**Several recent studies have examined the effectiveness of the provision of technical assistance. Boyd (1983, 1984) used regression to estimate the effects of various types of forestry assistance on timber production. In general, Boyd found that forestry incentive programs (FIP) did encourage investments in growing timber, though somewhat less than one might expect from a profit-maximization criterion alone. He found that FIP did not contribute to owners harvesting timber

currently, but he did not evaluate their effects on future timber supplies. Boyd computed that provision of technical assistance was more likely to increase regeneration than subsidy programs were (7.3 percent probability versus 5.5 percent) and that technical assistance was significant in increasing the probability of harvest (7.1 percent).

Royer and Kaiser (1985) found that the use of foresters was commonly associated with southern pine regeneration by nonindustrial private forest owners. An early study of Pennsylvania State forestry assistance, tree planting, and timber-stand improvement under the Agricultural Conservation Program found social rates of return of about 6 percent to 10 percent on average to good sites (Manthy 1970).

A survey in Georgia identified the characteristics of nonindustrial private forest landowners who invested money in forestry improvements (Mullaney and Robinson 1980). Investors usually owned more than 100 acres of land, had greater than average incomes, and often were repeat users of forestry subsidy programs. The study concluded that subsidy programs would be ineffective in encouraging further investment by currently uninterested owners, despite their high use by current investors. Mullaney and Robinson felt that technical assistance stressing low-cost management should be provided to encourage production by lower income forest owners if full subsidies were not used.

Hickman and Gehlhausen (1981) performed a survey in east Texas that examined the interest of forest landowners in different assistance programs. They found that providing management assistance for multiple use and requiring performance bonds from loggers were preferred program features. Urban residents with above-average education and income levels expressed the most interest in forestry programs.

In a study in the Georgia Piedmont, Cabbage evaluated the effects of providing technical forestry assistance to assisted and nonassisted groups of landowners who made timber harvests (Cabbage 1983, Cabbage and others 1985). He found that harvests between the assisted and nonassisted landowners differed significantly. Landowners assisted by State foresters generally had less pine timber removed (1,135 vs. 1,485 cubic feet per acre), had more softwood volume left after harvest (810 vs. 226 cubic feet per acre), and had more pine seedlings (1,602 vs. 803 per acre) after harvests of natural stands. A pine-plantation sample was too small for differences to be detected, but the two

groups seemed similar. No differences in the amount of soil erosion or damage to the residual trees were detected between the assisted and nonassisted groups. Personal characteristics did not differ much between assisted and nonassisted landowner classes.

Cabbage also found that harvest returns differed significantly between owners who did and who did not receive forestry advice. Owners assisted by State service foresters received an average price of \$108 per thousand board feet of timber; those making their own sales averaged only \$66 per thousand board feet. A small amount of this difference could be explained by differing product distributions, but even in the most conservative case, assisted landowners received stumpage prices 58 percent greater than landowners making their sales without assistance. Greater returns for current sales and greater residual volumes also led to a greater total net present value per acre on lands whose owners received assistance (\$1,563), compared to the nonassisted group (\$940), at a real discount rate of 4 percent.

Greater returns to landowners receiving assistance created large private, social, and program benefit-cost ratios. In fact, returns for sawtimber marking and harvesting assistance alone were enough to justify total Georgia cooperative forestry assistance program costs in most comparisons. Tax dollars that could be attributed to harvesting assistance exceeded costs for timber marking but not entire program costs. Returns to the Federal treasury were greater than those to the State, and the Federal share of program cost is less; so pay-backs were greatest for the Federal contribution.

In Montana, Jackson (1983 unpubl.) performed an economic evaluation of the private forestry assistance program by examining records of landowners who made timber harvests in the State. From his sample, Jackson found that more timber would be grown on lands whose owners had received State assistance than on lands of nonassisted owners, and that assisted landowners would receive substantially greater present values. Accordingly, assisted owners' lands would generate more State income taxes in the future. Seven owners receiving technical assistance and seven not receiving assistance were used in current stumpage price comparisons. Using regression analyses to predict timber prices based on the empirical data, receiving technical assistance was a significant independent variable as an interaction term with haul distance. Holding other variables at their mean values, Jackson



estimated that, on the average, forestry assistance added \$4,205 to the total sale price received by each landowner.

Jackson discussed several implications of his study. First, nonassisted landowners tended to make high-grading selective cuts, leading to lower present values of future harvest yields. Based on the economic results, the private forestry assistance program could be expanded to provide positive economic returns. Also, using a price-prediction equation, Jackson found that economical sales could have volume as small as 35,000 board feet, translating into an area of 5 to 10 acres. He noted that small landowners might even be a logical group to receive private forestry assistance.

Jackson (1985 unpubl.) recently concluded a study of the nontimber effects of assistance in Montana. His preliminary results indicate no detectable difference in use of best management practices on forester-assisted and nonassisted ownerships, although the study did confirm the advantages of assistance in making timber sales and in encouraging good timber management practices.

Straka and others (1986) recently performed an evaluation of the Mississippi Forestry Project. This project consisted of placing an extra State service forester in two areas in Mississippi in order to improve contacts with landowners and increase forest management practices. The new foresters contacted all owners in their area to promote increased management. Straka found that service-forester promotional activity and management assistance produced direct benefit-cost ratios of 20:1, 8:1, and 3:1 and at real discount rates of 4, 7, and 10 percent, respectively. The program also generated large local economic impacts and increased tax returns. The study demonstrated that adding foresters and making intensive contacts with owners were profitable in the State.

After reviewing the preceding studies and others on financial assistance, Royer (1985) described the preliminary results of a logit regression model he developed using data from an earlier survey of non-industrial private forest landowners in the South (Fecso and others 1982). He examined the reforestation decision made by nonindustrial private owners as a function of tract ownership characteristics, personal characteristics, market variables, and public policy variables. Sixteen independent variables were used in the analysis, divided into four groups. Owner variables included tract size, forest ownership as part of a farm, and the predominant local land use (urban, agricultural, mixed

agriculture/forested, and forested). Personal characteristics included income, age, education, farming as a primary occupation, absentee ownership, and plans to sell harvested land. Indices of stumpage prices for sawtimber and pulpwood, an index of reforestation costs, and advice by industry or consulting foresters constituted the market factors analyzed. Financial and technical assistance (from FIP and private forestry assistance, respectively) were the relevant policy variables.

A hierarchical statistical analysis of the data indicated that ownership variables alone would correctly predict reforestation decisions only 17 percent of the time. Personal characteristics interacted with ownership variables, adding nothing to the model's explanation of reforestation probability. Economic (market) variables increased the model's probability of accurately predicting reforestation by 13 percent. Public policy variables--the provision of FIP or public technical assistance--were most influential, explaining 60 percent of these landowners' reforestation decisions.

Royer then developed single-equation models that eliminated the effects of multicollinearity (inter-relatedness) among many of the independent variables. This allowed interpretation of the effects of individual variables within each category. Partial derivatives and elasticities were calculated for each independent variable. Derivatives represented the "probability of reforestation corresponding to a one-unit increase in the independent variable evaluated at the means. The elasticity, which can be computed only for continuous variables, reflects the percent change in the probability of reforestation corresponding to a percent change in the independent variable."

Royer's results indicated that the asset positions (income or forest ownership size) of landowners had a strong positive influence on the probability of reforestation. Pulpwood (but not sawtimber) prices had a positive but only modestly significant effect on reforestation decisions. Coefficients for technical assistance from both private and public foresters were positive and significant, as was the effect of public cost-sharing. Of the significant variables, increases in reforestation probability, as indicated by the partial derivative, were greatest for the provision of public forestry assistance (about 66 percent greater), followed by FIP expenditures (+50 percent per dollar spent) and provision of private forestry assistance (+44 percent). Other statistically significant factors were much less influential: size (+0.04 percent per acre), income (+0.05 percent

per \$100), farmer status (-0.14 percent), and age (-0.6 percent per year). Plans to sell the land had a negative effect on the probability of reforestation (-21 percent), and pulpwood prices a slight positive effect (+1.3 percent).

The State foresters and the Forest Service's State and Private Forestry branch also cooperate in providing advice to loggers and sawmillers regarding harvesting, sawmilling, lumber drying, secondary processing, wood energy, and market and industrial development--called the Forest Product Utilization programs. Harvesting and marketing programs are available to landowners. In an evaluation of the Sawmill Improvement Program, Risbrudt and Kaiser (1982) found excellent returns to sawmillers and social returns to the program. The Forest Service and some States also offer urban forestry programs, which were authorized federally in 1972. These programs emphasize combating insect and disease outbreaks and utilizing wood that would otherwise be lost due to pests and land clearing.

Soil Conservation Service (SCS) employees also provide limited on-the-ground technical assistance to forest landowners when making SCS farm plans. In heavily forested counties and States, county conservationists provide considerable advice on multiple-use management and farm and forest conservation practices. They often coordinate their farm plans with recommendations from State foresters or extension service personnel.

### **Private Forestry Assistance**

In addition to public programs, technical forestry assistance is also now offered by many private consultants and forest-products firms. Consulting forestry services available to private landowners have increased greatly in the last 20 years. Currently, it is estimated that there are over 1,900 consulting foresters in the United States. Georgia has the largest concentration, with over 100 known consultants (Field and Holt 1984 unpubl.). In addition, many forest industries have begun formal management assistance or landowner assistance programs in areas around their mills. They also lease a large amount of forest land in the South.

**Industry Assistance**--A number of surveys have been performed to estimate the extent of private forestry assistance to nonindustrial private forest landowners, although none have published an eco-

nomic evaluation per se. Studies were begun at the Southern Forest Experiment Station (Pleasanton 1968, 1969; Siegel 1973; Siegel and Guttenberg 1968) and have been continued by others until the present.

Leasing programs began in the 1940's and 1950's. In these programs, industry leases land from private, nonindustrial owners and generally manages it as if it were their own. The acreage under lease in the South seemed to peak at about 6.7 million acres (Siegel 1973) in 1970. Current surveys indicate that this figure has declined to about 4.66 million acres in 1982 (Meyer 1984, Meyer and Klemperer 1984). Average tract size under lease was 2,078 acres.

Industrial forest management assistance programs also provide private forest landowners with forest regeneration, timber-stand improvement, and harvesting assistance, in addition to leasing programs. Land-management practices may be performed at cost for private landowners. Programs generally require that treated tracts be of a minimum size and within a maximum distance from the mill, and some require first refusal rights--the right to meet or exceed any other firm's bid--when participating landowners sell timber (Cleaves and O'Laughlin 1983, O'Laughlin and others 1983, Cubbage and Skinner 1985). Land enrolled in formal industrial management assistance programs has increased steadily. In 1984, Meyer and Klemperer found that total enrollment included 4,214,000 acres in the South, with the largest programs being in the west gulf. Average tract size was 484 acres.

**Consulting Foresters**--Private consulting foresters are located throughout the South and provide a wide array of services. Most consultants provide complete forest management services, including performing timber inventories and appraisals, preparing management plans, administering timber sales, and providing for regeneration. Several consultants also assist landowners in planning and managing for wildlife or other nontimber goods, constructing and maintaining firelanes, and managing Christmas tree plantations. Additionally numerous consultants prescribe timber-stand improvement and site preparation for their clients' tracts. Due to the large expense of maintaining work crews for sporadic silvicultural work, many consultants contract such work with private forestry vendors. Normally, these vendors concentrate on providing silvicultural treatment rather than long-term

management for landowners. Landowners may also contract directly with private vendors.

Charges for consultant services vary with the type and size of the project, the location of the tract, and the time required to complete the task. Most consultants charge on a daily or per acre basis for services not involving monetary transactions or valuations, such as preparation of management plans. Projects involving sales are generally provided for a percentage basis.

Regional and national surveys have found a steadily increasing number of private forestry consultants through the 1970's and 1980's (Field and Holt 1984 unpubl.; Harou and others 1981; Hodges and Cubbage 1986; Kronrad and Albers 1984a, 1984b; Martin 1977; Myers and Goforth 1980; Pleasonton 1968, 1969). Good estimates of the total area in the United States receiving consulting forestry assistance do not exist. Expanded totals from the survey by Field and Holt (1984 unpubl.) indicate that consultants helped manage at least 3.7 million acres of land in the South, as well as helping in marking over 1/2 million acres for timber sales. Hodges and Cubbage (1986a, 1986b) found that, for Georgia in 1983, 3,900 landowners received management-plan assistance from consultants for forest land covering a total of 779,400 acres. In 1983, consultants in the State also marked 279,400 board feet of timber and 485,600 cords of pulpwood and helped in the artificial or natural regeneration of 61,400 acres of nonindustrial private forest land. This would indicate that the Field and Holt figures probably underestimate total assistance levels.

No direct evaluations of consulting services have been completed to date. However, Cubbage and Hodges (1985) reported that harvests made with the assistance of consultants in Georgia appeared similar to those made by State service foresters. Prices based on Timber Mart-South data were also very similar. Thus one might expect similarly good returns for landowners receiving consulting assistance. Some public programs have also helped establish consulting foresters in targeted areas of the South, which have generally proved successful.

**Program Overlap--**If private forestry assistance is now available at reasonable costs, is public technical assistance necessary? Cubbage and Hodges (1985, 1986) estimated the total levels of assistance in Georgia in 1983 in order to examine this issue. They found that the total level of accomplishments

and average tract size varied significantly among the management assistance, consulting, and State forestry programs. Consultants marked more timber than industry and State programs and generally provided more services and detailed management plans compared to State foresters. Industry programs assisted considerably fewer owners but had very large average tract sizes associated with each ownership managed (636 acres). Average tract size managed by State foresters was 131 acres; for consultants it was 376 acres. Georgia State foresters assisted the most landowners, but the brunt of the assists consisted of brief plans that did not require intensive site examinations. Service foresters helped in marking less than 1 percent of the timber harvested in the State, compared with about 8 or 9 percent marked by consultants.

Overall, it seems that each type of technical assistance fulfilled separate needs. Industry programs concentrated on owners of large forests, consultants focused on medium-size ownerships, and State foresters on the smaller ownerships. Georgia, which is probably similar to other States, has a yearly limit of 5 person-days of assistance per owner per year. Most requests from owners of large tracts were probably referred to private programs. However, States do seem to be fulfilling a necessary goal of providing assistance to smaller owners who might not be able to afford consultants or qualify for industrial programs.

## **State and Private Forestry**

The State and Private Forestry branch of the Forest Service serves as the national coordinator for technology transfer and information management at the Federal level. It helps administer Federal funds given to the States for cooperative forestry programs. Additionally, it provides technical expertise to the States in fire, pest-management, and forest-management programs. In particular, State and Private personnel assist in and coordinate State forest resource planning and provide much-needed advice in managing forest land for nontimber uses.

Programs administered by State and Private Forestry include the broad categories of forest pest management, cooperative fire protection, and cooperative forestry. Pest management technical assistance ranges from pest data collection and impact assessments to aerial spray technology and management of pests in nurseries and seed orchards. Cooperative fire assistance includes man-

agement of the rural cooperative fire protection program, administration of the Federal Emergency Management Assistance Act, assistance in fire planning, and coordinating the Smokey Bear fire prevention program. Cooperative forestry includes assistance in forest management activities such as silviculture, tree planting, nursery improvement, herbicide use; economic, tax, and harvesting activities; sawmill utilization and improvement programs; and management of watersheds and wildlife. Utilization, marketing, and export programs have been a recent program initiative in State and Private Forestry.

In the 1980's, annual direct funding for State and Private Forestry dwindled from almost \$100 million to about \$60 million, and the Office of Management and Budget has repeatedly proposed reducing State and Private Forestry or eliminating it entirely. State and Private Forestry does receive transfer funding from other Federal sources as well, however. This includes Resource Conservation and Development and emergency watershed funds; funds for administering the Forestry Incentives, Agricultural Conservation, and Conservation Reserve Programs; and funds for agricultural pest management programs. In total these external transfer funds account for almost one-fifth of the State and Private budget.

## Extension Programs

Extension forestry began in Michigan as an agricultural extension project in 1911. The Smith-Lever Act of 1914 created the Cooperative Extension Service and gave it broad directives to carry out nationwide educational programs in agriculture and related areas. Extension foresters were employed under this act for the first time in 1918. The Clarke-McNary Act of 1924 augmented the legislative mandate for such efforts by directing the Secretary of Agriculture to work with the States in developing extension forestry efforts (Extension Committee on Organization and Policy 1986).

The act has resulted in cooperative agricultural extension efforts between the U.S. Department of Agriculture and the State land-grant colleges. The act is funded by the Federal Government, individual States, and local communities, with total contributions of about \$1 billion in 1985. Recently, the Federal Government has funded about 37 percent of the programs, local governments 7 to 11 percent, and the States the balance. About 200 forestry and relat-

ed resource personnel are now employed by extension services in the United States.

Extension now includes a substantial forestry component in most States. Separate congressional authority for forestry extension services was granted under the Renewable Resource Extension (RRE) Act of 1978 to address educational needs in managing renewable natural resources. To date, very little additional RRE money has been appropriated. Annual forest management and utilization extension funds have usually amounted to about \$4 million, and natural resources as a whole to about \$15 million.

State extension foresters provide information and education for private landowners, loggers, and forest-products firms, primarily by holding workshops, meetings, tours, and forestry demonstrations; by publishing forestry bulletins; and by utilizing the mass media. They also work closely with county extension agents in conducting local forestry education programs. In addition to public education, extension personnel have taken a leading role in disseminating research findings to public and private foresters, as well as informing researchers of the concerns of forestry professionals and the public.

The extension forestry mission includes several components. Extension forestry programs are designed to provide a problem-oriented education, by improving forest management, utilization, and multiple use; increasing the productivity of forests and the efficiency of soil logging and wood-processing industries; and protecting and enhancing the soil, air, water, and amenity benefits of trees. Extension continues to focus on transferring new technology to research users and to provide feedback to researchers about the needs of forest landowners, managers, processors, and consumers. It also helps policymaking by providing factual and credible information to the public regarding forestry (Extension Committee on Organization and Policy 1976).

Few evaluations of forestry extension per se have been performed. Agricultural economists have performed detailed analyses of the combined returns to investment in agricultural research and extension and found that they have large payoffs (e.g., Huffman 1978, Norton and Davis 1981, Orden and Buccola 1980). In a 1983 national forum on nonindustrial private forests held in St. Louis, education of woodland owners was identified as one of the most effective ways to stimulate management of privately held forest land. Extension forestry does serve as

the lead agency in the Department of Agriculture for educating private forest landowners.

A national study by Krygier (1980) concluded that people receiving assistance through extension woodlands programs believed the programs had provided them with income benefits, improved forest-management practices, increased timber supply, facilitated use of other government and State forestry programs, and increased timber harvest. In a separate study in Oregon, Krygier (1986 unpubl.) queried private landowners regarding their management objectives, income and investments, and information sources. He found that landowners ranked extension forestry as providing the most valued information, followed closely by the Oregon Department of Forestry. About 41 percent of the landowners in his sample relied on extension forestry at some level of intensity. User groups found publications and newsletters the most helpful. Personal consultations, field visits, tours, demonstrations, meetings, and workshops were ranked in a similar, but somewhat lower class. Media of various kinds were rated least helpful.

A pilot landowner assistance program sponsored by the Alabama River Woodlands Company in conjunction with the Alabama Cooperative Extension Service has been evaluated recently. A survey of landowners in the southwest Alabama area near the company's mill indicated that the county extension chairman or county agent had the highest credibility with landowners regarding agricultural or forestry matters. Thus Alabama River Woodlands Company proposed to provide most of the funds for a graduate forester who would work entirely for and under the supervision of the Extension Service. The forester was to work in the four-county area around the company mill to help interest landowners in regenerating their land. The program has been very successful to date. An economic evaluation of the program indicated a benefit-cost ratio of 3.12:1.0, and an internal rate of return of 9.9 percent.

## Discussion

A variety of alternatives may be used to implement public policy for forest resources. In the broadest sense, laissez-faire, government ownership, public regulation, or public incentives and education may produce socially desirable results. The appropriate mix of these programs at any given time depends on the goals of society and the cur-

rent institutional structure. Successful policies must be designed to achieve an objective or solve a perceived problem; however, they cannot do this based on economic or political science theory alone. Policymakers must also consider all other relevant policies that affect forest resources. Examining a program in isolation may lead to overlooking its side effects on other programs.

Overall, the recent studies reviewed here provide considerable information on the roles of owner characteristics, markets, and public policy. All the published evaluations have found technical assistance to be effective and to provide excellent private and social returns. It has helped inform knowledgeable landowners, encouraged reforestation and harvest, and promoted other investments in forestry. Differences in environmental effects during timber harvests, however, could not be detected in the Georgia and Montana studies. Recent forest research evaluations have indicated that forest products research and technology transfer have been very profitable, and that forest management assistance has had benefits slightly exceeding costs, at low discount rates. Technology transfer and education programs are obviously important in disseminating research results.

Public and private research and assistance programs seem important in encouraging prudent forest management and improved utilization and marketing by private forest landowners. In the United States, trees of some species will grow with or without assistance to landowners. But many recent studies have shown that assistance is crucial in fostering good land management practices and the growth of desirable species. Utilization and marketing of any species also is facilitated by education and technology transfer programs. Thus, it seems likely that a mix of public and private research and technical assistance programs will continue to be an effective approach to increasing timber supplies from tracts owned in the private, nonindustrial sector. It will be up to the participants of this conference to recommend which programs should be enhanced, reduced, or maintained.

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# The Role of the Private or Consulting Forester in the South's Fourth Forest

William F. Milliken (1)

It is my job to make this audience aware of the role the private or consulting forester has played, is playing, and will play in the potential increase in forest productivity for our Southern States.

A quick overview of this field is appropriate at this point. The Association of Consulting Foresters (ACF) has well over 400 members or candidate members in the United States, about 210 of whom practice in the region covered by this study. Georgia, with 48 members, has the most consulting foresters; several States have only 7 to 20 members. These are professionally dedicated private practitioners who believe that the diversified services they render are well worth their cost. They are continuously upgrading their education to meet the ever-growing demand for their services.

ACF members employ about an equal number of foresters as those who are ACF members, virtually doubling the 210 ACF members in the South who are actively engaged in productive forest management activities at no public cost.

We further estimate that ACF members in the South represent about two-thirds of the practicing private or consulting foresters who are available to the public in the Southern States for intensive or extensive forestry needs.

Thus, it would be a reasonable estimate that there are perhaps 450 to 500 foresters presently in the private or consulting field available to assist private landowners in these Southern States on a fee or other businesslike basis.

The growth of consulting forestry has occurred mainly during the past 15 years with the past 10 years being the most significant. Like any profession, some consultants are not as qualified as others. The ACF has set rigid standards, which are gradually upgrading the quality of performance.

With every passing year each of these private practitioners has been able to bring a few hundred to several thousand acres under intensive management. This happens because it is good business for both the client or landowner and the consulting forester.

We are passing through a period of readjustment in the forest ownership, forest investment, and forest management fields. Basically, only those who can afford to practice forest management, for whatever reason they own their timberland, will do it. Those who cannot have not done so in the past and will not in the future. Commercial forestry has become more businesslike due to changes in ownership patterns. Forest farming must be run like a business. Good consulting foresters are first and foremost business people.

Advice and education will not be enough to maintain and even build up the forest resource in private and nonindustrial ownership.

There is a place for public agencies to educate, screen needs, and provide information and guidance. There is a place, yes, even a need, for forest industry to do all it can to assist in maintaining or building up supplies safeguarding its own future.

The private or consulting forester is now and will remain the catalyst who will get the job done in the field. They are now in place, growing in quality, experience and quantity. Acceptance of and cooperation with consulting foresters by public agencies and forest industry throughout the South will be a major step toward achieving the goals of this conference and the resulting report.

Consulting foresters will do the job well because their livelihood and their dreams depend on getting the job done in a competent and financially responsible manner. You may count heavily on their influence in the future forest resources of the Southern United States.

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(1) William F. Milliken is a consulting forester, Milliken Forestry Company, Inc., Columbia, SC.



# Forestry Investment Incentives in the South: A Review of Empirical Research on Cost-Sharing and the Reforestation Tax Credit and Amortization

Jack P. Royer (1)

## Introduction

The draft report entitled "The South's Fourth Forest" concludes on page 38 that "achieving the economic potential to grow a fourth forest in the South will require action to expand [programs of] protection, technical and *financial* assistance, research, education, and management" [my emphasis]. Two public financial incentives directly affecting forestry investment are the Federal reforestation tax credit and amortization (hereafter the reforestation tax incentives) and cost-sharing under one of three Federal programs--the Forestry Incentives Program (FIP), the Agricultural Conservation Program (ACP), and the Conservation Reserve Program (CRP)--or 13 State programs, 7 of which are found in the South. These "direct" financial incentives can be distinguished from other incentives by their requirement that landowners undertake specific forestry investments, such as tree planting, in order to qualify. Public financial incentives such as the capital gains treatment of timber income, the preferential assessment of forest properties, and the expensing of management costs improve the financial position of forest landowners but do not require specific forestry practices, in particular reforestation. (2)

The central aim of this paper is to survey our knowledge of the effects of cost-sharing and reforestation tax incentives on landowner investment decisions. The review does not include studies of the cost effectiveness or social efficiency of the incen-

tive programs; instead the paper concentrates on a series of recent modeling efforts that have used econometric methods to isolate determinants of the forestry investment behavior of landowners. The paper first summarizes the current provisions and recent accomplishments of Federal and State cost-share programs and the reforestation tax incentives. It then highlights the results of the empirical research on landowner investment behavior and discusses the significance of the findings of that research in light of recommendations in "The South's Fourth Forest" to expand financial assistance programs.

## Direct Financial Incentives

The reforestation tax credit and amortization were enacted into law on October 14, 1980, as a rider to the Recreational Boating and Facilities Improvement Act (P.L. 96-451). These so-called "Packwood amendments" joined cost-sharing under FIP as the major Federal financial incentives intended specifically to encourage tree planting. FIP was established in 1973 by the Agriculture and Consumer Protection Act (P.L. 93-86). It was modeled after the Agricultural Conservation Program, a cost-share program dating to 1945 and modified in the early 1950's to allow forestry practices. Both the Forestry Incentives Program and the ACP can be used for tree planting; the primary difference between the programs is their goals. The Forestry Incentives Program is intended to increase forest production; ACP is intended to conserve soil and water. The Conservation Reserve Program, like ACP, is a soil conservation program. It was created by the Food Security Act of 1986 to remove highly erodible cropland from cultivation.

Under the reforestation tax incentives, as modified by the Tax Equity and Fiscal Responsibility Act of 1982, all persons who plant trees after Decem-

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(1) Jack P. Royer is Associate Professor, School of Forestry and Environmental Studies, Duke University, Durham, NC.

(2) The distinction between direct and indirect financial incentives is made here strictly for the purpose of clarifying the scope of this paper. Distinguishing between these types of incentives is not intended as a reflection of their relative importance.

ber 31, 1979, may report capitalized reforestation expenditures on their Federal income tax returns in one of two ways: they may claim a 10-percent tax credit on an annual maximum of \$10,000 of reforestation expenditures and amortize 95 percent of those expenditures over a 7-year period (84 months), or they may claim an 8-percent tax credit and amortize 100 percent of their expenditures up to the \$10,000 annual limit over the 7-year period. Qualifying costs include expenditures for seeds or seedlings and the costs of labor, tools, and site preparation incidental to planting, seeding, or natural regeneration.

The reforestation tax incentives and cost-sharing are not exclusive programs; that is, qualifying landowners may take advantage of both incentives. For example, a nonindustrial private landowner may receive cost-sharing under FIP, report it as ordinary income, and then apply the tax credit and amortization to all of his or her reforestation expenditures up to the \$10,000 annual limit. If the cost-share payment is not reported as ordinary income, then the landowner may apply the tax incentives only to his or her share of the expenditures.

The major provision of FIP is a Federal cost-share that, until recently, ranged up to 75 percent of the costs of tree planting, timber stand improvement, or natural regeneration. The Forestry Incentive Program's maximum cost-share rate is now 65 percent. States and counties are further permitted to adjust this rate downward through the State Agricultural Stabilization and Conservation Boards that administer the program. To be eligible for FIP assistance, a landowner must be nonindustrial and hold fewer than 1,000 acres of commercial forest land. Landowners are limited annually to \$10,000 of cost-share assistance. Also, the candidate site must be capable of growing 50 cubic feet of wood annually.

The Agricultural Conservation Program provides cost-sharing for tree planting, up to a maximum Federal share of 60 percent. In each ACP case, however, the primary purpose for the assistance must be soil and water conservation. Under the ACP, landowners may receive cost-shares to plant trees in counties not designated to receive FIP monies or in counties where all the FIP assistance has been used.

Under the Conservation Reserve Program, landowners elect to retire highly erodible, recently cultivated land and may receive up to a 50-percent

Federal cost-share to plant their land with trees (or grass) as well as receive up to \$50,000 annually in rental payments (established through bids) over a 10-year contract period. During that period, the landowners must keep their land out of cultivation. Lands enrolled in the CRP must meet erosion criteria established by the Soil Conservation Service. No more than 25 percent of the cropland in any one county may be enrolled in the program.

State forestry cost-share programs are available in seven Southern States: Virginia, North Carolina, South Carolina, Florida, Alabama, Mississippi, and Texas. Each of the seven States with cost-share programs requires an approved forest-management plan for candidate sites, and each precludes the simultaneous use of State and Federal cost-share funds. Other eligibility requirements and the administration of the programs vary among the States, as shown in table 1.

The relative importance of Federal and State cost-share programs across the South can be seen in funding levels and planting accomplishments over the past 5 years. As shown in table 2, the prominence of FIP in the South, a region that receives approximately 75 percent of the disbursements from the national program, has declined over the past 5 years, but that decline has been largely offset by increases in State cost-share programs and ACP. In 1981, FIP accounted for nearly 70 percent of the cost-share dollars spent in the South. By 1985 that proportion was under 45 percent. The increase in State spending over the 1981-85 period is due in part to the startup of four new State programs, but spending also increased in existing State programs. These trends seem to signify a willingness by the States to pick up the slack in Federal assistance.

Planting levels across the South further reflect the declining prominence of FIP, although FIP continues to put more trees in the ground than the State programs combined (table 3). Nonetheless, cost-sharing by the Southern States has become increasingly important, growing from less than 20 percent of the cost-shared acres in 1981 to over 40 percent of the acres planted with public cost-sharing in 1985. Acres in the Agricultural Conservation Program have experienced an even greater rate of increase in recent years, with ACP accounting for 20 percent of the cost-shared acres in 1985.

**Table 1--Characteristics of State cost-share programs in the South, 1987**

State	Year est.	Funding source	Cost-share ratio	Annual limits	Minimum acreage
Alabama	1985	Off-shore oil leases	60%	\$3,500	20
Florida	1981	Forest industry donations	Free seedlings	None	10
Mississippi	1974	Severance tax	50%	\$10,000	None
North Carolina	1977	Primary products assessment and appropriations	40%	100 acres	None
South Carolina	1982	Primary products assessment and appropriations	50%	100 acres	None
Texas	1981	Forest industry donations	50%	None	10
Virginia	1970	Severance tax and appropriations	50% or \$60 per acre maximum	500 acres	None

**Table 2--Funding levels under the Forestry Incentives Program, Agricultural Conservation Program, and State forestry cost-share programs in the South, 1981-85**

	1981	1982	1983	1984	1985	1981-85
	Millions of dollars					Percent change
FIP (South)	13.5	9.2	7.7	6.0	7.5	-44
ACP (South)	1.5	1.6	2.0	1.5	2.5	+66
State cost-sharing	4.5	4.6	4.9	7.0	7.2	+60
Totals	19.5	15.4	14.6	14.5	17.2	-12

**Table 3--Southern nonindustrial private forest land acreage planted with Forest Incentives Program, Agricultural Conservation Program, and State cost-shares, 1981-85**

	1981	1982	1983	1984	1985	1981-85
	Thousands of acres					Percent change
FIP (South)	190	141	131	135	152	-20
ACP (South)	28	32	43	31	65	+132
State cost-sharing	53	75	92	102	115	+117
Cost-share totals	217	248	266	268	332	+23

Comparing the planting accomplishments under the public cost-share programs with total planting levels on nonindustrial private holdings reveals not only the relative importance of cost-share programs but also the trend in acres planted without cost-shares (table 4). Planting of pine on nonindustrial private holdings in the South nearly doubled between 1981 and 1985, but the proportion planted with cost-share assistance declined from 70 to 47 percent. This decline suggests that other factors may be contributing to increased reforestation. One such factor may be the reforestation tax incentives.

Unfortunately, records of the use of reforestation tax incentives are not available through government agencies like those for cost-sharing. As a result, survey techniques are the only means available to compile data on the use of the tax credit and amortization. A recent Southwide survey of landowners who had clearcut and reforested following a timber sale in 1983 showed 59 percent of the

owners using the tax credit, compared to 48 percent using a cost-share program (Royer 1986b unpubl.). Overall, 70 percent of the landowners had used either the tax incentives or cost-sharing; 36 percent had used both programs. Table 5 gives a full profile of program use among the 1983 sellers. No trend data are available for use of the reforestation tax incentives.

The accomplishments of the Conservation Reserve Program are just beginning to unfold because the program is only in its second year. Initial responses suggest, however, that over the short term, planting levels in the South are going to be markedly affected by the CRP. During the three signup sessions in 1986, nearly 600,000 acres of qualifying southern cropland were accepted for tree planting. The initial signup in 1987 yielded an additional 519,000 acres tentatively accepted for tree planting pending inspection by the Soil Conservation Service.

**Table 4--Total versus cost-shared acres planted in the South, 1981-85**

	1981	1982	1983	1984	1985	1981-85
	Thousands of acres					Percent change
All planting (South-wide)	388	415	477	590	712	+84
Cost-share totals	271	248	266	268	332	+23
	Percentage					
Percent of planting cost-shared	70	60	56	45		47

**Table 5--Use of public forestry assistance programs among southern landowners reforesting after selling timber in 1983, by owners and acres**

Program vehicle	Percent of owners using	Acres
Only tax credit	23	30
Both tax credit and cost-sharing	36	32
Only cost-sharing	12	9
Neither tax credit nor cost-sharing	23	25
Unable to respond	6	4
Total	100	100

**Table 6--Southwide acreage of tree planting enrolled under Conservation Reserve Program (to March 1987)**

Signup periods	Thousand acres
1986	
First	124
Second	183
Third	253
1987	
First	519

These acreages represent about 95 percent of all tree planting under the Conservation Reserve Program, which has a 5-year goal of approximately 5 million acres of tree planting. Table 6 profiles the enrollment for tree planting for the first four signup periods.

The Southwide data on use of public forestry incentives reflect program accomplishments, but they do not answer this question: To what extent, if any, do the incentive programs stimulate investment, other factors being equal? That is, to what extent can we attribute any of the recent increases in tree planting in the South to public financial incentives as opposed to changes in markets, owner, and ownership characteristics? The array of possible determinants of reforestation behavior has recently drawn the attention of econometricians and empirical studies of landowner investment behavior are beginning to emerge. A review of the findings of these studies serves here as a means to judge our progress toward isolating the effects of public programs on landowner decisions.

### **Empirical Studies of Forestry Investment Behavior**

To understand the significance of recent econometric models of forestry investment behavior, readers will need a brief review of landowner research. Empirical surveys of landowner behavior since the

1940's are numerous, but the overwhelming majority of these surveys simply profiles the characteristics of landowners. Rarely are the surveys based on theoretical models, and rarely do they explore the simultaneous effects of a full array of market, policy, owner, or ownership influences. Those studies that include some analysis of behavior typically explore only bivariate interactions, such as a correlation or test of dependence between two variables. The literature on landowner behavior is thus extensive but inadequate for understanding and predicting landowner behavior.

Recently, debate over the relative importance of market and policy effects has led to the development and estimation of more fully specified econometric models of landowner behavior. These efforts use multiple regression techniques to model one of two landowner decisions: (1) the decision to *harvest* timber, which determines short-term timber supply; or (2) the decision to *invest* in forest management, most often reforestation after harvest, which determines long-term timber supply. The distinction between these two categories is important because the decision to harvest can be made separately from the decision to invest, even though the two may be dependent. Hence, the harvesting choice can have determinants that are different from those of the investment choice.

The review in this paper focuses primarily on investment models because of their rigorous examination of public financial incentives and the central importance of regeneration after harvest (the invest-



ment decision) to future supplies of softwood in the South. Nonetheless, a brief summary of the findings of harvest decision models is instructive, if only for purposes of comparison with investment models.

## **Models of Harvesting Behavior**

Models of harvesting behavior are found in the works of Binkley (1981), Max (1983), Wallace and Silver (1983), Boyd (1984), Provencher (1985), Hyberg (1986) and Holmes (1986). Each of these researchers uses a variation of utility theory to characterize forest landowners as consumers (utility maximizers) rather than producers (profit maximizers). The utility-governed landowner theoretically contrasts timber and nontimber opportunities when deciding whether to harvest and responds in a rational way to the utility (returns) he or she perceives from these opportunities. The empirical estimations of harvest choice models show that landowners do indeed act as utility maximizers, choosing to harvest timber when or where markets (stumpage prices) are favorable, but only if returns from harvesting timber exceed those stemming from nontimber values. Several of the harvest models further explore subgroups of landowners, notably farm and non-farm owners, finding these groups to vary in their sensitivities to timber and nontimber opportunities. (The findings show generally that farmers are more sensitive to stumpage prices and therefore are more producer than utility oriented.) Other researchers have noted that timber and nontimber values need not conflict and may be satisfied simultaneously. The upshot of harvest models has been an emerging consensus that stumpage prices work well as short-term determinants of timber supply, although two markets--those for timber and nontimber opportunities--loom important.

Some of the harvest models also examine the effect of public financial incentives, notably cost-sharing. Boyd, for example, suggests awareness of cost-sharing should affect the harvest decision if landowners are intent upon achieving maximum financial returns from their timberlands. His finding of an insignificant effect is consistent with the notion that utility, not profit, governs harvesting behavior. Hyberg finds a similar modest effect of cost-sharing on harvesting, as do Wallace and Silver. Max examines the effects of yield and property taxes on timber sale strategies, finding no effect from yield taxes but a positive effect from property taxes.

## **Models of Investment Behavior**

The models of investment behavior offer more specific theories and more stringent tests of the effects of public financial incentive programs. Through these models we have the opportunity to gauge the impacts of cost-sharing and reforestation tax credits. Models of investment behavior are found in the work of Boyd (1984), de Steiguer (1985), Brooks (1985), Romm (1985), Royer (1986a and b unpubl.), Hyberg (1986), and Greber and Lawrence (1986). As a group, these studies are much less uniform than the harvest models in their adoption of a theory to explain landowner behavior. Some extend utility theory to the investment decision; the others are derived from investment theory or microeconomic theory. In each case the effects of market, policy, owner, and ownership variables are investigated, but the model specifications differ, as do the expected signs and significance of key variables. A general summary of the sign and significance of key variables from selected investment models is presented in table 7. The discussion below examines these studies in more detail.

**Table 7--Summary of findings from selected models of forestry investment behavior**

	Brooks (1985)	de Steiguer (1985)	Boyd (1984)	Royer (1986a unpubl.)	Royer (1986b unpubl.)	Hyberg (1986)
Dependent variable	Total acres planted	Non cost-shared investment	Investment probability (timber stand improvement and reforestation)	Probability of reforestation	Probability of reforestation	Probability of reforestation
Independent variables	3	4	8	8	9	12
Owner/Ownership	(YES = STATISTICALLY SIGNIFICANT AT SPECIFIED LEVEL)					
Income	NA	+/yes ***	*/no	+/yes ***	+/yes **	+/no
Size of holding	NA	NA	+/yes ***	+/no	+/no	+/yes **
<b>MARKET</b>						
Stumpage price	+/no	+/no	+/yes ***	+/yes **	+/yes **	+/yes *
Planting costs	-/yes ***	NA	NA	-/yes ***	-/yes *	-/yes ***
Interest rates	NA	-/yes **	NA	NA	NA	NA
Technical assistance (private)	NA	NA	+/yes ***	+/yes ***	+/yes ***	+/no
<b>POLICY</b>						
Technical assistance (public)	NA	NA	+/yes ***	+/yes ***	+/yes ***	-/no
Cost-sharing	+/yes ***	-/no	+/yes ***	+/yes ***	+/yes ***	+/yes **
Tax credit/amortization	NA	NA	NA	NA	+/yes ***	NA
R-square or % correctly predicted	0.90	0.94	0.87	0.89	0.82	0.72

\*\*\* = 0.05 level, \*\* = 0.10 level, \* = 0.20 level.

## **Boyd**

Boyd's investment model is an extension of the utility model he developed and estimated for the harvesting decision. Using microlevel data from a survey of landowners in seven North Carolina counties, Boyd reports that a landowner's decision to undertake any one of several forestry investment activities, including reforestation, is affected by stumpage prices, size of holdings, and programs of financial and technical assistance. Farmers and absentee owners are less likely to invest. By comparing the higher price elasticity of the landowners' harvesting decisions to the price elasticity of their investment decisions, Boyd notes that landowners are more likely to harvest than to invest in response to improving prices. This suggests a diminished importance of market signals as determinants of the investment decision. Boyd's estimated equations show further that both technical assistance and knowledge of cost-sharing increase the likelihood of investment. Boyd compares the greater derivative (elasticity) for technical assistance with that for financial assistance and concludes that "a government policy which relies more on dissemination of technological and market information is probably a better means of increasing timber supply than a policy involving subsidies."

## **Hyberg**

Hyberg (1986), like Boyd, examines both the harvesting and reforestation choices of landowners using the same survey data from North Carolina and additional Statewide survey data from Georgia. Hyberg's objective was to test the appropriateness of the utility- and profit-maximization models for harvesting and reforestation decisions. His estimations generally support the utility maximization model for reforestation, although he concludes that the data do not allow a strong rejection of the profit-maximization model. In the reforestation model, exogenous income (income generated from sources other than timber) has a positive but not significant effect on reforestation. Stumpage prices have a positive but modestly significant effect. Reforestation costs have a negative and highly significant effect.

## **de Steiguer**

The model developed by de Steiguer (1985) uses aggregated data rather than survey data to examine the effects of stumpage prices, income, interest rates, and cost-sharing. De Steiguer's dependent variable is the number of autonomous (unsubsidized) acres of trees planted across the South. The estimated model reveals strong positive effects of income and interest rates on autonomous investment, while the effects of stumpage prices and cost-sharing are not statistically different from zero. De Steiguer's results, unlike Boyd's, demonstrated an income constraint. His finding that interest rates affect investment behavior suggests a sensitivity of landowners to capital markets. The absence of a price response reflects a limited market effect, while de Steiguer views the absence of a cost-share influence as evidence that the substitution of public capital for private capital is not a valid contention. If substitution had been widespread, the coefficient for cost-sharing (when the dependent variable is autonomous investment) would have been negative and statistically different from zero. The conclusion, therefore, is that autonomous reforestation does not decline as the result of increased cost-share dollars being available.

## **Brooks**

Brooks (1985) uses aggregated data similar to de Steiguer's but specifies reforestation costs as a primary determinant of investment while dropping interest rates and income. He also uses expected returns rather than current prices as the primary market determinant. Like de Steiguer, Brooks found minimal effects of market signals on forestry investments. He did, however, demonstrate a strong negative effect of costs in the South Central States, but not in the Southeast. Cost-sharing was found to have a strong positive influence on investment levels throughout the South.

## **Romm**

The study by Romm and others (1985) uses microlevel survey data from telephone interviews with nonindustrial private forest landowners in California to examine the effects of the California Forest Improvement Act, a 90-percent cost-share program for landowners holding less than 5,000 acres of

timberland; and the Williamson Act, legislation offering preferential property tax assessment to landowners who place their holdings under a Timberland Protection Zone. The study reveals forestry investment in California to be a function of income, age, and absentee ownership, with the cost-share program and property tax incentives proving socially selective. Landowners with high probabilities of investment tended to use the California program to intensify investments, a factor the authors attributed more to the management content of the program than to its subsidy, while landowners with low probabilities of investment tended to respond to the property tax incentives to initiate forestry investments. The study concludes that a fundamental need is "to diversify policy instruments so that owners and governments gain choices and more favorable contexts in which to make them."

### Royer

Royer (1986a unpubl.) used southwide survey data from personal interviews with landowners who had harvested timber between 1971 and 1981 (Fecso and others 1981) and an investment model specified by McMahon (1964) to demonstrate a positive, albeit modest, effect of pulpwood (but not sawtimber) prices on the likelihood of reforestation after harvest, a strong negative effect of reforestation costs, and strong positive effects of income, technical assistance, and cost-sharing.

Using a similar specification with Southwide data from a 1986 survey of landowners who sold timber in 1983, Royer (1986b unpubl.) found similar, modestly positive effects for pulpwood prices, but not sawtimber prices, a negative effect of costs, and strong positive effects of income, technical assistance, cost-sharing, and reforestation tax incentives. (In the pilot study for the 1986 survey, Royer (1985) failed to demonstrate a marginal effect of the tax incentives among landowners from seven North Carolina counties.)

### Greber and Lawrence

Greber and Lawrence (1986) explored landowner investment behavior using data supplied by consultants for several Virginia counties and a two-staged investment model. The first stage models the decision of whether to reforest; the second stage models the decision of how much to invest

once a reforestation decision is made. Their results show that the decision of whether to invest is a function of owner and ownership characteristics, namely age, farm versus nonfarm occupation, and the harvest of pine rather than hardwood. Financial variables such as price, harvest revenues, and costs are not significant for this decision. In contrast, the amount invested in reforestation is a function of prices, revenues, and cost-sharing assistance. The implication, according to Greber and Lawrence, is that ". . . tax incentives and cost-sharing may serve to encourage more intensive reforestation practices by landowners inclined towards plantation forestry, but may not encourage more landowners to adopt plantation forestry."

### Collective Results

The upshot of these recent studies of investment behavior is new information on the effects of certain key structural parameters of landowner investment models. But while some degree of convergence emerges, enough variation in the theoretical underpinnings of landowner investment behavior, model specification, and parameter estimation remains to suggest that more work is needed. At this juncture, however, the following conclusions seem to hold:

- Forestry investment decisions are only modestly affected by stumpage price signals and the prospect of financial returns.
- Landowners considering forestry investments are sensitive to costs and therefore are likely to respond to low-cost reforestation alternatives or public financial incentives that reduce their costs.
- Landowners respond to public financial incentives, if not by opting to reforest then by intensifying their investment.
- Despite public financial assistance and high economic opportunities, some landowners are constrained from investing by limited financial resources.
- Technical assistance from professional foresters, public or private, increases the likelihood of forestry investment.

## Investment Behavior in the Context of "The South's Fourth Forest"

The review draft of the South's fourth forest report identifies, on page 101, the low price elasticity of timber supply in the South as the central problem facing southern forestry. It further notes that this elasticity has remained low despite widespread economic opportunities to earn competitive rates of return on forestry investments. The report attributes this incongruity between opportunity and behavior to several market imperfections:

1. Failure of the stumpage market price to reflect all benefits associated with forests, such as the provision of wildlife habitat, scenic beauty, and improvement of water quality; and all costs, such as the pollution resulting from the use of chemicals and fires.
2. Short time-preference of individual landowners, which constrains investments in management options yielding rewards after an extended period of time.
3. Lack of investment capital and market and management knowledge among private timber owners.
4. Ownership objectives that constrain timber production.
5. Limited competition among timber buyers.

The investment models developed in the above studies offer insights on items 2, 3, and 4. With respect to item 2, landowners have not exhibited a high degree of response to market signals, measured either as stumpage prices or expected returns on investments. The fact that the highest sensitivity is to pulpwood prices, rather than sawtimber prices, supports the notion that landowners may have planning horizons shorter than those necessary for many forestry investments. These short time-preferences may very well negate any effect of the attractive long-term returns offered by sawtimber rotations.

With respect to item 3, several of the studies have isolated an income constraint, indicating that many southern landowners may not be in a financial position to consider an investment in forestry. The models further show that many landowners lack the

management savvy to make a forestry investment. This is evident in the near universal finding of a significantly higher likelihood of investment among landowners assisted by professional foresters.

The evidence of conflicting ownership objectives (item 4) is not as clear. Nontimber values are more likely to affect a harvesting decision than a decision to reforest. It is conceivable, however, that landowners might reject investment opportunities, such as plantation forestry, based on a desire to maintain a more natural stand. Perhaps more plausible is the notion that landowners reforest based on a feeling of obligation to keep their land productive. The utility models of Boyd and Hyberg suggest that this latter scenario may be accurate. Another ownership objective conflicting with reforestation may be farming. Several studies show negative coefficients for farmers, suggesting that farm and forestry operations may compete for investment capital. Additional research aimed at decisions such as the choice of harvesting method, choice of reforestation technique, and subgroup membership will be needed to verify possible competing motives.

Following its contention that market failure occurs in southern timber supply, "The South's Fourth Forest" endorses increased public programs of financial assistance to improve forest productivity. The investment models are in general agreement that public programs increase forestry investment, but the limits of these findings must be clarified. Cost-sharing and tax incentives yield positive and significant coefficients in most of the investment models. This indicates that some of the credit for increased planting in the South in recent years belongs to public financial incentives. These findings further imply that if we choose to continue programs like reforestation tax incentives and cost-sharing, then landowners are likely to respond. What these models do not tell us, however, is whether public dollars *ought* to be invested in southern forestry. Models of investment behavior are positive models, not normative models; they tell us what *is*, not what *ought to be*. Numerous studies have shown public forestry investments to be efficient from a *program* standpoint (cf. Gregerson 1979, Mills and Cain 1979, Risbrudt and other 1983), but no study has demonstrated the social efficiency of public forestry initiatives.

The decision to intervene in the market thus hinges on whether timber markets are deemed imperfect. Until foresters make this judgment, the prudent course of action seems to be to heed the evidence that market signals are not eliciting adequate

landowner response and opt for a public/private partnership of investment through continued programs of cost-sharing and tax incentives. This is not to say that we should ignore ways to improve the administration of these programs, nor that we should cease to seek ways to improve market incentives. For example, we might experiment with lower cost-share ratios or making the tax credit and cost-sharing exclusive programs. We might also experiment with higher cost-share ratios for low-cost natural regeneration techniques, those that may attract landowners concerned about compromising non-timber objectives. Federal and State responsibilities for providing financial assistance might also be examined; perhaps cost-share dollars need not be Federal.

The weight of the evidence from the literature on investment behavior suggests that cost-sharing and the reforestation tax credit and amortization *are effective* in stimulating landowner investments. In this regard, "The South's Fourth Forest" states, "If growth in income and employment in [the South's] forest industries is to be sustained, action must be taken to increase investments in those public and private programs that are effective in increasing forest productivity." It further notes that "this can be done in a variety of ways--but it must be done." I tend to agree.

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# Legislative Regulation of Private Forestry Practices-- National Trends With a Focus on the South

William C. Siegel and Terry K. Haines (1)

Should government formally regulate private forestry practices in the United States? This question has been debated by foresters and policymakers for more than half a century. Public regulation of private forest lands was first introduced in North America in the early 17th century when the Plymouth Colony passed a statute that prohibited the cutting of trees without government permission (Huffman 1978). Numerous other forestry regulatory laws were later passed in the colonies (Kawashima and Tone 1983). Once the United States became an independent Nation, however, forestry policies reverted almost exclusively to exploitation (Scheiber 1983). This situation eventually led to a new drive for forest conservation in the late 19th and early 20th centuries.

Extensive discussion of Federal regulation of private forestry in the United States began about 1917 and continued through the mid-1920's (Siegel and Cubbage 1985). Nearly every issue of the *Journal of Forestry* during this period contains some mention of the failure of private owners to practice good forest management, and of alternative methods for improving their stewardship (Salazar 1985). All regulatory bills introduced in Congress, however, failed.

The focus on Federal regulation arose again in the late 1930's, when Congress established a joint committee to examine forestry issues. The committee issued its report in 1941, calling for combined Federal-State regulation of private forestry. Fearing that Federal legislation would be passed if they failed to act, 5 States in the West and 10 in the East enacted regulatory laws between 1937 and 1949 (Cubbage and Ellefson 1980). Most of these statutes addressed regeneration after harvest, usually by mandating the leaving of seed trees.

The call for further regulation faded during the 1950's and 1960's. Only one additional State forest practice act was passed during those two decades.

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(1) William Siegel and Terry Haines are project leader and forester, respectively, in forest resource law and economics, Southern Forest Experiment Station, USDA Forest Service, New Orleans, LA.

## The Legal Basis of Regulation

A solid legal basis has been established for regulating forestry practices on private lands in the United States. The courts have consistently ruled that such statutes are constitutional if they do not discriminate among owners and are equally applicable to all. It is a well-established American legal principle, stemming from the English Common Law, that society can--through its police power--restrict, for the public good, the freedom with which owners may use their land and its resources (Roberts 1974, Bosselman and others 1973).

However, the police power exercised by the State for this purpose should not be confused with eminent domain. Under the doctrine of eminent domain, private property is taken for a public purpose and compensation paid. Such public taking without compensation is clearly prohibited by the 5th Amendment to the United States Constitution and the various State constitutions (Roberts 1974). Although regulation of forest properties by use of police power may decrease their value or earning potential, the property is not physically taken, nor is compensation paid. Such action is clearly legal.

## Recent Regulatory Trends Outside the South

Forestry practices in States outside the South are regulated both directly and indirectly by a wide range of interacting Federal, State, and local laws. Some specifically address control of forestry operations; others may be interpreted to apply in particular situations. Most of this legislation was passed during the 1970's and 1980's. National attention in recent years has largely focused on the strict new State statutes passed in the West--primarily those of California, Washington, and Oregon. Alaska, Idaho, and Nevada also have comprehensive practice laws recently enacted or revised. The environmental movement of the 1960's and 1970's was a major force in the passage of this legislation in the West.

Many forested areas in this region are environmentally sensitive and located on steep slopes, near streams, or on erodible soils.

Massachusetts is the only State in the East that regulates forest operations in a comprehensive manner throughout the State with a single law. However, three State reforestation laws have also been passed in the East, as have been numerous other State environmental statutes that regulate certain forestry practices under specified circumstances. Today 14 States outside of the South have formal forest-practice legislation that regulates the practice of forestry on private lands on a Statewide basis (Cubbage and Siegel 1985).

### **Interaction With Federal Water-Quality Law**

Much of the State legislation outside the South that regulates private forestry practices has some interaction with the Federal Water Pollution Control Act as amended in 1972 and again in 1977 by the Clean Water Act. Sections 208 and 404 of the Act provide the primary legal framework for control of water pollution from silvicultural activities. Section 208 mandates that each State develop and implement a water-quality management plan subject to approval of the Federal Environmental Protection Agency (EPA). Silvicultural operations are designated as one source of nonpoint pollution that must be addressed. Section 404 addresses point sources of pollution associated with forestry dredge-and-fill operations.

EPA's subsequent aggressive efforts to implement Section 208 planning included strong suggestions for formal regulation of private forest practices by means of State forest-practice laws (Agee 1975). A model regulatory law drafted by EPA contained strict regeneration standards, water-quality protection measures, and even guidelines for protecting esthetic qualities. Critical response from the forestry community prompted EPA to discard the model act in favor of less formal implementing mechanisms. Nevertheless, a number of States outside of the South have enacted specific regulatory legislation for controlling silvicultural nonpoint source pollution. Two of these laws--those of Massachusetts and Oregon--will be examined more closely. Both are considered by most observers to have been particularly successful in improving timber produc-

tivity as well as controlling nonpoint source water pollution.

Eight States--Massachusetts, Alaska, Idaho, California, Maine, Nevada, Oregon, and Washington--have incorporated such control into their State forest-practice acts.

### **Massachusetts Forest Practice Cutting Act**

A proliferation of restrictive local ordinances and the State's Wetlands Protection Law, which was impeding logging operations and creating costly delays, were major forces in the enactment of the Massachusetts Forest Practice Cutting Act. The stated purpose of the law, enacted in 1983, is to maximize the timber resource while at the same time protecting all other forest resources. This legislation regulates forestry operations on both private and public lands. Small harvests, harvests of minor forest products, and conversions to nonforest use are exempt from its provisions. Although the act does not currently limit the authority of local governments to adopt forest regulatory ordinances, it has thus far satisfied the regulatory needs of most local governments in the State.

Before rules may be adopted under the act's authority, public hearings must be held. The rule-making committee is composed of eight members, four of whom by definition have a professional interest in forestry. The remaining members include three with other resource interests and one representing the general public.

The law requires timber operators to be licensed and addresses harvesting systems to be used, regeneration methods, harvesting practices, and road construction. A separate law regulates slash disposal. Landowners must file a notification of intent/forest cutting plan, notify abutting landowners that cutting will occur, and notify the State when cutting is completed. A permit is required when operations take place on steep slopes or wetlands. The cutting plan must describe the silvicultural methods to be used, the method for designating trees to be cut, estimated volumes, logging and erosion-control measures, procedures to be utilized in buffer strips, and measures to control mud on highways. A detailed map of the logging site is also required.

The State may impose stop-work orders for violations. Violators are also subject to fines. The act is considered to be highly successful, and is generally accepted and supported by all concerned parties--

forest industry, loggers, environmental groups, local governments, and private landowners. In 1985, 636 operator licenses were issued and 1,123 harvesting plans were submitted for operations on 40,764 acres. Only 25 stop-work orders were issued and one logger's license was suspended during that year. To date, no fines have been imposed (Quink, personal communication).

### **Oregon Forest Practice Act**

The 1971 Oregon Forest Practice Act is considered by most observers to be very effective in protecting the State's forest resources. It has been particularly successful in improving water quality and increasing reforestation. The law is generally supported by the State's entire forestry community, and compliance with its provisions is high.

Rules under the act's authority are promulgated by a 12-member State Board of Forestry. The Board's nine voting members include three who represent timber production interests, and one representative each from small woodland owners, agriculture, wildlife interests, the counties, labor organizations, and the public at large. There are also three advisory members. Forest-practice rules and standards are established for some activities on a Statewide basis; others are adopted by region. Regional forest-practice committees recommend rules appropriate to their particular regions to the Board.

The law requires the filing of a notification form within 15 days of commencing any of the following acts on private or non-Federal public land: harvesting, road construction, precommercial thinning, forest land conversion, slash disposal, and chemical application. A detailed plan may also be required when operations are located in areas where the potential for erosion is high. Harvests of minor forest products are exempt from the notification requirement. However, the operator must still comply with Department rules and standards.

An average of 11,054 notifications were filed annually from 1980 to 1984. Notifications are ranked according to their potential for environmental damage. All medium and high-risk operations are inspected at least once. The Department of Forestry issues an average of 200 citations and 120 repair orders per year. Operator repair costs average \$900 (Stone, personal communication). The compliance rate for the act is estimated at more than 98 percent. The Oregon Forest Industries Council has estimat-

ed that the cost of compliance is \$12 per thousand board feet of cut timber.

The Oregon law is unique in that 40 percent of the funding for its administration is obtained from the State's Forest Products Harvest Tax (Henley and Ellefson 1986). The act preempts county rulemaking authority on lands zoned as commercial forestland--a rather controversial provision, which is currently being challenged in court (Henley and Ellefson 1986).

### **Voluntary Approach to Regulation**

Most States outside the South have taken a voluntary approach for ensuring good forest practices on private land. With EPA approval, their Section 208 forestry plans have taken the form of voluntary forest-practice guidelines to be implemented through training and educational programs. In the now-familiar jargon, these guidelines are better known as "best management practices" or "BMP's." In general, BMP's prescribe proper methods of harvesting, road construction, site preparation, reforestation, and slash disposal. Although primarily directed to protection and enhancement of water quality, they also are usually written so as to protect site productivity, increase timber production, and maintain fish and wildlife habitat.

Legislation in some States exempts forest operations from regulation, provided the operator complies with voluntary forest-management guidelines. For example, the Maryland Sediment Control Act has been used in recent years to regulate some operations in that State. However, most silvicultural activities are exempt provided forestry BMP's are followed.

In New Hampshire, owners and operators must file an "Intent to Cut" form under the State's yield-tax law prior to logging. The form contains an optional statement of agreement which stipulates that the operator will implement appropriate BMP's to protect water quality. If the agreement is not signed and problems then occur, the operator will thereafter be required to submit formal plans for all future logging.

Under Vermont's Water Pollution Control Act, forest operators must implement acceptable management practices to ensure exemption from permit requirements. Should an operator fail to obtain a permit or adopt such practices, he will be subject to penalties under the law.

Several States promote the use of BMP's by providing tax relief to owners who accept and follow

them. Others encourage their use by subsidizing reforestation costs.

### **Related State Legislation**

Many States outside the South that utilize voluntary BMP's have also passed formal legislation that focuses on protecting wetlands, shoreline areas, and designated rivers and streams, and on controlling sediment loss and erosion, stormwater runoff, and stream obstruction. These laws all affect forestry operations to some extent.

The general water pollution control statutes of most non-Southern States, although not specifically addressed to forestry, could also be interpreted to be applicable to silvicultural nonpoint source pollution. The definition of "pollution" in these laws is generally quite broad. To date, however, virtually none of this type of legislation has been directed to forestry operations.

### **Local Regulation**

State legislation is not the end of the story. The forestry issue of the decade may well be the virtual explosion of local regulatory ordinances being passed by county, township, and municipal governments--primarily in the East, but also to some extent in the West. These ordinances are currently causing the most controversy over regulation within the forest community. They have been prompted primarily by concerns about logging and its effects on roads, water quality, wildlife, and esthetics. Frequently, local laws have been enacted in response to clashes between urban and rural values (Popovich 1984, Wolfgram 1984, Youell 1984).

Local regulatory measures are of two kinds. The first specifically addresses forestry operations in a comprehensive and detailed way, while the second applies to forestry indirectly by concealment in a statute of much broader scope (Siegel and Cubbage 1985). For example, the application of a particular ordinance may not be evident in the legislative wording, but nevertheless it may be construed to relate to timber cutting. Many local statutes are not only conflicting, but also stifling to forestry and logging operations--that is, impractical and difficult for foresters and loggers to follow. There is evidence that the proliferation of such local laws in the Northeast may prompt some States in that region to con-

sider enacting State legislation similar to the Massachusetts Forest Practice Cutting Act. For example, of the 567 municipalities in New Jersey, about 100 have established ordinances restricting forest operations.

### **Recent Regulatory Trends-- The South**

Only two Southern States--Mississippi and Virginia--have formal, Statewide forest-practice laws. Both are seed tree statutes that stipulate the leaving of a specified number of crop trees following harvest. Enforcement in Mississippi is virtually nonexistent. The legislation in Virginia has been enforced more consistently and is considered to be a rather successful program. Today, the law is well accepted by the State's forestry community. However, in the early years of enforcement, a number of small independent operators were prosecuted for noncompliance. The law requires that a minimum number of crop trees be left for 3 years following harvest on sites where pine or yellow poplar constitutes 10 percent or more of stocking. An alternative to the seed tree provision is provided under the law. An owner or operator may submit a regeneration plan for the site to the Virginia Department of Forestry, which must approve the plan prior to any cutting. Through this provision, Department foresters are notified of impending harvests and are able to provide the owner technical guidance before less desirable harvesting and regeneration practices are undertaken. The benefit of this provision in influencing landowners was shown in a survey of landowners in which four out of five listed the advice of a professional forester as being highly or moderately important in their decision to undertake planting operations or site preparation activities prior to natural regeneration (Graff and Kaiser 1986).

Each year approximately 40,000 acres are reforested in compliance with Virginia's Seed Tree Law (Stare, personal communication. Current USDA Forest Service inventory statistics indicate that the acreage of pine forest type in Virginia declined by 2 percent in the last decade (Brown 1986). This is a significant improvement over the two previous decades, during which the acreage in softwood species decreased by 24 percent (Knight and McClure 1978). Most of the improvement is reflected in planted acreage, which has increased by 72 percent during the last 10 years.

No Southern State has enacted any type of comprehensive forest-practice regulatory legislation based on water-quality control. At this time, no enactment of such statutes in the South is anticipated, although there has been occasional mention of the subject in several States. The universal approach in the Southern States to controlling nonpoint source silvicultural pollution has been the development and utilization of voluntary BMP's--to be implemented through training and educational programs (Goetzl and Siegel 1980).

Each Southern State does have a general water-quality statute, often enacted long before the 1972 Federal legislation. Most of these laws, however, have been amended in recent years. Although not specifically keyed to water quality and forestry, they do contain provisions that apply to pollution caused by human activity in and around forested areas. They generally empower a designated State agency to adopt standards and rules to deal with the consequences of polluting activities in forested areas rather than addressing the manner in which forestry operations are conducted (Goetzl and Siegel 1980). All of the Southern State water-quality statutes contain provisions for the establishment of water-quality standards. These vary from State to State, but all meet at least the minimum EPA requirements. However, water-quality standards specifically for sediment, the chief pollutant attributable to silvicultural activities, have never been definitively established. It is difficult to set a standard because sediment levels are extremely variable, difficult to measure and compare, and occur naturally in substantial quantities.

A number of Southern States also have other laws that relate to water quality even though they were primarily enacted for some other purpose. Secondary provisions in statutes that pertain to protection of aquatic environments often have relevance for forest-management practices. These laws include statutes that prohibit stream obstruction and that protect designated scenic rivers or natural streams.

Despite the South's traditional conservatism, a number of local governments have enacted ordinances to regulate logging practices in order to protect water quality or to prevent damage to local roads. Some urban counties--particularly in Georgia, Florida, and North Carolina--also regulate logging in order to control unbridled development, eliminate trash-covered logging sites, and protect esthetic values.

The next section of this paper discusses the specific water-quality implementing mechanisms utilized in each Southern State for the control of forestry practices as required by the 1972 Federal Water Pollution Control Act amendments. The discussion is based on State statutes, published voluntary guidelines, and conversations and correspondence with State officials.

## **Water Quality Protection Legislation and Programs in the South**

### **Alabama**

The Alabama silvicultural nonpoint pollution-control program is based on the voluntary use of BMP's, as outlined in the State's "Handbook of Best Management Practices for Silviculture." This non-regulatory approach emphasizes education, monitoring of forestry operations, and continuous planning. Several studies by the Alabama Water Pollution Commission have demonstrated that the BMP's are effective in minimizing forestry pollution (National Council of the Paper Industry for Air and Stream Improvement 1983).

Formal water-quality legislation in Alabama does not specifically address forestry operations. The Water Pollution Control Act, passed in 1972 and amended several times, emphasizes damage to fish and wildlife, and public health concerns. The law could, however, be utilized against timber operators if pollution from their activities clearly results in harm to aquatic life, wildlife, or persons (Goetzl and Siegel 1980).

### **Arkansas**

Arkansas relies primarily on an educational program to encourage the use of voluntary silvicultural BMP's as published by the State Forestry Commission. The Commission has monitored several hundred logging sites throughout the State to evaluate the implementation of BMP's and the performance of operators in protecting water quality. It reports a steady improvement in practices (National Council of the Paper Industry for Air and Stream Improvement 1983).

The Arkansas Water and Air Pollution Control Act, originally enacted in 1949 and amended numerous times, does not mention silvicultural activi-

ties. Nevertheless, it gives implied authority for control of forestry nonpoint pollution to the State water-quality agency, which can issue permits and orders and promulgate rules and standards with respect to prohibited pollutants. Although the term "pollutants" is defined broadly enough to encompass runoff from forestry activities, there has been no formal regulation of silvicultural operations under the act to date. Arkansas also has a stream obstruction statute that prohibits blocking any improved drainage project or natural drain with trees or logging debris. Another law prohibits the cutting of trees growing below the normal high watermark of any navigable river or stream.

### Florida

Florida utilizes a nonregulatory educational approach as its primary method of controlling silvicultural nonpoint pollution and has developed a detailed set of forestry BMP's. Although periodic assessments of the program still find some water-quality problems, the general compliance rate is extremely high.

The Florida Air and Water Pollution Control Act grants sufficiently broad powers to the State's Department of Environmental Regulation to include regulatory authority over nonpoint pollution from land-management activities. The Department may develop whatever water pollution abatement programs it deems necessary. Thus, silvicultural activities could be regulated under the act if the voluntary approach were to prove unworkable.

In 1984, the new Warren Henderson Wetlands Act delegated silvicultural dredge-and-fill responsibility to Florida's five regional Water Management Districts. Nominally, the law governing these districts exempts most agricultural and silvicultural activities from regulation. This has been interpreted to mean that harvesting, site preparation, and planting are exempt, but that construction of roads, ditches, and culverts does require a permit if the activity diverts or impedes waterflow. Each of the Water Management Districts approaches forestry activities differently, some requiring permits, others only notification, and some nothing more than compliance with district standards.

A law empowering the Soil Conservation Districts to formulate land use regulations includes silvicultural practices. However, adoption of regulations is contingent upon the approval by

referendum of a majority of landowners in the district.

### Georgia

The silvicultural nonpoint-source control program for Georgia is a voluntary one with emphasis on both education and information. BMP's were identified in 1978, based largely on existing research on watershed response to forestry practices being conducted at the University of Georgia (Hewlett and others 1979, Georgia Forestry Commission 1981).

The Georgia Water Quality Control Act is unique legislation for the South in that it specifically empowers the Georgia Division of Environmental Protection to issue permits for nonpoint as well as for point source discharges. Conceivably, the Division could require a permit for any activity--including one related to logging or silviculture--that has been recognized as a potential source of nonpoint pollution. State water-quality officials, however, have not yet utilized this provision with respect to forestry operations.

Several counties have adopted ordinances which prohibit harvesting and hauling practices which leave excessive amounts of mud on county roads.

### Louisiana

Louisiana has taken the nonregulatory approach to control of silvicultural nonpoint pollution. BMP's have been developed for access road and skid trail construction, shearing, and windrowing. However, the guidelines have not been published or distributed to date. The primary authority for issuance of BMP's rests with the State's Office of Forestry, which is hampered at the present time by severe budget and personnel reductions.

The Louisiana Water Control Law is the State's formal authority for addressing water protection and pollution. Although this statute does not specifically address silviculture, it is broadly enough written to govern forestry operations if the Office of Water Resources and the Department of Environmental Quality should choose to do so. The Office of Water Resources is empowered to "regulate and restrain the discharge of pollution into water," and the Department "may promulgate rules and regulations, and issue permits for the control of water pollution."

Administrative regulations, however, specifically exempt silvicultural operations from the nonpoint permit process. Forestry point sources do require discharge permits, though.

Louisiana also has a Natural and Scenic River System Law that prohibits the removal of trees near designated streams, and a stream-obstruction statute forbids the felling, disposal, or transport of timber in navigable bodies of water.

Several parish ordinances have been adopted to restrict logging operations that result in damage or obstruction of parish roads or leave mud and debris on roads or rights-of-way or in ditches.

## Mississippi

Mississippi also relies on the voluntary use of BMP's. Forestry BMP's have not been developed by the State but rather by forest industry, which has issued a publication detailing the various recommended practices.

The Mississippi Air and Water Pollution Control Act gives to the State's water-quality agency implied authority over nonpoint pollution, including that related to forestry activities. Under this law, that body has the authority to develop ". . .comprehensive programs for the prevention, control and abatement of new or existing pollution of the air and waters of the state. . . ." To date, this legislation has not been directed to silvicultural operations.

## North Carolina

Forestry BMP's have been developed in North Carolina, and their voluntary use is the primary control mechanism. A strong educational program to inform loggers, foresters and landowners of the recommended BMP's is ongoing.

The North Carolina Air and Water Resources Act, enacted in 1951 and amended numerous times, does not refer directly to nonpoint pollution but does contain a strong indirect reference. As defined in the statute, water pollution includes "alterations resulting from the concentration or increase of natural pollutants caused by man-related activities." The act allows the Department of Natural Resources and Community Development to issue permits for the discharge of pollutants. Thus this legislation could conceivably be directed to forestry activities. North Carolina also has a stream obstruction statute that prohibits felling trees or placing

stumpage or slash into any stream that will impede navigation or drainage.

## Oklahoma

The Oklahoma silvicultural nonpoint source control program is based on voluntary application of accepted management practices on a site-by-site basis. This program is a comprehensive one and includes water-quality monitoring in areas of forestry activity, providing technical assistance during the use of forestry BMP's, educational and training sessions, and demonstration areas (Oklahoma Department of Agriculture 1982).

The broad authority given by the Oklahoma Pollution Control Coordinating Act to the State's Water Resources Board includes the development and enforcement of standards for control of nonpoint source pollution--including that emanating from silvicultural activities. To date, however, the authority has not been invoked with respect to forestry operations.

## South Carolina

South Carolina also relies primarily on a voluntary BMP program to control silvicultural nonpoint pollutants. The BMP's are outlined in "Voluntary Forest Practice Guidelines for South Carolina."

The State's Pollution Control Act addresses the term "pollutant" in its broadest sense, thereby presumably covering all nonpoint sources--including forestry operations. The statute reads ". . .and all other pollutants, by-products, or substances not sewage or industrial waste. . . ." By implication, such an open-ended definition would permit the regulation of sediment and debris stemming from silvicultural activities. Under the act, the Department of Health and Environmental Control can issue permits and promulgate rules and regulations as it deems necessary. To date, this authority has not been directed to forestry.

South Carolina also has three other water-related laws that apply to forestry operations. A stream obstruction statute prohibits felling trees or leaving logging debris in any stream so as to obstruct drainage. The Scenic Rivers Act forbids timber harvesting on State-controlled land located near streams designated Class I (free-flowing rivers with shorelines essentially unchanged by man). And finally, the Stream Clearing Act requires

landowners to clean out streams adjacent to their properties twice a year and to keep them free of obstructions, which could include logging debris.

## **Tennessee**

A voluntary BMP program has also been developed in Tennessee and is in the early stages of implementation. The BMP's direct particular attention to logging roads, skid trails, and mechanical site preparation.

The Tennessee Water Quality Act, enacted in 1971, differs from the general water-quality statutes of the other Southern States in that it clearly exempts forestry activities from all its provisions unless a point source discharge is involved. The legislation specifically lists decayed wood, sawdust, silt, shavings, bark, and rock as potential pollutants subject to regulations if they come from a point source. The State's Scenic Rivers Act prohibits commercial timber harvesting in certain conservation or public-use easements associated with Class II or Class III river areas.

## **Texas**

The continuing position of the Texas Department of Water Resources is that "...only upon identification and documentation of silviculturally related water-quality problems will BMP's be developed and implemented." To date, no problems have been identified.

The Texas Water Quality Act contains definitions of pollution and pollutants that are sufficiently broad to include any number of nonpoint discharges related to forestry operations. Also, the powers the act vests with the State Water Commission and the State Water Development Board can be interpreted to include regulation of nonpoint pollutants, including those associated with silviculture. Such regulation includes the issuance of permits and the promulgation of rules and regulations. Texas also has a stream-obstruction law that prohibits obstructing navigable streams with debris from the cutting of trees.

## **Virginia**

Voluntary forestry BMP's, as developed by the Virginia Department of Forestry, are also utilized in

this State. Annual reports are submitted to the State Water Quality Control Board detailing progress with respect to use of BMP's.

The Water Quality Control Board has the authority, under the State's Water Control Law, to regulate forestry activities that are a potential source of nonpoint pollution at any time that it determines the voluntary program is not working. The term "pollution" is broadly enough defined under this law to apply to silvicultural operations. Virginia also has a stream-obstruction statute that prohibits the felling, disposal, or transport of timber in navigable streams. The State's Scenic Rivers and Wetlands Act contains no specific prohibitions against forestry activities.

## **West Virginia**

West Virginia relies on voluntary silvicultural BMP's as the primary control mechanism for forestry nonpoint pollution. A manual has been developed that outlines and discusses the various recommended practices. The BMP's concentrate on road and landing construction and maintenance.

The West Virginia Water Pollution Control act is sufficiently broad to cover nonpoint pollutants--including those related to forestry--under its provisions. The Division of Water Resources is authorized by this law to issue permits and stop-work orders. Stringent water-turbidity standards have been in effect in West Virginia since 1981. As applicable to forestry operations, they allow very small net loading increases in turbidity due to logging. The logging turbidity standard, however, allows exceptions to such increases for operations where a site-specific BMP plan is in effect. To demonstrate that BMP guidelines are in effect, loggers file a voluntary registration of their logging operation.

West Virginia also has a stream-obstruction law that prohibits any felling of timber that would obstruct a navigable or floatable stream.

## **Discussion, Conclusions, and Recommendations**

A primary concern of forestry practitioners in the South lies in the possibility that pressures stemming from Sections 208 and 404 of the Federal Water Pollution Control Act, coupled with other resource concerns, will produce unmanageable and unneeded-



ed regulation of forestry practices. The consensus of most professional foresters in the Southern States is that silvicultural activities are generally not responsible for major water-quality problems and that formal regulation is not needed to ensure that good practices are followed. The belief is widespread that the various voluntary programs incorporating recommended management guidelines are working well for the most part, and that continual education and training will be sufficient to prevent degradation of waters in forested areas and to retain site productivity.

Upgrading the technical skills of personnel to deal with forest-practice problems is probably the most consistent issue addressed by State agencies. The reason is that training of agency personnel results in multiplying benefits as these persons interact with landowners and timber operators. In Arkansas, for example, the Forestry Commission has trained 100 of its field employees to allow them to assess local conditions associated with forestry practices (National Council of the Paper Industry for Air and Stream Improvement 1983). In Virginia, all Division of Forestry field personnel have been trained in the use of BMP's, together with 123 employees of other resource agencies. And in Florida the Division of Forestry provides slide material and a general script to forest landowners and timber operators. The Georgia Forestry Commission has assigned a training coordinator to each of its 14 districts to provide local expertise and foster onsite training.

Perhaps the best measures of benefits resulting from the voluntary programs in the South are the generally favorable assessments of program accomplishment by State agency personnel. All of the Southern States have assessed their voluntary BMP programs, and all report a significant level of accomplishment. Most States have confirmed that the recommended BMP's have been widely incorporated into forest-management activities. For example, a recent Alabama Forestry Commission report on the State's silvicultural BMP program stated that ". . .the voluntary approach is a great success. Over time, major industries have changed their systems of management and site preparation measures." Agency personnel from other States report similar improvements and widespread cooperation with their voluntary control programs. The Oklahoma Forestry Division has found that ". . .good management practice guidelines have been established and accepted by EPA, State agencies and industry."

Another measure of program success or failure is the number of enforcement actions and complaints concerning forestry operations. The Alabama Forestry Commission annual reports have consistently found few or no complaints concerning forestry practices. Similar findings are reported by the other Southern States. Many of them have conducted field assessments of their programs. All of these reviews have shown as increased awareness of and use of BMP's in the conduct of forestry activities. For example, in Arkansas 200 sites were inspected several years ago by district foresters trained in the BMP program. The survey showed that operators were doing a consistently good job overall and that there had been a significant improvement in practices since development of the BMP guidelines.

Several States have awarded regulatory exemptions to forestry operators because of the wide acceptance of BMP's. In Florida, a storm runoff law that required a management plan to contain initial stormwater runoff was not imposed on silvicultural operators--even though initially considered--because of the effectiveness of the State's voluntary BMP program.

In conclusion, therefore, it appears that the overall status of voluntary silvicultural control programs in the South can be termed "highly successful." Wetlands protection measures and other specialized controls may be appropriate for certain environmentally sensitive areas in some States. As a general rule, however, the voluntary approach is seen as working well and should be encouraged.

The passage of the 1987 amendments to the Federal Water Pollution Control Act, coupled with the recently released Corps of Engineers Section 404 regulations, indicate that preventing water pollution will continue to be a national priority. In this regard, the forestry community in the South should be aware that most of the existing general water-quality laws could be more forcibly implemented, through either administrative regulation or by relatively minor amendment. Thus a strong focus on the voluntary BMP programs to protect water quality should be a continuing priority.

To encourage timber productivity and regeneration, detailed guidelines for site preparation and regeneration could be developed and incorporated into the various State voluntary programs.

Regulatory alternatives that could be adopted to enhance timber productivity include the regulation of a wide range of silvicultural activities through a comprehensive forest-practice law or more-

specific legislation focusing primarily on reforestation. Enactment of a stringent statute similar to that of Massachusetts or Oregon is not viewed as a necessary or acceptable alternative by most professional foresters and landowners in the South. For this and other reasons, such legislation would not be politically feasible in most Southern States.

The adoption of more-specific legislation aimed primarily at reforestation has been quite successful in Virginia. This experience could have favorable implications for similar legislation in other Southern States. In addition to significantly improving the productivity of existing pine sites, Virginia's law has also had a favorable impact on increasing pine acreage. Funds from the State's forestry cost-share program are made available only to owners of forest land where pine-type stocking is not sufficient to require compliance with the Seed Tree Law. Therefore, more funds are made available for the conversion of suitable hardwood sites to pine.

Although the forestry community in Virginia is highly supportive of the Seed Tree Law, the prevailing attitude in most of the remainder of the South would likely preclude the enactment of similar statutes in other Southern States. The willingness of landowners in Virginia to concede some private property rights to ensure long-term timber resources has not been demonstrated elsewhere in the South.

It appears that the most feasible alternative to enhance timber productivity would be the expansion of the voluntary programs to include site-preparation and regeneration guidelines for a wide range of site characteristics. Currently, only a few Southern States have developed reforestation BMP's, most of which are specific to hardwood regeneration. The inclusion of such guidelines could be quite effective provided they are actively promoted by State forestry agencies and forest industry.

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# Taxes and the Southern Forest

William C. Siegel and Clifford A. Hickman (1)

The influence of taxes on American forests, an issue even in colonial times, became a matter of serious concern during the decade of the 1920's. Prices of forest products during those years experienced the steepest and longest decline in their history, and woodland owners suffered disastrous losses of income. Tax delinquency on forest lands became a national problem.

As part of the Federal Government's attack on forestry problems, Congress passed the Clarke-McNary Act in 1924. One section of this legislation called for a nationwide study of forest taxation, subsequently carried out under the title "Forest Taxation Inquiry." The monumental and comprehensive report of the study (Fairchild and Associates 1935)--sometimes called the "Fairchild Report" after its author--is still a basic forest tax reference.

Following the Fairchild Report, both the Federal Government and the individual States began to place greater importance on the privately owned 74 percent of American commercial forests, and on taxation's impact upon the stewardship of these lands. The result has been the promulgation during the last 50 years--both at State and Federal levels--of a multitude of special tax laws designed to encourage forest management and timber investment.

Tax legislation has been an important component of the evolution of southern forestry. Historically, the first special forestry tax statutes were property and yield tax laws enacted at the State level. New forest property tax laws are still being written and older legislation amended. Next to appear were the special timber provisions of the Federal income tax. These statutes, too, have been dynamic in nature. Statutory, judicial, and administrative changes in the Federal timber income tax law continue to be made on a rather frequent basis (Siegel 1978a). Of more recent origin are the timber provisions of the Federal estate tax legislation, and those State in-

come tax and State death tax statutes that address forestry.

## The Federal Income Tax

The Federal income tax treatment of timber-related receipts and expenditures has been of particular interest to forest resource managers in the South. The

16th amendment to the Constitution, ratified on February 25, 1913, established the constitutional basis for a Federal income tax. Subsequent rapid enactment of the 1913 Revenue Act, which became effective on March 1 of that year, implemented the tax. Thus began the continuous series of income tax laws which have evolved into the Internal Revenue Code of 1986, under which the tax is presently administered.

## Timber Depletion

Timber is a natural resource; thus it is a depletable rather than a depreciable asset. The depletion deduction provides for the tax-free recovery of the cost or other basis of the timber as it is cut. A deduction for timber depletion has been allowed since the beginning (Siegel 1978b). All revenue acts since have contained essentially the same provisions with respect to timber depletion, and the administrative regulations have not materially changed.

## Long-Term Capital Gains

With the exception of the depletion allowance, timber owners and operators during the years 1913 through 1943 were subject to the same Federal income tax rules as other taxpayers (Siegel 1978b). Standing timber during those years was recognized as a capital asset. Therefore, when it was sold outright in a lump-sum transaction, the sale was considered to be a disposal by an investor of a capital asset--provided that the timber had not been held by the owner for sale to customers in the ordinary

(1) William C. Siegel is the leader of a project on forest resource law and economics at the Southern Forest Experiment Station, USDA Forest Service, New Orleans, LA. Clifford A. Hickman is principal economist with that project.

course of his business. Beginning in 1922, and until the 1986 Tax Reform Act, if these requirements were met, and if the owner had held the timber for the required length of time, any profit was treated as a long-term capital gain and taxed at lower effective rates than ordinary income. There was no specific language in the Revenue Code or regulations dealing with timber under these circumstances. Nor is there any today, nor is any necessary.

However, during the years prior to 1944, if a landowner cut his timber himself and then sold it, or else used it in his business, he had to pay taxes at the ordinary income tax rate on whatever gain resulted. Such transactions were not given the benefit of capital gains treatment. For example, the owner who cut his own trees and then sold the logs to a sawmill was taxed at a higher rate than if he had sold the trees outright on the stump and let the purchaser come on his land to do the cutting. Also, the sawmill owner who cut his own standing timber for use in his mill had to pay the higher ordinary income tax rates on the timber's increase in value. Thus, as a practical matter, such a mill owner might have been better off had he sold his timber outright as a capital asset and then bought other timber for use in the mill.

As tax rates climbed, woodland owners found that outright, lump-sum sales of their standing timber worked to their distinct advantage. This tended to encourage liquidation rather than long-term management. The situation became more serious when the Bureau of Internal Revenue (forerunner of the Internal Revenue Service) took the position in 1941 that the sale of standing timber at an agreed price per unit of measure involved "retention of an economic interest" by the owner. In other words, such a disposal did not constitute a sale for capital gains purposes. Therefore, if a timber owner tried to manage his lands properly and marked the trees for cutting, with the purchaser paying on a unit basis as the timber was cut and removed, the proceeds were generally treated as ordinary income. Here again, the timber owner who wanted to dispose of his timber under a cutting contract was penalized as opposed to one who made a lump-sum sale.

Under the pressure of demand for timber during the Second World War, remedial legislation was sought. It was obtained in the Baily Amendment to

the 1943 Revenue Act, the latter being passed by Congress over President Roosevelt's veto. This legislation placed owners who cut their timber themselves, or who disposed of it under a pay-as-cut contract, on the same tax basis as people who sold their timber outright in a lump-sum transaction. Such cutting or exchange was now, and is today, treated as a sale or an exchange of a capital asset. Transactions qualifying under these provisions of the law (originally Section 117(k), now 631, of the Internal Revenue Code) are given capital gain status regardless of whether the timber is includable in business inventory or whether it was held by the taxpayer primarily for sale to customers in the ordinary course of a trade or business.

Section 631(a) of the Code specifically permits taxpayers who cut their own timber, either for sale or for use in their trade or business, to qualify for capital gain or loss treatment. The gain or loss is calculated as the difference between the fair market value of the cut timber on the first day of the taxable year and its adjusted basis for depletion. The "sale" is hypothetical--a sale of the timber by taxpayers to themselves. Thus the capital gain tax is backed up against the corporate or personal income tax that is paid on the ordinary income that results from the profits from sale of the processed or manufactured products.

Section 631(b) permits taxpayers to treat income derived from the sale of standing timber as a long-term capital gain when they retain an economic interest in the timber. The gain or loss is calculated as the difference between the income from the timber and its adjusted basis for depletion minus the costs of sale. Fair market value of the timber is not involved. For the seller to retain an economic interest, the buyer's obligation to pay must be contingent on the volume of the severed timber measured either before or after it has been cut. Lump-sum sales do not qualify.

**Changes Made by the 1986 Tax Reform Act**--Prior to 1987, individual taxpayers paid Federal income tax on ordinary income at one of 15 rates, ranging from 11 to 50 percent. Bracketed into five groups, these were as follows for married taxpayers filing joint returns:

<i>Taxable Income</i>	<i>Range of Rates</i>
\$0--\$ 5,940	0-11%
5,940--17,270	12-16%
17,270--37,980	18-28%
37,980--49,420	33%
Over \$49,420	38-50%

Prior to 1987, also, individuals were taxed on only 40 percent of a long-term capital gain. The maximum effective rate was thus only 20 percent, as compared to a maximum of 50 percent on ordinary income.

For certain individual taxpayers, the rates on ordinary income and on long-term gains will be the same beginning in 1987. For others, however, 1987 is a transition year with differences in rates still existing (table 1).

By 1988, the rate differential between long-term gains and ordinary income will be eliminated entirely for all individual taxpayers (table 2). There will be only two basic tax rates--15 and 28 percent. For

married taxpayers filing a joint return, the first \$29,750 of taxable income will be taxed at 15 percent and amounts over that at 28 percent. The other categories of individual taxpayers will begin paying 28 percent at somewhat lower levels. However, a 5-percent surtax will apply to certain income initially taxed at 28 percent, resulting in an effective marginal tax rate of 33 percent. For married taxpayers filing a joint return, the 5-percent surtax will begin at \$71,900 of taxable income.

For corporations, 1987 is also a transition year with differences in rates between ordinary income and long-term gains still existing until July 1. The old rates and the new ones are shown in table 3.

**Table 1--How noncorporate taxpayers will be taxed in 1987 (1)**

Married taxpayers filing joint return	Tax filing status		Effective marginal tax rate	
	Single taxpayers	Estates and trusts	Long-term gains	Ordinary income
	Dollars of taxable income		Percent	
0-3,000	0-1,800	0-500	11	11
3,000-28,000	1,800-16,800	500-4,700	15	15
28,000-45,000	16,800-27,000	4,700-7,550	28	28
45,000-90,000	27,000-54,000	7,550-15,150	28	35
90,000 +	54,000 +	15,150 +	28	38.5

(1) Two other categories of noncorporate taxpayers are not shown here--married taxpayers filing separate returns and heads of household. Some taxpayers in these categories are also in the 35-percent and 38.5-percent marginal tax brackets and thus will pay less tax on long-term gains.

**Table 2--How noncorporate taxpayers will be taxed in 1988 and later years (1)**

Married taxpayers filing joint return	Tax filing status		Effective marginal tax rate	
	Single taxpayers	Estates and trusts	Long-term gains	Ordinary income
	Dollars of taxable income		Percent	
0-29,750	0-17,850	0-5,000	15	15
29,750-71,900	17,850-43,150	5,000-13,000	28	28
71,900 +	43,150 +	13,000 +	(2)33	(2)33

(1) Two other categories of noncorporate taxpayers are not shown here--married taxpayers filing separate returns and heads of household.

(2) A 5-percent surtax applies to taxable income within certain ranges. It also applies to married taxpayers filing separate returns and heads of households, in somewhat different tax ranges. The surtax is intended to phase out, respectively, the benefits of both the 15-percent rate and the deduction for personal exemptions for higher bracket taxpayers. The 33-percent rate first applies up to that level of taxable income necessary to phase out the benefits of the 15-percent rate; i.e., \$149,250, \$89,560, and \$26,000, respectively, for married taxpayers filing jointly, single taxpayers, and estates and trusts. The 33-percent rate is then applied to any taxable income above these levels until the benefit of the personal exemptions claimed are phased out; i.e., for 1988, \$10,920, and for 1989, \$11,200 of taxable income for every personal exemption claimed. At that level of taxable income at which the benefits of personal exemptions are entirely phased out, the tax rate returns to 28 percent. For example, in 1989, a married couple filing jointly and claiming two personal exemptions will be taxed at the 33-percent rate on taxable income between \$71,900 and \$171,650. Taxable income above \$171,650 will be taxed at the 28-percent rate.



**Table 3--How corporate taxpayers will be taxed in 1987 and later years (1)**

Taxable income	Effective marginal tax rate			
	Prior to July 1, 1987		July 1, 1987, and later	
	Long-term gains	Ordinary income	Long-term gains	Ordinary income
Dollars	Percent			
0-25,000	15	15	15	15
25,000-50,000	18	18	15	15
50,000-75,000	30	30	25	25
75,000-100,000	34	40	(2) 34	(2) 34
100,000-335,000	34	46	39	39
335,000-1,000,000	34	46	34	34
1,000,000-1,405,000	34	(2) 51	34	34
1,405,000 +	34	46	34	34

(1) A corporation with a taxable year that includes (but does not begin on) the July 1, 1987, date must prorate its tax on a daily basis. The new rates apply to that portion of the corporation's taxable year following June 30, 1987; the old rates apply to that portion before July 1, 1987.

(2) As reflected by the table, a 5-percent surtax applies to income within these ranges.

**Timber Capital Gains**--The new rules outlined above for capital gains in general also apply to timber capital gains. That is, all capital gains resulting from timber sales will be taxed the same as ordinary income beginning in 1988. However, the provisions of pre-1987 law entitling taxpayers to capital gains treatment of timber income have been retained in the Internal Revenue Code (Sections 631(a), 631(b), 1221 and 1231). Technically, capital gains continue to exist as a separate concept in the tax law even though there will no longer be a rate differential between a long-term capital gain and ordinary income. This means that if tax rates on ordinary income are raised in the future, rates on long-term gain would remain unchanged--once again creating a rate differential between the two.

For certain taxpayers, it may still be advantageous to qualify and report timber sale income as a long-term gain in 1988 and beyond even though it will be taxed the same as if reported as ordinary income. By so doing, those with large capital losses from any source will be able to deduct a bigger proportion of the losses during the current year rather than carrying them forward to later years. Under the new law, only \$3,000 of capital losses per

year may be offset against ordinary income, but there is no limit on offset against capital gains.

Also, some timber owners may avoid paying social security tax on timber sale income by reporting it as a long-term gain rather than as ordinary income. Individual taxpayers who qualify as sole proprietors with respect to timber holdings that are considered to be a business are subject to self-employment social security payments on timber sale proceeds reported as ordinary income. Capital gains, on the other hand, are not subject to the social security tax.

The new law also contains a special rule that permits timber owners who have been cutting under a 631(a) election to unilaterally revoke it. Prior law required Internal Revenue Service permission for revocation. Since there will no longer be a rate differential between ordinary income and long-term capital gains for certain taxpayers in 1987, and for all in 1988, revoking may be advantageous for some who do not dispose of timber in the same tax year in which they cut it. Otherwise, they would be taxed in the year of cutting on the timber's gain in value as stumpage, even though no income has yet been realized from its disposal. For other woodland own-

ers, however, it may be more advantageous--as discussed above--to retain capital gain status rather than revoke the election.

### **Deduction of Forest Management and Related Expenditures**

All timber establishment costs must be capitalized. These can be recovered (deducted) only when the timber is cut or sold except as described next under the reforestation amortization provisions. Establishment costs include those incurred for timber purchase, planting, seeds and seedlings, site preparation and related costs, and all practices necessary to ensure seedling survival. Virtually every other management cost may be either capitalized at the taxpayer's option or expensed--that is, deducted from income each year as paid. Deductible expenditures include those incurred for silvicultural practices in established stands, protection, property taxes, interest, salaries, and professional advice. Any ordinary and necessary business or investment expense is deductible.

**Tax Reform Act Changes**--The 1986 Tax Reform Act made a number of significant changes in the procedures associated with the expensing of operating costs and carrying charges. The changes impose a number of limitations on deductions.

The new law mandates a system of rules intended to limit, in certain cases, the ability of taxpayers to use deductions and credits attributable to one activity to offset income realized from other sources or activities. These rules are referred to as the "passive loss rules." They apply to individuals, estates and trusts, as well as to personal service corporations (i.e., corporations the principal activity of which is the performance of personal services), and to certain closely-held corporations that are subject to the corporate income tax ("closely-held C corporations"). For this purpose, a corporation is closely held if more than 50 percent of the value of its stock is owned, actually or constructively, by five or fewer individuals. Except for these two specified categories of corporations, the passive loss rules do not apply to corporations generally. They will begin to take effect in 1987. For those types of taxpayers subject to the rules, the 1986 Tax Reform Act creates three relevant classes of properties or activities for purposes of expensing, or currently deducting, such items as management costs, taxes, and interest. The rules for deducting such costs will vary,

depending upon the category in which the particular timber activity fits.

*Trade or Business*--The first category concerns timber held as part of a trade or business in which the taxpayer materially or actively participates. In this instance, all operating costs and carrying charges are fully deductible against income from any source each year as incurred. Credits can also be applied to taxes associated with income from any source. Individuals can take the deductions on either Schedule C or Schedule F of Form 1040.

*Investment*--The second classification concerns timber held as an investment rather than as part of a business, with the taxpayer being either a material or active participant in the activity, and is applicable only to individual taxpayers. In this situation all operating costs and carrying charges except property and other deductible taxes, and interest, are deductible against income from any source as "miscellaneous itemized deductions" on the tax return--but only to the extent that, when aggregated with other "miscellaneous itemized deductions," the total exceeds 2 percent of adjusted gross income. Other types of miscellaneous deductions include, but are not limited to, expenditures for tax return preparation, safety deposit box rental, professional journal subscriptions, and investment advice. Such costs not expensed can, at the taxpayer's option, be capitalized and recovered when the timber is sold. If not taken as either an itemized deduction or capitalized, they will be permanently lost. One word of caution is in order, however. The same expenditure cannot be used to meet the 2-percent threshold and also be capitalized.

Property and other deductible taxes, such as severance and yield taxes, paid by an active timber investor are deductible in full each year against income from any source. Interest on indebtedness associated with a timber investment, however, is now deductible by active investors only to the extent of net investment income from all sources--not just timber--for the year. This rule is being phased in gradually over a 5-year period. Any such interest not deducted in a particular year may be carried forward indefinitely and deducted in later years when investment (portfolio) income--of any type--is realized. It may also be capitalized against future timber income.

It is possible that most timber ownerships with some type of management activity that do not qualify as a trade or business in the traditional tax sense

will be categorized as such when the regulations governing deductions are written by the Internal Revenue Service. If that does occur, the restrictions outlined above for investment deductions will be largely inapplicable to forest properties.

*Passive Participation*--The third situation involves passive participation in a timber "trade or business," which is defined to include not only a trade or business in its usual sense but also activities not rising to the level of a trade or business but nevertheless entered into for profit, such as timber investments. If passive involvement began after October 22, 1986, management costs, property taxes, and interest can be expensed only to the extent that, when aggregated with all other passive activity expenses for the year, the total does not exceed total passive income from all sources for the year. Also, credits may be applied only to taxes associated with passive income. Certain closely-held corporations are the only exception to this rule. In some situations, a closely-held corporation may offset passive expenditures and credits against both active and passive income, but not against portfolio income such as dividends and interest. If passive timber activities began before October 23, 1986, they are subject to a 5-year phase-in period before the new rules become fully effective. During this time, some operating costs and carrying charges will be deductible against nonpassive income. Passive expenditures and credits that cannot be expensed or used in the year incurred may be carried forward indefinitely (suspended) and deducted in later years when passive income--of any type--will be realized. They may also be capitalized against future timber income. The passive interest rules will apparently apply to the reforestation amortization and credit.

**The Distinction Between "Material," "Active," and "Passive" Participation**--For individuals, the preferred tax status would seem to be as a material or active participant in a trade or business. Ostensibly, unless this status is achieved, the deduction of some expenses attributable to the growing and holding of timber will either be deferred or lost forever.

There are many unanswered questions in trying to determine what "passive participation" means with respect to a timber investment or business. The new law indicates that the ownership of a timber stand will not constitute a "passive activity" if the owner "materially participates" in the operation of the property.

With respect to material participation, the new statute provides that,

A taxpayer shall be treated as materially participating in an activity only if the taxpayer is involved in the operations of the activity on a basis which is --

- (A) regular,
- (B) continuous,
- (C) substantial.

The conference agreement which preceded passage of the new law discusses the concept of "material participation" in several respects relevant to timber owners:

A taxpayer is likely held to be materially participating in an activity, if he does everything that is required to be done to conduct the activity, even though the actual amount of work to be done to conduct the activity is low in comparison to other activities.

With respect to material participation in an agricultural activity, ... decision-making ..., if bona fide and undertaken on a regular, continuous, and substantial basis, may be relevant to material participation. The types of decision-making that may be relevant in this regard include, without being limited to, decision-making regarding (1) crop rotation, selection and pricing, ... (3) the purchase, sale and leasing of capital items, such as crop land, animals, machinery, and equipment, ... and (5) the selection of ... crop managers who then act at the behest of the taxpayer rather than as paid advisors directing the conduct of the taxpayer.

Thus, based on this guidance, an individual owner who follows a sound timber management plan, whether through an agent such as a consulting forester or directly, should be viewed as "materially participating" in the timber enterprise (whether termed a business or an investment)--and thus be entitled to deduct all property taxes, interest, and management expenses from all other forms of income of any type--subject to the specific rules for active businesses and the specific rules for investments as outlined above.

A limited partner by definition in the law will automatically fail to meet the "material participation" requirements.

Generally speaking, a retired or disabled timber owner will be treated as satisfying the material participation requirement if he or she satisfied it for at least 5 of the 8 years immediately preceding the date social security retirement benefits began, or that the owner became disabled, whichever happened earlier. Also, if a surviving spouse acquires a timber property from the deceased spouse, he or she thereafter need only satisfy an "active management" requirement, which is less stringent than material participation. Active management means making broad business-management decisions rather than periodic operating decisions.

Although the regulations have not yet been written by the Internal Revenue Service, in most cases, those timber owners who follow sound management practices and who utilize good technical advice should be able to avoid being trapped by the passive loss rules.

## **Reforestation Amortization and Credit**

Although it has been proposed from time to time that the Federal income tax law be amended to authorize the expensing of reforestation costs in order to encourage tree farming, no such provision has to date been enacted. However, a compromise was reached in 1980. The Internal Revenue Code was amended in that year to provide an exception to the general capitalization rules described above. Taxpayers may elect to amortize over 8 tax years the first \$10,000 of reforestation expenditures incurred each year. One-fourteenth is deductible the first year, one-seventh in each of the next 6 years, and the remaining one-fourteenth in the eighth year. In addition, a tax credit is allowed equal to 10 percent of the first \$10,000 of such costs paid annually. Reforestation expenses in excess of the annual \$10,000 ceiling must continue to be capitalized and recovered as before. This provision was not changed by the 1986 tax law.

## **Impacts of the Federal Income Tax on Southern Forestry**

Rigorous evidence is lacking as to the specific cause-and-effect relationship of the special Federal timber income tax provisions to improved forest investment and productivity in the South. However, a 1985-86 Society of American Foresters task force on Federal forest taxation (Society of American Foresters 1986) concluded that the equitable Federal tax treatment enjoyed until 1987 by woodland owners, and to some extent even now, paralleled significant and distinctly improved forest resource trends in the Southern States realized through the application of scientific forestry practices. The task force also reported that a large number of independent and respected economists who are recognized as authorities on the workings of the forest economy--and who have long studied the relationship of public support mechanisms to the improvement of private forestry practices--agreed that the special Federal timber income tax provisions have provided a favorable climate and contributed significantly to private forest productivity in the South.

## **State Income Tax**

In addition to the Federal tax treatment of timber income, most southern woodland owners are also concerned with State income tax provisions that affect returns on forestry investments. State income tax laws in the South may be divided into three broad categories (McGee and others 1982) in terms of effect on timber revenues (table 4). In the South, five States use Federal adjusted gross income as the basis for computing taxable income; four compute their own adjusted gross income for this purpose. Florida, Tennessee, and Texas have no State income tax.

**Table 4--Key provisions of State income tax laws in the South (1)**

State	Federal adjusted gross income used as tax basis	Federal income tax deductible	Proportion of long-term capital gains <sup>(2)</sup> taxable	Comments
			Percent	
Alabama	No	Yes	100	Federal income tax deductible if itemizing.
Arkansas	No	No	40	For years prior to 1987, 100 percent of long-term gains are taxable.
Florida	—	—	—	No income tax.
Georgia	Yes	No	100	
Kentucky	Yes	Yes	100	
Louisiana	Yes	Yes	100	Allowable tax credit equal to 10 percent of Federal credits.
Mississippi	No	No	100	
Missouri	Yes	Yes	100	
North Carolina <sup>(3)</sup>	No	No	100	
Oklahoma	Yes	Yes	100	Deduction of Federal income tax optional—those who deduct are subject to higher rates.
South Carolina	Yes	No	100	
Tennessee	—	—	—	Income tax on interest and dividend income only.
Texas	—	—	—	No income tax.
Virginia	Yes	No	100	
West Virginia	Yes	No	100	

(1) As of 1985.

(2) As of 1987.

(3) Timber income may be reported in the year received or in equal installments over a 3-year period at the taxpayer's election. Reforestation expenses may be deducted currently or amortized over a period of 60 months at taxpayer's election.

The States that use Federal adjusted gross income as a basis have automatically offered two Federal incentives to timber investors. These are the long-term capital gains exclusion of 60 percent of net gain, available under pre-1987 Federal law, together with the associated depletion allowance, and the reforestation amortization deduction.

Of those States that do not use Federal adjusted gross income as the basis for computing taxable income, none exclude a part of long-term capital gains from tax, although Arkansas will do so beginning in 1987. However, all allow taxpayers to use the Federal schedule for reporting business income and expenses and, therefore, indirectly permit reforestation costs to be amortized. Louisiana additionally allows a tax credit equal to 10 percent of total Federal credits. Thus Louisiana landowners who claim the Federal reforestation investment tax credit may additionally deduct 10 percent of that amount against their State tax.

North Carolina woodland owners who meet the qualifications for Federal forestry incentive payments may also elect to report income from timber sales either entirely in the current tax year or over a 3-year period. Reforestation expenses may either be deducted entirely in the year incurred or amortized over 60 months.

Long-term capital gains treatment has probably been the most important provision affecting State income taxes (McGee and others 1983). In those States that use Federal adjusted gross income as the basis for computing taxable income, only 40 percent of the net gain on qualifying timber sales has been--through 1986--subject to State income tax. On the other hand, woodland owners in States that compute taxable income separately from the Federal return have had to pay tax on the full amount of the net gain. Therefore, State income tax on timber revenue had been much more significant in those Southern States that do not exclude a part of the long-term gains.

Beginning in 1987, all of those States that utilize Federal adjusted gross income as the State tax base will no longer automatically exclude 60 percent of the long-term gains as was done previously. This means that the entire gain will be taxable next year in all of the Southern States except Arkansas. Beginning in 1987, as mentioned previously, Arkansas--which computes its own taxable income basis--will tax only 40 percent of a long-term gain.

Thus, one of the major provisions of the new Federal law that will increase Federal adjusted gross income is directly timber related--the loss of

the 60-percent long-term capital gain exclusion. An increase in Federal adjusted gross income affects the State income tax in two ways in those States that utilize the Federal figure as their tax base.

First, of course, more income is subject to the State tax. Second, such an increase may very well place the taxpayer in a higher marginal State tax rate bracket, resulting in an even larger State tax bill.

Tax rates also are important in determining the total tax obligation. Advantages derived from income deductions may be offset by a high or excessively progressive tax rate. Rates in the Southern States vary considerably, both in terms of percentage and progressiveness. However, they are all lower and generally less progressive than the Federal rates. As income rises, therefore, Federal taxes increase more rapidly than do State taxes, and the State's portion of the total tax decreases.

### **Forest Property, Yield, and Severance Taxes**

Historically, forested properties in the South, as in other parts of the country, were annually assessed and taxed on the basis of their fair market value in highest and best use. That is, they were subject to the unmodified ad valorem property tax. Over the years, however, this method of taxing these properties was increasingly criticized. Among the major criticisms were the following:

1. The tax was not equitable--it placed a greater burden on low-valued and deferred-income land uses.

2. The tax was not neutral regarding the allocation of resources--it worked to reduce stocking levels, shorten rotations, and shift marginal forest lands into other uses.

3. The tax was not convenient in the time and manner of its levy--it mandated annual collections even though most forest properties were not regulated so as to provide annual incomes. [For a more complete discussion of the preceding and other alleged disadvantages, see Duerr (1960) or Gregory (1972).]

Because of these complaints and others, many States in the region, as well as in other parts of the country, saw fit to develop and enact "special" forest property tax laws. Nationally, these "special" forest taxes assumed several different forms, but only

three found usage in the South. These taxing mechanisms were exemption laws, yield tax laws, and modified assessment laws.

Exemption laws provide for removal of forest land and/or timber from the property tax rolls, either permanently or for some specified number of years. A timber exemption may apply to all standing timber, planted stands, immature stands, trees of a particular species, or trees retained for specific purposes, such as reforestation or windbreaks.

Yield tax laws provide for a conceptual separation of land and timber values. Land values normally remain subject to the annual property tax, although sometimes in modified form. Timber values go untaxed until the time of harvest. At this juncture, a gross income tax, equal to some percentage of the stumpage value of the products being cut, is imposed.

Finally, modified assessment laws provide that forest properties are to be valued differently from other forms of property. If fair market value in highest and best use is retained as the basic valuation standard, forest assessments may be frozen or calculated using a reduced assessment ratio. Alternatively, fair market value may be abandoned in favor of another valuation standard such as current use value.

In addition to these various "special" forest taxes, all of which represent alternatives to the traditional ad valorem property tax, the timber severance tax is another tax system which has been employed in the South. This taxing mechanism is similar to a yield tax in that it is imposed when timber is cut. However, a severance tax differs from a yield tax in that, (1) it is levied in addition to, not in place of, the normal property tax; (2) it is always mandatory; (3) it is usually calculated as a fixed amount per unit of product, not as a percentage of stumpage value; and (4) it rests upon the timber operator, not the timber (Hall and others 1959).

## Long-Term Trends In Usage

Figure 1 shows how usage of the various "special" forest taxes has changed over time in the region.<sup>(2)</sup>

Section A indicates that the first exemption law was adopted in 1907. This Alabama statute was subsequently repealed in 1923. No further exemptions were authorized until the late 1930's, when legislation was implemented in both Mississippi (1938) and North Carolina (1939). While Mississippi's statute was quickly withdrawn, the number of exemptions has gradually increased to the point that there are now three in existence.

Section B shows that the first yield tax laws were enacted in the early 1920's. Alabama led the way (1923) and was quickly followed by Mississippi (1924) and Louisiana (1926). Since that time, except for a relatively brief period during the 1930's, the number of yield tax statutes has remained constant at the current level of three.

Section C reveals that the first modified assessment law was passed in 1910. This Louisiana statute provided that the land devoted to timber growing was to be taxed on the basis of a fixed value. This legislation was repealed in 1926, and no further programs of this type were implemented for over 30 years. In the late 1950's, a crop of new modified assessment laws began to appear. Florida (1959) led the way and was subsequently followed by all of the other Southern States. As a consequence, this type of legislation is now the most prevalent form of "special" forest tax.

Finally, section D indicates that the first severance tax laws appeared about the same time as the first yield taxes--the early 1920's. Louisiana (1922) led the way and was followed the next year by Arkansas. Subsequent to this initial spurt of activity, usage of such laws remained unchanged until the mid and late 1940's, when both Alabama (1945)

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(2) The information used to prepare figure 1 as well as the rest of this section was obtained from the following sources: USDA Forest Service (1945), Forest Industries Committee on Timber Valuation and Taxation (1972-84), Fairchild and Associates (1935), and Williams (1957, 1968).

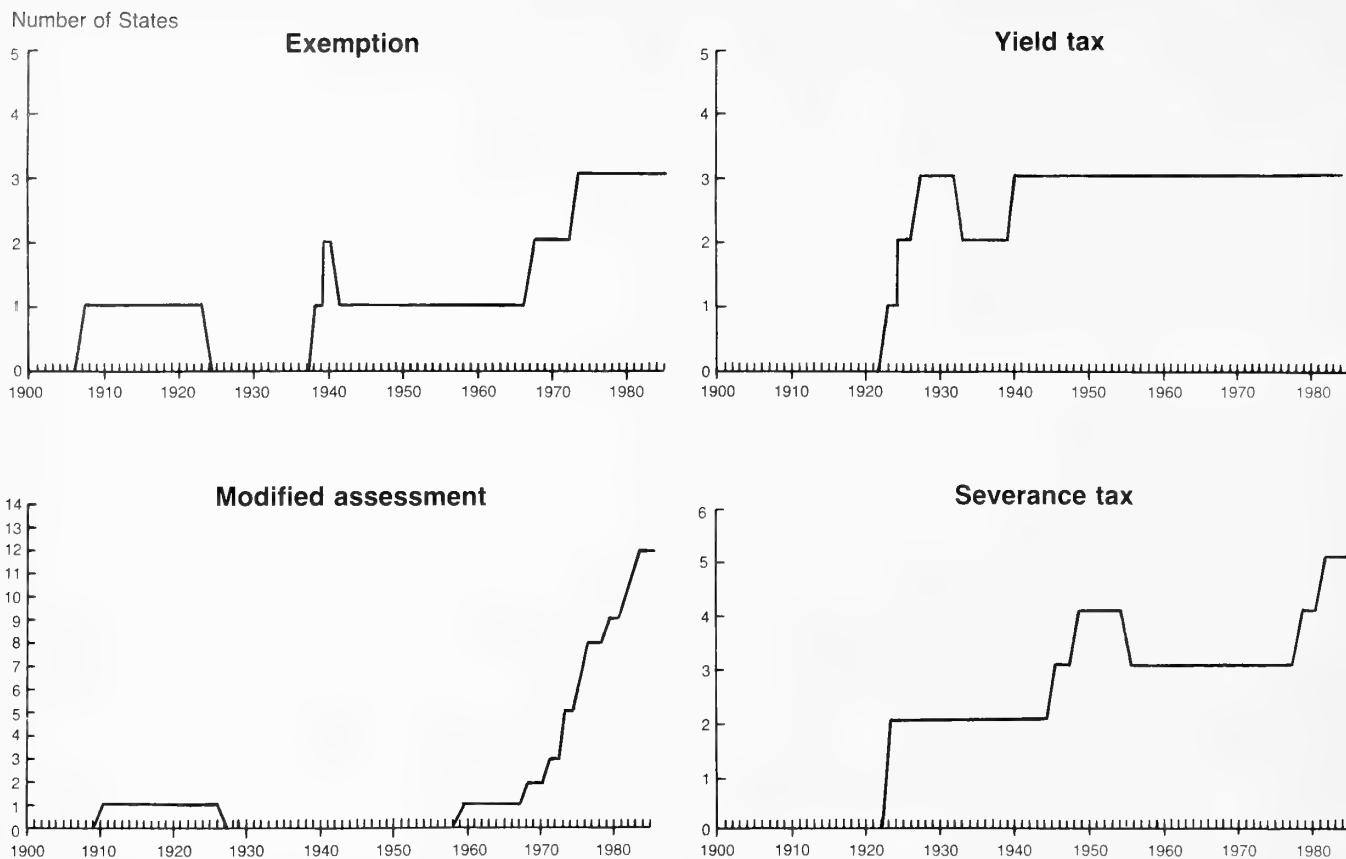


Figure 1—Long-term trends in the use of alternative "special" forest tax laws in the South.

and Virginia (1948) adopted similar statutes. Over the last 35 years, the number of such laws has grown to five.

made to describe these various statutes in depth, their key features warrant brief review.

### Review of Current Policies

Table 5 identifies the special forest tax laws that are now operative in each of the Southern States.<sup>(3)</sup> The table also indicates the year that each piece of legislation was enacted. While no attempt will be

(3) The information used to prepare table 5 as well as the rest of this section of the report was obtained from essentially two sources: volume 20 of the Timber Tax Journal (Forest Industries Committee on Timber Valuation and Taxation 1984) and statute books for each of the Southern States.



**Table 5--Years of enactment of special forest tax laws employed by the various Southern States, as of January 1, 1986**

State	Type of special forest tax			
	Exemption	Yield	Modified assessment	Severance
Alabama	1967	1923	1982	1945
Arkansas			1981	1923
Florida			1959	
Georgia			1983	
Louisiana		1954	1976	
Mississippi		1940	1980	
N. Carolina	1939		1973	1977
Oklahoma			1975	
S. Carolina			1975	1981
Tennessee	1973		1976	
Texas				1979
Virginia			1977, 1977	1948

**Exemption Laws**--Three States--Alabama, North Carolina, and Tennessee--currently have exemption laws. All of these statutes are mandatory, and each applies to essentially all standing timber. Because the laws are mandatory, they do not set forth any eligibility requirements or application procedures. In addition, there are no penalties prescribed for withdrawal from the program.

**Yield Tax Laws**--Yield tax laws are presently being employed in Alabama, Louisiana, and Mississippi. Mississippi's law is known as a severance tax but has been classified as a yield tax because it is levied in place of, not in addition to, the normal property tax on timber (Forest Industries Committee on Timber Valuation and Taxation 1984).

The programs of Louisiana and Mississippi are mandatory and accordingly do not set forth any eligibility requirements or application procedures. In contrast, Alabama's program is optional and limits participation to landowners who are willing to keep their land in timber production and protect it from fire for 5 years.

Alabama's is the only law containing special provisions relating to the tax treatment of enrolled lands. These provisions stipulate that properties of 160 acres or less are to be exempted from any land tax. Tracts exceeding this size are to be taxed on the basis of a fixed assessment established at the time of enrollment.

All of the statutes defer any timber taxes until the time of harvest. Tax rates, however, are variable. Alabama taxes all products at 8 percent of their stumpage value. Louisiana uses a rate of 5 percent for pulpwood-sized material and 2.25 percent for everything else. Finally, Mississippi, following the pattern of a severance tax, imposes a fixed levy per unit volume or per unit of product. The amount of this levy varies with the type of product being cut.

Alabama's yield tax, consistent with its optional nature, is the only program to provide for a declassification penalty. This penalty equals 8 percent of the value of the timber on a tract at the time of withdrawal.

**Modified Assessment Laws**--All of the States now have modified assessment laws, and indeed one--Virginia--has two laws of this type. These statutes differ greatly in terms of the eligibility criteria, application requirements, valuation procedures, and declassification penalties they embody. [For a more thorough discussion of these laws, see Hickman (1983).]

In terms of eligibility criteria, 3 of the existing laws are mandatory and 10 are optional. The States with mandatory programs are Arkansas, Mississippi, and Oklahoma. In these States, as well as in Alabama and South Carolina, essentially all forest lands qualify for special assessment. In the remaining States, participation is limited in some manner. Among the variables used to restrict enrollments are (1) tract size, (2) the proportion of annual income derived from forestry activities, (3) length of tenure, and (4) the type of owner--individual v. corporate or natural citizen v. foreign alien.

In terms of application requirements, only the 10 programs that are optional need be considered. Of these, five call for initial applications, two call for periodic applications, and one calls for annual applications. The two remaining laws stipulate that interested property owners must covenant to retain their land in timber growing for some specified length of time. This covenant period is 10 years in Georgia and varies from 4 to 8 years under Virginia's newest law.<sup>(4)</sup>

In terms of valuation procedures, all of the existing laws except one employ current use value as the relevant valuation standard. Furthermore, in almost all instances, forest use values are established using an income capitalization approach. The only statute not predicated upon use value is Georgia's. In Georgia, participating and nonparticipating forest properties are assessed on the basis of fair market value, but the assessment ratio applicable to the former is 30 percent as opposed to the usual 40 percent.

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(4) Virginia's newest law is known as the "Agricultural and Forestal Districting Act." Modified assessment is only one of several inducements which the State uses in an effort to encourage farm and forest owners to keep their lands in crop and timber production. Other advantages are (1) government's ability to take land by eminent domain is limited, (2) government's ability to regulate farm and/or forestry activities is constrained, and (3) government's ability to impose special taxes to support non-agriculturally-related improvements is restricted, as is its power to expend public funds for such purposes.

Finally, in regard to declassification penalties, eight of the existing optional laws contain provisions of this nature. In almost all instances, the penalty takes the form of a "rollback tax." This is a charge equaling, for some specified number of years, the difference between the taxes that were actually paid and those that would have been paid except for the benefits of special assessment. The lengths of the rollback periods vary from 3 years in Alabama, North Carolina, and Tennessee, to 5 years under Virginia's newest law. In addition, three States--North Carolina, Texas, and Virginia--add interest charges to the amount of the rollback tax.

**Severance Taxes**--At present, five States--Alabama, Arkansas, North Carolina, South Carolina, and Virginia--have severance taxes. As is characteristic of this type of tax, all of the statutes are mandatory and all, save one, impose a fixed levy per unit volume or per unit of product. The one exception is Arkansas. Arkansas' severance tax is based on the weight of the timber to be processed. Arkansas' law also is unique in that it requires monthly payments whereas the others provide for quarterly collections. The various programs are similar in that they all exempt timber cut by individuals from their own lands for their own use. North Carolina and South Carolina also exempt Christmas trees and fuelwood cut for personal use or use in individual homes.

### Impacts on Forest Management

There is no quantitative evidence showing that the special property and related tax policies which have applied, and which continue to apply, to forest owners in the South have had a positive effect on timber management. However, there are at least two reasons for believing that such legislation has been beneficial.

The first reason is traceable to the fact that annually recurring costs such as property taxes can have a profound effect on the profitability of forestry investments. Because of the long-term nature of such investments, annually recurring costs accumulate with interest and can easily extinguish opportunities for profit. Except for the period of the Great Depression, this phenomenon has not normally been a problem in the South. Since the 1950's, however, a number of factors have been working together to change this situation. Inflation has

caused the value of forest and other rural lands to increase, strong markets have caused timber prices to rise relative to the prices of most other commodities, mounting operating costs have increased the revenue needs of many local governments, and the quality of tax administration has improved so that appreciating land values are now more quickly reflected in higher assessments. Because of these changes, strict reliance on an unmodified ad valorem tax could conceivably force substantial acreages of forest land into other uses.

The second reason is that many Southern States have chosen to reinvest the revenues derived from some of their special forest taxes--in particular their severance taxes--back into the forestry sector. These revenues are being used to support a variety of activities. As described in volume 20 of the Timber Tax Journal (Forest Industries Committee on Timber Valuation and Taxation 1984), the specific expenditure guidelines being employed in each State are as follows:

- *Alabama*--All severance tax receipts are distributed under the supervision of the State Forester. At least 85 percent of the revenues must be used for forest protection purposes.
- *Arkansas*--All severance tax receipts go to the State Forestry Fund and are allocated by the Forestry Commission. Expenditure guidelines are not prescribed by law.
- *Mississippi*--Eighty percent of all yield tax proceeds go to the State's forestry incentives program. The remaining funds go to the county of origin.
- *North Carolina*--All severance tax revenues go to the State's forestry incentives program.
- *South Carolina*--All severance tax receipts go to the State's forestry incentives program.
- *Virginia*--All severance tax proceeds are distributed by the Virginia Division of Forestry. At least 50 percent of the revenues must be expended in the county of origin. The moneys are used to support forest protection efforts, State tree nurseries, and the State's forestry incentives program.

## The Federal Estate Tax

Certain provisions of the Federal 1976 Tax Reform Act were enacted to alleviate estate tax problems for farm and forest properties. These amendments to the law are specifically directed to the inherent illiquidity of many farm and forest assets and the necessity of forced sales to pay the tax (Gardner and others 1984).

## Special Use Valuation

Special use valuation is one such provision. It is applicable to estates whose primary resource are farm, woodland, or closely-held business properties. If certain qualifying conditions (table 6) are met, the executor is permitted to value the estate at its "use" value rather than at fair market value as determined by the highest and best use. This election will generally result in a reduced estate tax bill. Tax savings are permitted by decreasing an estate's qualified property values in an aggregate amount not to exceed a maximum of \$750,000.

**Table 6--Qualifications for Federal estate tax special use valuation (1)**

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1. Decedent must have been a U.S. citizen.
2. Property must be located in the United States.
3. Property must pass to a qualified heir (member of the family).<sup>(2)</sup>
4. Property must have been owned by the decedent and/or a member of the decedent's family for a least 5 of the last 8 years immediately before the decedent's death.
5. During at least 5 years of such ownership, the property must have been used for farming or a closely-held business purpose, which includes timber growing, by the decedent or a member of the decedent's family.
6. The decedent, or a member of the decedent's family, must have had an equity interest in the forestry operation at the time of death and for 5 or more of the last 8 years before death.
7. The decedent and/or a family member must have materially participated in the operation of the business for at least 5 years during the 8-year period ending on the earliest of: (1) the date of the decedent's death; (2) the date on which the decedent became disabled provided disability continued until date of death; or (3) the date on which the decedent began receiving social security retirement benefits provided the benefit continued until the date of death.
8. All use valuations taken together (forest land and timber, farms, and other qualifying property) cannot reduce the fair market value of the gross estate by more than \$750,000.
9. The total property (both real and personal) qualifying for special use valuation must constitute, at fair market value, at least 50 percent of the adjusted value of the decedent's gross estate (gross estate less secured debts).
10. At least 25 percent of the adjusted value of the decedent's gross estate must be qualified real property and passed from the decedent to a qualified heir.
11. An agreement of use valuation must be signed by all persons who have inherited an interest in the forest land and filed with the estate tax return. The election can be made on a late return as long as it is the first return filed.
12. For the agreement to remain valid, the following requirements must be met for 10 years after the death of the decedent (the 10-year period may be extended to 12 years if the full 2-year grace period is utilized):
  - o Ownership must continue solely within the decedent's family unless there is an involuntary conversion or like-kind exchange.
  - o At least one member of the decedent's family must materially participate in management of the property during 5 of every 8 years. A less stringent "active management" test is substituted for "material participation" for surviving spouses and certain other classes of heirs.
  - o The property must be used and managed for the qualifying use, and the qualified heir must maintain an equity interest in it.

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(1) Internal Revenue Code 2032A.

(2) The term "member of the family" includes:

- (1) Ancestors of the decedent;
- (2) Spouse of the decedent;
- (3) Lineal descendants of the decedent, of the decedent's spouse, or of the decedent's parents; and
- (4) The spouse of any lineal descendent in (3) above.

The Economic Recovery Tax Act of 1981 (ERTA) liberalized both the procedures and benefits of the special use valuation election. One important change is that an estate is now permitted to include the value of standing timber growing in a qualified woodland to help meet the special use valuation requirements (Siegel 1982a).

Certain of the requirements are very strictly construed. One in this category is that the property must have been owned by the decedent or a member of the decedent's family and used by the decedent or family member for a qualifying purpose for at least 5 of the 8 years immediately preceding death. The qualified use test, used to make this determination, requires that the decedent or family member have had an equity interest in the forestry operation at the time of death and for 5 or more of the last 8 years before death.

Material participation is another prerequisite strictly interpreted (Siegel 1982b). In meeting this test, material participation may be accomplished by either the decedent or a member of the decedent's family during the time the property was held by the decedent. For the period following death, during which the property is held by the qualified heir, material participation may be accomplished by the qualified heir or any member of that person's family. The timber example in the Treasury regulations that govern special use valuation suggests that at least the following activities are to be generally required in order to qualify for election:

- (1) Participate actively in making management decisions such as where and when to conduct stand-improvement operations.
- (2) Assume financial responsibility for meeting forestry business expenses.
- (3) Retain prerogatives for approval of management plans submitted by consulting foresters or other forester-advisors.
- (4) Participate in the supervision of harvesting, marketing, and planting activities to a degree indicative of an ongoing business rather than of a passive investment.

Following the decedent's death, heirs are required to continue active operation of the property in its qualifying use for a period of 10 years. Failure to do so, or disposition of any portion of the property (to anyone other than another family member) trig-

gers the imposition of an additional estate tax. This amounts to a recapture of the tax saved by special use valuation.

### **Deferral and Extension of Payments**

Another important provision of the estate tax law permits deferral and extension of that portion of the estate tax payment attributable to the decedent's interest in a farm or woodland if it qualifies as a closely-held business (Siegel and Utz 1983). If the qualifications are met, this option can provide financial flexibility for the estate and may reduce the net present value of estate tax liability. The tax is permitted to be deferred for a period of up to 5 years, to be followed by payments in a maximum of 10 equal annual installments. Interest must be paid during both periods but is deductible as an estate administration expense.

To qualify for this election, more than 35 percent of the adjusted gross estate must be comprised of an interest in a closely-held business. The Internal Revenue Service interprets this requirement to mean an active as opposed to a passive trade or business. Thus investment property per se does not constitute a trade or business. Only where there has been active management by the decedent or his agent does property qualify.

Termination of deferral and extension privileges occurs and the remaining balance of the estate tax becomes payable immediately if either of the following situations occurs:

- (1) One-half or more of the qualifying property is sold, exchanged, or otherwise disposed of before the estate tax is paid in full.
- (2) Any payment of interest on the tax is not made within 6 months of its original due date.

### **Impact on Southern Forestry**

Both the special use valuation and deferral and extension options are too new to accurately evaluate their utilization and impact on southern woodlands. Nevertheless, it is known that a substantial number of southern estates have elected timber special use valuation since the option has become available. A lesser number have qualified for the tax deferral and extension provisions.

**Table 7--Current State death tax systems in the South**

State	Type of tax <sup>(1)</sup>				
	E	I	PB	PU	G
Alabama			X		
Arkansas			X		
Florida			X		
Georgia			X		
Louisiana		X		X	X
Mississippi	X				
North Carolina		X		X	X
Oklahoma	X			X	X
South Carolina	X			X	X
Tennessee		X		X	X
Texas			X		
Virginia			X		

(1) Key to abbreviations for types of taxes: E = Estate, I = Inheritance, PB = Piggyback, PU = Pickup, G = Gift.

## State Death Taxes

The current death tax systems of the Southern States are shown in table 7. Four types of death taxes are currently utilized in the South--the inheritance tax, the estate tax, the piggy-back tax, and the pick-up tax (Olsen and Haney 1980).

An estate tax is a levy on the right to transfer property by the decedent's estate. South Carolina, Oklahoma, and Mississippi currently impose an estate tax.

An inheritance tax is a levy on the right to receive property by the individual heirs or legatees. Louisiana, North Carolina, and Tennessee have an inheritance tax.

A piggy-back tax is equal to the State death tax credit allowable against the Federal estate tax. Alabama, Arkansas, Florida, Georgia, Texas, and Virginia levy a piggy-back tax.

A pick-up tax absorbs the difference between an inheritance or estate tax and the maximum credit

allowed for State death taxes on the Federal return. South Carolina, Louisiana, Oklahoma, North Carolina, and Tennessee all impose a pick-up tax.

In addition to death taxes, five Southern States--South Carolina, North Carolina, Oklahoma, Louisiana, and Tennessee--have a gift tax.

Special use valuation for State death tax purposes is available for forest estates in all the Southern States except Louisiana, Oklahoma, North Carolina, and South Carolina (Walden and others 1985). It is available indirectly through the Federal estate tax for the six piggy-back States--Alabama, Arkansas, Florida, Georgia, Texas, and Virginia. In addition, Mississippi and Tennessee have "stand-alone" special use valuation provisions for woodland. Most Southern States also allow some degree of deferral and extension for State death tax payments. The qualifications and details vary by State. They are summarized in table 8.

**Table 8--Death tax structure for the Southern States**

State	Rates	Special use valuation provisions	Deferral and extension of payments
Alabama	0.8% minimum 16.0% maximum	Indirect through Federal provisions	Tax can be paid over a 10-year period at a variable rate.
Arkansas	0.8% minimum 16.0% maximum	Indirect through Federal provisions	Extension of payment up to 5 years at 10% interest.
Florida	0.8% minimum 16.0% maximum	Indirect through Federal provisions	Interest accrues at 1% per month.
Georgia	0.8% minimum 16.0% maximum	Indirect through Federal provisions	State deferral and extension if Federal deferral and extension granted.
Louisiana <sup>(1)</sup>	2% of the first \$20,000, plus 3% of the actual value in excess of \$30,000	None	Not to exceed 15 months after death.
Mississippi	1.6% minimum 16.0% maximum	Cannot decrease property value by more than \$500,000.	Allowed in 6-month increments if hardship can be proved.
No. Carolina <sup>(1)</sup>	1.0% minimum 12.0% maximum	None	Extension if reasonable cause is shown. Interest of 5% per annum charged.
Oklahoma		None	None
So. Carolina	6.0% minimum 8.0% maximum	None	Extension of up to 5 years if hardship can be proved.
Tennessee <sup>(1)</sup>	5.5% minimum 9.5% maximum	Available	Deferral of payment up to 5 years at 11% interest.
Texas	0.8% minimum 16.0% maximum	Indirect through Federal provisions	State deferral and extension of Federal deferral and extension granted.
Virginia	0.8% minimum 16.0% maximum	Indirect through Federal provisions	Extension of time to file but not time to pay.

(1) Rates are for Class A beneficiaries, which include spouse, children, and parents.

(2) In 1990, there will be one class of beneficiary.

## Conclusion

In examining forest management from a business point of view, the practical significance of taxation is probably greater than that of any other economic institution. This is particularly true in the South, where most of the commercial forests are privately owned. In speaking of taxes in general, Ciriacy-Wantrup (1959) stated, "... the tax system has highly significant but unintended, unrecognized and socially undesirable effects upon conservation decisions of private planning agents." In an attempt to alleviate some of these effects for the forestry sector, society has made the decision to modify many of the traditional taxation precepts in order to better address the unique aspects of forestry investments.

These modifications have been well accepted by southern woodland owners. Many have tailored their forestry investments and management decisions to the fiscal certainty provided by the special forest tax laws. Unexpected tax changes could render established forestry programs completely invalid from an investment standpoint. Likewise, the threat of a tax change could discourage even the most prudent manager from investing in an otherwise presently sound and profitable forest practice. This picture suggests that the most important issue in forest taxation for southern forests is neither the rate structure nor form of particular taxes but rather tax stability.

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# TREASURE Forest in Alabama: A Case Study of Multiple-Benefit Forestry

L. Louis Hyman (1)

The southern timber supply study, entitled "The South's Fourth Forest," included in its findings some serious problems in forest productivity throughout the South. The primary purpose of the study was to look at timber, but its findings and initial recommendations affect all the resources of the forest: soil, water, air, forage, range, and wildlife populations.

Many people propose that the way to improve the situation is increased regulation of forest land-management practices. The landowners in Alabama do not want regulation. But there is an alternative that is fairly effective in increasing good forest resource management: the use of positive landowner recognition through the TREASURE Forest Program.

## What Is TREASURE Forest?

TREASURE Forest is a voluntary incentives program that is open to all Alabama landowners and that publicly recognizes good forest management. "Good forest management" is defined as managing the land to develop all the resources of that land to the maximum extent compatible with that landowner's objectives.

The name TREASURE is an acronym that stands for all of the benefits of the forest: **T**imber, **R**ecreation (which includes wildlife), **E**nvironment, **A**esthetics, from a **S**ustained **U**sable **R**esource.

The early 1970's was a period of strong environmental awareness. The Monongahela decision outlawed clearcutting in the national forests until the law was rewritten in 1976. In the States, many traditional forestry and conservation practices were challenged by an aroused public. The TREASURE Forest Program was begun in 1974 as an effort to define good forest management and to publicly reward those who practice it.

The definition of good forest management is not set in concrete but is constantly evolving. The present definition includes the following minimum actions by the landowner:

Protect from fire, insect, and disease problems.

Salvage damaged timber where possible.

Regenerate all lands after harvest.

Follow Best Management Practices.

Protect critical wildlife habitat and endangered species.

Manage the forest in a way least damaging to other resources.

Manage the forest to achieve multiple objectives.

It needs to be emphasized that these definitions were developed by a multiagency group that included foresters, wildlife biologists, and soil conservation personnel.

One of the keys to the success of the TREASURE Forest Program is that it is tied directly to the landowner's objectives--what he or she wants from the land. The goal is to help landowners reach their goals in such a way as to produce the maximum benefits for the citizens of Alabama. By using this approach, many landowners with nontraditional perspectives can be encouraged to practice good forest resource management.

In general terms, landowner objectives fall into four categories: timber, wildlife, recreation, and environment/esthetics. In order to receive the TREASURE Forest award, a landowner must have one primary and at least one secondary objective. A recent survey of participants in the program found the distribution of objectives shown in table 1.

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(1) L. Louis Hyman is chief of forest management for the Alabama Forestry Commission.

**Table 1--Primary and secondary objectives of landowners participating in the TREASURE Forest Program**

	Primary objective		Secondary objective	
	<i>Number</i>	<i>Percent</i>	<i>Number</i>	<i>Percent</i>
Timber	339	78.7	57	13.2
Wildlife	47	10.9	301	69.9
Recreation	31	7.2	41	9.5
Environment and esthetics	14	3.2	32	7.4
Totals	431	100.0	431	100.0

### **The Alabama Forestry Planning Committee**

The TREASURE Forest Program is sponsored by the Alabama Forestry Planning Committee (AFPC). The AFPC was organized on April 5, 1971, with the aim of increasing "the value derived from the forest resources of the state by more effectively coordinating and delivering forestry programs being offered to small, private landowners" (Wade and Moody 1983). The AFPC works under a memorandum of understanding and meets every 6 months.

The AFPC is made up of all the State and Federal agencies that influence forest management in Alabama. Forest industry, environmental, and landowner groups are not part of the AFPC but work with its subcommittees in accomplishing mutual goals. The members of the AFPC are as follows:

Alabama Department of Conservation and Natural Resources

Alabama Department of Education, Vocational Division, Agribusiness Education

Alabama Forestry Commission

Alabama Soil and Water Conservation Committee

Alabama Agricultural Experiment Station, Auburn University

Alabama Cooperative Extension Service, Auburn University

School of Forestry, Auburn University

School of Agriculture, Auburn University

USDA, Agricultural Stabilization and Conservation Service

USDA, Farmers Home Administration

USDA, Forest Service

USDA, Soil Conservation Service

Tennessee Valley Authority

The AFPC is organized into subcommittees on education, productivity, and services. The education subcommittee coordinates all technical assistance programs, avoiding duplication of efforts and increasing cross-training. The productivity subcommittee, with the mission to improve forest productivity in Alabama, works with the Alabama Forestry Association to increase the amount of tree planting in the State. The services subcommittee coordinates and administers the TREASURE Forest Program.

### **How the TREASURE Forest Program Works**

The TREASURE Forest Program has three elements: landowner awareness, technical assistance in forest resource management, and certification.

Landowner awareness is developed through a public information and education program that distributes articles about the TREASURE Forest Program to local newspapers and specialty journals. In addition, all TREASURE Forest awards are publicized locally, with pictures of the landowner in the county newspaper. Talks on the TREASURE Forest Program are presented frequently to civic groups and tours for landowners. All cost-share clients are told about the program and encouraged to develop full forest resource management plans. The goal of the awareness campaign is to enlist landowners who wish to practice good forest management.

Once landowners are enlisted in the program by accepting a TREASURE Forest Landowner Creed (fig. 1), they begin to receive comprehensive technical assistance to help them manage their land under the TREASURE Forest standards. The centerpiece of this effort is the *Alabama's TREASURED Forest* magazine, which is published quarterly by the Alabama Forestry Commission. This award-winning periodical contains "how-to" articles on all aspects of forest resource management.

All landowners who sign the creed can get a TREASURE Forest Management Plan made for their property. This plan explains what work needs to be done on their particular parcel to qualify it as a TREASURE Forest. The work outlined in the plan includes forestry practices, wildlife habitat improvements, and soil conservation practices. Each plan is tailored to the landowner's specific objectives.

The basic theme of the technical assistance is that landowners can manage their timber (for example) in a way that meets their personal goals and at the same time minimizes soil erosion and water quality damage and enhances wildlife habitat. Or, in another example, landowners can develop their land for wildlife in a way that enhances timber productivity and protects the soil, water, and recreation resources.

Good forest management is good wildlife habitat management. There is an old saw that pine management is automatic death to wildlife. This idea, which goes by the name of "biological desert," is a myth: if pine stands are properly managed, they can be homes to a wide variety of animal species. Many sites that are pointed out as examples of "biological deserts" are also examples of bad forest management. Good forest management that includes

streamside management zones, residual mast trees, an active prescribed burning program, and early, frequent thinnings will produce prime wildlife habitat. This type of forest management is what the TREASURE Forest Program endorses.

The TREASURE Forest Program has a strict quality-control system. When landowners have brought their management up to the TREASURE Forest standards, they are nominated by their resource manager. The property is then inspected by a registered forester, as defined in State law, and a certified wildlife biologist, as defined by the Alabama Wildlife Society. The inspection record is quite detailed (see appendix) and emphasizes landowner accomplishments instead of plans. The inspection record is reviewed by AFPC's services subcommittee and either accepted, rejected, or sent back for further clarification. On some questionable cases, a member of the subcommittee will reinspect the property before final approval.

The property of an approved landowner becomes certified as a TREASURE Forest. At a public ceremony with media coverage, owners receive a certificate and a large wooden sign to display on their property. The certification is good for 5 years, at which time the property is reinspected.

## TREASURE Forest Accomplishments

In the first 10 years of the program, TREASURE Forest has achieved national recognition. Its unique combination of multiple-benefit forestry and landowner recognition makes it a model of an effective public program.

As of January 1987, there are 431 certified TREASURE Forests, covering over 872,000 acres. In addition, there are another 600 landowners with over 297,000 acres who are actively working toward achieving TREASURE status under the landowner creed program.

More important than sheer numbers is the fact that TREASURE Forest has accomplished its main goal of defining good forest resource management. TREASURE's standards are now the benchmark to which landowners and resource managers compare their practices. TREASURE's definition of good forestry has been endorsed by environmental groups, such as the Alabama Conservancy, and

## TREASURE Forest Landowner's Creed

I BELIEVE the right to own land is among the most treasured and most valued rights of all Americans;  
and

I BELIEVE the ownership of land not only grants me the privilege of pursuing my goals but that it also carries the responsibility of good stewardship; and

I BELIEVE that good stewardship of this country's precious natural resources is necessary to the strength and well being of our great nation; and

I BELIEVE that good stewardship of my forest lands will help provide this country's needs for forest products, for clean air and water, for healthy and thriving populations of fish and wildlife, and for forest based recreation; and

I BELIEVE further that good stewardship of my forest lands will contribute to the natural beauty of Alabama and will guard against soil erosion and the depletion of soil productivity; and

I BELIEVE that good stewardship also involves protecting my forest lands from insects, diseases, wildfires, and overgrazing.

THEREFORE, I pledge that on my forest lands I will optimize

**Timber Production**--To help meet this country's need for forest products, to provide jobs, and otherwise to promote a healthy economy; and

**Recreational Opportunities**--For myself, my family, my friends, and for my invited guests;

**Environmental Quality**--To protect our country's vital soil, water, air; and

**Aesthetics**--For all who visit my forest lands to see and enjoy; and that my efforts will be

**Sustained**--For continuous, multiple benefits by managing all my resources in ways that are compatible with my primary objective so that my forest resources will be

**Usable**--For the enrichment, education, and enjoyment of others; and not only to meet my own

**Resource Needs**--But also to help keep our country strong and free not only for our present generation but also for

**Every Generation of Americans** that will follow us.

Figure 1--Wording from the credo of Alabama's TREASURE Forest program. Note that the signatory promises to optimize outputs whose first letters spell the acronym "TREASURE."

forest industry companies, such as Gulf States Paper.

TREASURE has also led to an increased coordination of efforts among all the agencies that work with forest landowners. This has improved quality assistance and brought about increased awareness among all resource managers of the multiple benefits of the forest, especially in regard to wildlife management. Through TREASURE Forest, Alabama Forestry Commission foresters and many forestry consultants have become aware of the interrelationships between timber management and wildlife habitat management. This awareness has resulted in higher levels of habitat management and resulting increases in both game and nongame populations.

### **Other AFPC Accomplishments**

TREASURE Forest has had a halo effect on other AFPC activities. The increased coordination of efforts from TREASURE has enhanced cooperation in other projects, as evidenced by several of Alabama's success stories.

Hurricane Frederic, in 1979, created tremendous damage to the forest resources of southwestern Alabama. The AFPC joined in with the Governor's Forest Disaster Recovery Council to improve and coordinate salvage operations and restore the forests of the area.

In other disaster work, the AFPC increased landowner awareness during the southern pine beetle epidemics of 1973 and 1986. Meetings that were held in counties with severe infestations resulted in increased salvage of damaged wood, saving Alabama landowners millions of dollars.

Reforestation has been a major thrust of the AFPC, through its productivity subcommittee. This group serves as a clearinghouse for reforestation ideas. Working through county committees, the productivity subcommittee has reported annual increases in the number of acres planted to pine each of the last 5 years.

### **County Forestry Planning Committees**

Since 1981, county-level representatives of the AFPC agencies have met with landowners, consulting foresters, and forest industry representatives to

form County Forestry Planning Committees. The groups implement AFPC programs, such as TREASURE Forest, and develop creative new ways of helping landowners with forest resource management.

The effectiveness of these county committees was demonstrated in February 1983. At that time, the AFPC had a 9-million-seedling surplus in its nursery. On February 2, word went out to all county committees that the surplus was available at no cost to farmers who had marginal cropland that they would like to take out of row crops. The Soil Conservation Service in each county identified eligible lands and signed up landowners. The county forestry planning committees publicized the work and helped landowners find tools and vendors. Within three weeks, more than 8.2 million seedlings were picked up by farmers. This was enough to plant 11,700 acres. Very few organizations can match that record of efficiency.

An effective county forestry committee program requires visible and sincere support from the heads of each organization involved. One way Alabama makes this support visible is by presenting annual awards to the outstanding county forestry committees. The county committees are invited to nominate themselves. The AFPC selects three district winners (north, southeast, southwest Alabama), based on committee accomplishments, and from this group, a Statewide outstanding committee.

The regional and Statewide winners are publicly recognized at a banquet held during the annual TREASURE Forest agency-landowner conference. All members of the winning county committees receive a plaque from the head of their departments. This public applause encourages other county committees to work better together. In fact, several counties formed committees based on the encouragement they saw at the recognition banquet.

### **Recommended Policies for the South**

The purpose of this paper is to show an alternative to forest regulations. The TREASURE Forest Program uses incentives to improve the quality of forest management practices. Here are three basic initiatives that can be put forth as alternatives to legislating for change:

1. Every State should establish a forestry planning committee.

2. Every State should establish county forestry planning committees.
3. Every State should establish a landowner awards program to recognize good forest resource management.

The development of State and county forestry planning committees will solve many problems of missed communications and duplication of efforts. Each State has its own resource problems, and they must be solved on the State and local level.

A landowner awards program similar to TREASURE Forest would greatly increase the visibility of good forest management. Most landowners want to

do good. They have a strong feeling of stewardship for their land. A program like TREASURE Forest gives that feeling a way of expression that can only benefit landowners, their State, and the South as a whole.

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# Wildlife and Fisheries Multiple-Use Management

John E. Frampton (1)

It is certainly important for the future of our Nation to have an accurate assessment of the natural resources that are available to its people. Likewise, it is essential that we project the utilization of our natural resource supplies so that they are not over-exploited or depleted. Without a logical and systematic approach to resource utilization, we cannot meet the needs of our planet's expanding population. The South Carolina Wildlife and Marine Resources Department, the agency I represent, is committed to the wise use of the State's natural resources.

The Department has supported the Resources Planning Act (RPA) Program since passage of the Forest and Rangeland Renewable Resources Planning Act of 1974. We have supported the periodic assessment of the Nation's resources that are derived from forests, rangelands, and associated waters. These inventories and assessments of public and private land are necessary to evaluate future resource conditions in an increasingly complex and challenging world. But though we are supportive of the RPA Program assessments, we cannot support the assessment entitled "The South's Fourth Forest: Alternatives for the Future." It is disappointing to see the USDA Forest Service put forth a set of alternative plans for forest management in the South while the ink is still drying on most of their land and resource management plans. And, I am equally disturbed that wildlife was not included in the initial draft. Change in direction, away from multiple-use programs, seems to be on the immediate horizon with the apparent intent to direct southern forest management on private land into intensive timber production. This type of forest management scheme does not take into consideration that many landowners place a high value on wildlife--for commercial, recreational, scientific, and ethical reasons.

Wildlife and fish habitats and populations have generally recovered from the destructive agricultural and forestry practices of the early 1900's. Forested habitats moved from the early successional stages that were created by exploitive logging, graz-

ing, burning, and farming to more mature coniferous and hardwood forests. Streams that 50 years ago sheltered no trout now support healthy populations--native or stocked--of this popular game fish.

Utilization of wildlife and fish resources on both public and private lands has increased dramatically over the past 50 years. However, wildlife and fisheries management is still heavily dependent on excise taxes and license revenues in the South. Non-consumptive wildlife-oriented activities are demanding new and additional funding sources. During 1980 in South Carolina, 1.1 million people (over one-third of the State's population) participated in nonconsumptive wildlife-oriented activities. In 1980, hunting and fishing contributed a total of \$702 million to the State's economy (a total greater than the combined value of soybean, corn, tobacco, and other crop production). Today, with lease prices as high as \$12 to \$15 per acre, hunting leases generate significant revenue for many private and industrial landowners in South Carolina. Unfortunately, many landowners have not yet capitalized on lease opportunities for wildlife and fish.

By the year 2030, the population of America will have increased to 300 million, with concomitant decrease in our forest land base. Future forest diversions and withdrawals will translate into net losses of forest land and a decrease in the quality and amount of wildlife habitat. Increased industrial and urban encroachment on forest lands--coupled with the proposed replacement of natural stands with intensive, even-aged pine monoculture--will exert additional long-term pressures on wildlife resources and may significantly reduce habitat quality for many wildlife species.

Ownership of forest land takes on special significance in the assessment and planning of forest and wildlife programs. For example, private landowners (including farmers, corporations, and nonfarming individuals) collectively own almost 84 percent of the commercial forest land in the Piedmont region of the South. Forest industries account for 11 percent of this total; national forests and other public lands comprise less than 6 percent. Because so much of the South's timberland is privately owned, plans to maximize timber production on it may have a sub-

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(1) John E. Frampton is chief of the game section, South Carolina Wildlife and Marine Resources Department.

stantial impact on wildlife and fish resources in the South.

With high-intensity timber management comes increased use of herbicides, increased stocking rates, shorter rotation lengths, and more-intensive site preparation. These practices can have adverse impacts on wildlife populations and habitat quality. Though herbicides may not cause a direct negative physiological impact on wildlife populations, they do have substantial negative impacts on habitat quality. Large-scale use of these herbicides on clearcuts or hardwood stands can make an area useless to wildlife for 2 or more years--particularly for species with a low range of mobility.

Substantial increases in timber production on private land will result in a reduction of key wildlife habitats such as bottomland hardwoods, riparian and other wetland zones, longleaf pine communities, and mature mixed-pine and hardwood forests. With a reduction in key habitat types, species dependent on unique or old-growth forests may be relegated to public lands. Consequently, further pressures and demands will be placed on public lands to increase diverse habitat components as they are lost on private and industrial lands.

Increased demand for wildlife recreation is resulting in higher lease and use fees on private lands. This economic incentive will result in more private landowners having wildlife as primary or secondary objectives in their management plans. Already in the South, annual hunting lease fees in some areas exceed the value of the forest's annual increment of growth. As this trend continues, more private landowners will direct their management programs toward wildlife production.

Under the base alternative of "The South's Fourth Forest," habitat capability for deer and wild turkey on the South's 164 million acres of private forest land will be substantially decreased. Environment for the endangered red-cockaded woodpecker would be virtually eliminated on private land. The species may survive only on national forests and in wildlife refuges. Coldwater fisheries habitat on private land would be reduced by 40 percent. Similar adverse effects could be expected for other wildlife species. The total impact from such an alternative cannot be assessed because the draft version of "The South's Fourth Forest" did not contain a section discussing effects of any alternatives on fish and wildlife.

Current Forest Service regulations require the maintenance of viable wildlife populations on all Forest Service land. One assumes that if such is the

mandate on Forest Service lands, it is appropriate for the Forest Service to promote viable population management on private lands. Apparently this is not the case. The worst possible scenario is found in the proposed assessment. We doubt that viable populations of some plants and animals can exist under the alternatives.

The appropriate management of the South's land base should be coordinated to meet two main objectives: (1) to maintain biological integrity and future resource options, and (2) to be responsive to the market demands by wildlife and fisheries users of the South.

In addition, critical habitats should be identified and managed to sustain and enhance characteristic plant and animal communities dependent upon them. These habitats should be linked to avoid fragmentation and maintain regional diversity.

Resource managers must develop a systematic approach to identify, protect, and manage critical habitats needed to maintain biological integrity. Present demands for specialized habitat types must be considered and future demands projected. Though public lands have in the past accommodated the protection of critical habitats, future political pressures will dictate that all ownership sectors protect these habitats.

One of the Congressional mandates to the Forest Service is in the area of State and Private Forestry. It seems that the current assessment is directed specifically to this area. But, should not the efforts toward State and Private Forestry programs be based on the same multiple-use principles that apply on Federal lands? The answer is yes. If the Forest Service is promoting this assessment for timber, then should they not direct the same type of assessment for wildlife--and other resource areas as well? Throughout the recent land and resource management planning process, wildlife was the first and foremost public concern on most forests. Considerable public comment was directed toward increased outputs for fish and wildlife, yet such outputs were not reflected in the plans. It is obvious that the current assessment does not give wildlife and fisheries equal consideration with the timber resource. Until such time as Congress directs, as a result of public demand, that forest programs (1) provide wildlife with consideration equal to that given other resource interests and (2) produce a mixture of resource yields with no single resource being managed or emphasized to the detriment of another, timber programs on national forest lands will continue to dominate over other resources.

There exists today a tremendous need for coordination between game, nongame, and forestry programs at the State and Federal level. There is little coordination between the various programs designed to provide technical and/or financial assistance to private landowners. Most States provide numerous programs where private landowners can receive technical assistance in resource management. For example, a landowner in South Carolina can obtain assistance from my department, the South Carolina Commission of Forestry, the Land Resources Department, the USDA Soil Conservation Service and Cooperative Extension Service, and even some industrial landowners. Yet there is little if any coordination among these agencies. To ensure that private landowners are presented with all management alternatives, coordinated technical assistance programs must be developed. Programs dedicated to managing land for one-resource output often fail to inform a landowner that management alternatives exist that can integrate several objectives. Once intensive timber management programs are implemented, it is difficult to incorporate meaningful wildlife management.

The Forest Service should take a leadership role through its State and Private Forestry programs in coordinating an integrated approach to forest management in the South. Likewise, it is imperative that we recognize the fact that public lands must continue to play a special role in protecting unique habitats across the region. Environmental assessments and impacts on public lands should take into consideration the habitats existing on adjacent lands. The public and private sectors must be encouraged to work together to meet wildlife and fish objectives in addition to timber objectives.

To assess any resource plan effectively, an economic analysis must compare total program benefits to total program costs. The Forest Service should develop realistic values for noncommodity resources such as wildlife and fisheries, for use in all planning processes and assessments. Until these values are developed, economic analyses will be biased toward commodity resources such as timber. With the increased complexity of forest management, demands for better accounting have grown, and the cost-benefit relationships have become more difficult to evaluate. Some resources, like wildlife, are difficult to price and assign realistic monetary values. As such, their true economic value is often inadequately considered. The result is that

the wildlife resource does not receive equal consideration with other resource interests.

Noncommodity resources, such as hunting, recreation, and bird watching, must be quantified and valued to project a true economic assessment. This information is generally not available now but must be developed before we can adequately assess the South's fourth forest. I recommend that the Forest Service initiate studies to determine these noncommodity values. The South Carolina Wildlife and Marine Resources Department, the Southeastern Association of Fish and Wildlife Agencies, and the International Association of Fish and Wildlife Agencies have already volunteered to assist the Forest Service in this endeavor.

The benefits that nonindustrial private forest lands provide to people are obviously much greater than just the income generated from the sale of timber. Wildlife is now producing substantial income for landowners with leasable properties. Hunting, fishing, and other wildlife-related activities are primary reasons why many nonindustrial private forest landowners buy and manage forest land in the South. Investments in wildlife habitat improvement projects on nonindustrial private forest lands should be encouraged. Existing programs such as the Conservation Reserve Program allow for wildlife improvements, with up to 50 percent of the cost provided through the program. Efforts must be directed to nonindustrial private forest landowners so that they are aware of programs such as this.

For nonindustrial private forest landowners to substantially increase their investment in timber or wildlife, they must understand the economic alternatives and benefits available to them. There must be research and educational programs coordinated with technical and financial assistance. Without educational programs that reach these landowners and their managers and consultants, adequate timber and wildlife programs will not become established. Nonindustrial private forest landowners and managers will not be interested in regenerating more pine on their lands to benefit the timber industry, nor will they enhance wildlife habitat unless there is benefit—either economic or esthetic. The impetus to intensify management, for both timber and wildlife, will come about only through appropriate incentives, educational programs, or the landowner's personal land ethic and commitment for wise stewardship.



# Air and Acid Rain--Status and Recommendations

Paul W. Hansen (1)

Over the past several years, reports of rapid and devastating forest declines in Europe and reports of forest decline, dieback, and reduced growth rates in North America have focused an increasing amount of attention and concern on the role of air pollutants, particularly sulfur compounds and ozone, in the forest ecosystem. In each case, forest damage is occurring in regions receiving high loads of acidic and other pollutants, and these air pollutants are implicated to some extent in virtually all of the forest declines.

One of the problems that has plagued the acid rain issue, since its recognition as a serious environmental threat, is the establishment of irrefutable cause-and-effect relationships between pollutants and environmental impacts. The complexity of ecological and chemical relationships means that we cannot enjoy the certainty we would all prefer to have as we make important policy decisions on pollution control. This has been particularly true regarding air pollutants, acid precipitation, and the forest ecosystem. Much of the debate in this region on legislation to control acid deposition (and implementation of current regulations for ozone and other pollutants) has focused on the scientific certainty linking the pollutants to forest damage.

## The Problem of Scientific Uncertainty

The White House Office of Science and Technology Policy addressed this problem in a report to the President in 1983. Several of the conclusions in their report are critical to considerations of the future of the fourth forest.

1. "Recommendations based on imperfect data run the risk of being in error; recommendations for inaction pending collection of all the desirable data entail even greater risk of damage."

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(1) Paul W. Hansen is the acid rain project coordinator with the Izaak Walton League of America.

2. "It is in the nature of the acid deposition problem, that actions have to be taken despite incomplete knowledge. . . . If we take the conservative point of view that we must wait until the scientific knowledge is definitive, the accumulated deposition and damaged environment may reach the point of 'irreversibility.' "

3. "We as a committee are especially concerned about possible deleterious effects of a sustained increase in the acidity of unmanaged soils. Its microorganism population is particularly sensitive to a change in acidity. But it is just this bottom part of the biological cycle that is responsible for the recycling of nitrogen and carbon in the food chain. The proper functioning of the denitrifying microbes is a fundamental requirement upon which the entire biosphere depends. The evidence that increased acidity is perturbing populations of microorganisms is scanty, but the prospect of such an occurrence is grave. It may take years of accumulation of acidity, from wet or dry deposition, before measurable consequences would be observed. Such an effect is 'long-term' or 'irreversible.' It may take at least that many years or longer for the soils to revert to their original condition. It is this possibility which provides us with the greatest concern." (On Camel's Hump in Vermont, where 50 percent of the red spruce have died or declined in the past 10 years, organic matter in the soil was found to have doubled or trebled, indicating that something was wrong with the forest soils' decomposing mechanism.)

4. "We recommend that additional steps should be taken now which would result in meaningful reductions in the emissions of sulfur compounds into the atmosphere."

Reduction below present sulfur dioxide emission levels would reduce total sulfur deposition levels and as a consequence both reduce the probability for major changes in additional acid sensitive lakes or forests and allow the possibility for a return toward the original biological conditions existing in recently acidified areas."

## Southeastern Observations-- the Fourth Forest in 2050

In spite of the difficulties in establishing definite causal links between pollutants, forest dieback, and decreased productivity in the fourth forest of the Southeast, several observations indicate that in order to assure sustained growth in employment and income in the forest sector of the southern economy, programs and policies must be put in place to reduce the scale and rate of deposition of pollutants in the forest ecosystem:

- In just a few years, forest damage has spread with frightening rapidity through portions of central Europe. Trees covering close to 10 million acres now show signs of injury often linked to air pollutants. A similar type of forest damage is now appearing in several areas of North America, including the fourth forest, particularly at high altitudes. On Mount Mitchell in North Carolina, for example, all trees at or near 6,350 feet exhibit marked growth reductions, and researchers found no successful reproduction of woody plants at this altitude. Throughout this region, unexplained reductions in growth rates are being reported in a number of habitat types at a variety of elevations.
- Air pollutants and acids generated by industrial activities are now entering forests at an unprecedented scale and rate, greatly adding to stress on the forest. Many forests in Europe and North America now receive as much as 30 times more acidity than they would if rain and snow were falling through a pristine atmosphere. Ozone levels in many rural areas of Europe and North America are now regularly in the range known to damage trees. Despite air-quality improvements made during the seventies, the average concentration of sulfur dioxide in many areas is already high enough to diminish tree

growth--and these pollutants are predicted to increase significantly in this region.

- In both West Germany and the United States the affected forests are located in areas that receive large atmospheric inputs of acidic substances and other pollutants. In Quebec, 82 percent of maples show evidence of necrosis and decline. At Camel's Hump in Vermont, and other New England sites, tree ring analyses show unprecedented growth reductions in the last 25 years.
- Growth rates of a number of southeastern species are down 30 to 50 percent from 1957-86 survey period.
- Utility sulfur dioxide emissions are predicted to increase by at least 14 percent from 1980 to 1995. Individual States listed in the table below predict sharp increases by 1995 and even higher by 2000.

### Projected Increases in Sulfur Dioxide Emissions From Utility Plants

State	(Percent above 1980 levels)	
	1995	2000
Arkansas	315%	375%
Florida	37%	24%
Georgia	16%	21%
Mississippi	126%	132%
Louisiana	624%	1,224%
North Carolina and South Carolina	13%	20%
Virginia	48%	62%

## Policies and Programs

Although scientists cannot yet fully explain how forest destruction is occurring, air pollutants and acid rain are apparently stressing sensitive forests. When weakened by the stress of air pollutants, acidic and impoverished soils, or toxic metals, the resistance of trees to natural events such as drought, insects, or frost is reduced. In some cases, pollution alone appears to cause injury or growth declines.

Although the mechanisms are complex and may take decades of additional research to become fully understood, assuring the future productivity of the fourth forest requires one of two things:

1. Concrete and scientifically defensible data from the polluting industries to prove unequivocally that pollutants are not harming the fourth forest ecosystem, or
2. Action to reduce pollutants, which should include legislation from the U.S. Congress to reduce sulfur and nitrogen oxides emissions by roughly 50 percent within the next 10 to 12 years, a commitment from State and Federal agencies to reduce emissions of sulfur dioxide to the maximum extent possible under State implementation plans and other current regulations, and a commitment from all parties to comply with current standards set for ozone and other air pollutants under the Clean Air Act. The Tennessee Valley Authority reduced emis-

sions by 50 percent at cost increase of only 7 to 8 percent to rate payers.

Natural events cannot explain the unprecedented devastation of European forests or the dramatic reductions in annual growth rates now being discovered in North American forests. Air pollutants, particularly acid rain and ozone, lead the list of suspected causes. Without a change in the current pattern of increasing air pollution in the Southeast, the future of the fourth forest will be clouded by uncertainty and doubt. Hopefully, the future of the forest will not include the frightening forest dieback that is now a reality in other parts of the world. Reducing the stress of anthropogenic pollutants on the forest ecosystem in this region is one positive action that would almost certainly help prevent that possibility. It will take at least 5 to 10 years to attain reductions in sulfur dioxides once a legislative decision is made. Further delays in making that decision may pose substantial risks to the fourth forest's ecosystem. Stewardship and the long-term viability of the forest requires our support.

We have a legislative opportunity now that may not exist in the near future. Southeastern support for the effort to reduce the pollutants that cause acid rain and ozone are pivotal to the success or failure of this effort. In addition to the likely benefits of 50-percent reductions in acid deposition in the forest ecosystem in the South's fourth forest, a growing body of data indicates that such a reduction in pollutant loading over eastern North America would also alleviate the growing threat that these pollutants pose in other areas, such as fisheries, waterfowl reproductive performance, and human health.





# Multiple-Use Alternatives--Range

Henry A. Pearson (1)

The South has approximately 70 million acres of pasture and rangeland suitable for grazing. Another 74 million acres of cropland, including over 5 million acres of hayland, may be available for aftermath or temporary grazing depending on the crop grown. An additional 212 million acres of forest land have some potential for grazing; however, less than half--99 million acres--has significant forage resources available for grazing (Shiflet 1980). Most of the available and potential grazing areas are located on lands other than national forests, which comprise only about 6 percent of the total forest land in the region. Currently, approximately 28 million head of cattle and calves use the forage resources of the South. Past and current supplies of forage available for grazing have exceeded the demand. In addition, productivity can be increased through intensive management such as fertilization and timber thinning, burning, and other management practices. The range resource is presently underutilized in terms of acres grazed and productivity per acre (Sternitzke and Pearson 1975).

The projections of forage resources in "The South's Fourth Forest" were made with assumptions that timber is the primary resource and forage is a secondary resource. Consequently, forage resources in the forest land situation are probably underestimated because management activities were not directed toward improving them.

The present projections of forage resources on pasture and rangeland described in the modeling process mask the forage resource responses of forest land. Predictions are that the pasture and range (without fertilization) will decrease in forage from 5 percent to 15 percent by 2030. These decreases are due to shifts in land use and fertilizer use. Consequently, the model predicts overall decreases in forage for pasture and treeless range. However, the forage resources on forest land are projected to increase, which will provide additional forage to the already underutilized forage resource.

Consequently, if future demands for forage materialize, they will probably need to be satisfied from forest land forage use.

## Future

The demand for grazable lands is expected to increase by about 30 percent between now and the year 2030. This is based on the southern timber supply study, which indicates that population growth will increase by 30 percent. Even if meat consumption remains static, the demand for grazing and food should increase similarly. Furthermore, due to reductions in pasture and range forage, the greatest demands for forage will occur on forest lands. To meet this demand, additional acres of forest range could be grazed, or productivity could be increased by intensifying management on the pasture, range, and forest-range lands.

Based on these forecasted futures, here are some land-management implications for forest owners, forest industry, and State and Federal Governments dealing with resources and economics of the South.

1. Grazing demands will increase for forest land forage; these demands will be due to economics (cost of production), fire hazard increases, food supply needs (grass fat beef), and pasture and rangeland shifts.
2. Conflicts will increase due to increased demands for all resources.
3. More efficient, economical, and practical range-management practices will be needed.
4. Available forage will go underutilized under the present policies.
5. Fire hazard on forest land will increase as forage supplies increase because of underutilization.
6. Brush will increase in forested situations where grazing and prescribed fire are excluded.

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(1) Henry A. Pearson is the supervisory range scientist at the USDA Forest Service's Southern Forest Experiment Station in Pineville, LA.

Desirable objectives for future management include several aspects of forest management. Depending upon population growth and other influences, there will probably be a need to increase the utilization of the forage resources in the South to meet rising demands for food throughout the Nation. Also, management needs to reduce continually the fire hazard on forest land, especially on young plantations; provide rural community stability; and provide efficient, economical alternatives for forest land management on public and private lands with flexibility for landowners to survive poor markets for any one of the forest land commodities--timber, livestock, or wildlife. We also need to realize that most forest lands are currently producing forage below their potential. Good forest management, including periodic timber thinning, prescribed burning, and other practices, will improve forage yields and help reach the resource potentials for timber, range, and wildlife.

## Policies

The principal statutes that provide guidance for range policy on Federal lands are the Multiple-Use Sustained Yield Act of 1960, the Forest and Rangeland Renewable Resources Planning Act of 1974, the Federal Land Policy and Management Act of 1976, the National Forest Management Act of 1976, the Public Rangelands Improvement Act of 1978, and the Forest and Rangeland Renewable Resources Research Act of 1978. *The present policy on Federal lands is to develop, demonstrate, and promote sound and practical range management.* Implications of this policy include research and development of compatible livestock practices for Federal and private lands; protection and/or improvement of timber, wildlife habitat, soil and water quality; and enhanced fish and wildlife habitat. *Policy on other lands parallels Federal policy with a greater emphasis on economics, employment, and community stability.* The principal statutes that provide guidance on other lands are the Resources Conservation Act of 1976, the Renewable Resources Extension Act of 1978, and the Cooperative Forestry Assistance Act of 1978. Also, an increased interest in conservation of soil and other resources on private lands was provided and supported through the Food Security Act of 1986 (the Farm Bill).

The current policies regarding range-management programs are probably adequate for accomplishing appropriate multiple-use goals. However, emphasis needs to be placed on implementation of these policies. On Federal lands in the South, the expertise to administer range programs on the forest range is greatly inadequate. A dearth of expertise in range programs also exists for providing assistance on private lands. There is need to provide support or incentives to implement the current policies regarding multiple use on both Federal and private lands. For instance, people with expertise and program direction to accomplish multiple-use goals must be included in the work force. Policy and program support is needed to achieve the potential forage productivity and use. Emphasis will need to be placed on maximizing economical forage productivity and use compatible with other multiple uses, including timber, wildlife habitat, and recreation on forest lands. Support for these programs should include (1) developing multiple-use range-management alternatives through research with sound economic approaches and vegetation management for multiple-use enhancement, (2) promoting sound and practical range management through technical assistance and technology transfer, and (3) demonstrating sound and practical range-management practices on strategic Federal or State lands in the South to illustrate new and practical techniques for public and private lands. Research and demonstrations can best be conducted on Federal (Forest Service) lands because of the long ownership tenure, concentrated support, and administrative control. However, most of the promotion and application of practices must be conducted on private lands because forest industry or other private land owners hold most of the forest land in the South.

## Considerations

Several positive steps could be taken to enhance the overall multiple-use productivity and coordination of the South's fourth forest. These steps involve research and development efforts, active technology transfer programs, reevaluation of incentive and protection programs, and active support of the multiple-use concept of forest lands in the South.

Research and development efforts should be supported and coordinated through Federal and

State (Forest Service and State Experiment Stations, universities, Agricultural Research Service) and private research organizations. Range-management research and development programs to be enhanced should include

1. Grazing management that is economically sound and compatible with the multiple resources. Livestock grazing can be used for vegetation management to improve timber, water, and wildlife production and protection.
2. Agroforestry practices on improved pasture for intensifying management and increasing multiple-use products of timber, livestock, forage, and wildlife.
3. Identifying and protecting threatened and endangered plant species.
4. Providing technical assistance for land-use planning considering multiple-use alternatives.
5. Marketing of forest-range resources.

Federal and State organizations (Forest Service, Soil Conservation Service, and universities) should provide areas to demonstrate multiple-use practices and provide technology transfer and technical assistance programs for public and private land managers. Forestry incentive programs for pine regeneration that essentially prohibit grazing during the early years should be reevaluated to provide positive range management to utilize the available forage resource as well as protect the timber resources through vegetation management to reduce the likelihood of wildfire. Conservation Reserve Programs that prohibit grazing during the first 10 years should be reviewed to provide proper range-management practices for vegetation management on these protected areas.

In summary, "The South's Fourth Forest" needs to develop support of the range policy to conduct multiple-use management on forest lands of the Southeast that provides full consideration for all resources, including manipulation of livestock for vegetation management to enhance the forestry, wildlife, watershed, and economic goals.

## Recommendations

Here are several recommendations for range-management programs in the South that I believe are essential for appropriate administration of the South's fourth forest:

1. Support the current policy to develop, demonstrate, and promote sound and practical range management on the South's forest land.
2. Promote a positive range-management program (research, technology transfer, technical assistance, and demonstration) to protect and enhance the forest resources through vegetation management.
3. Promote agroforestry programs on improved pastures in the South.

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# The South's Fourth Forest--Creating the Future

R. Neil Sampson (1)

The forests of the South frame the quality of life in this region and always have done so. Almost half of the land in most Southern States is forest, even after three centuries of settlement and increasingly intensive land use. Whether these forests are seen as the economic base for lumbering, papermaking, shipbuilding or grazing--or the environmental base for hunting, trapping, fishing or rural living--they have always formed the background for the quality of southern life.

In addition, these forests are critically important to the Nation and the world. The production of over \$6 billion worth of forest products each year, for example, has economic implications that extend far beyond the borders of the Southern States.

The questions we ask today have not so much to do with the southern forest of today but with the forest of the future. What will it be like? Our forefathers cut down the virgin forest, and in many areas it was replaced with a mediocre second forest. Then professional forestry came along, accompanied by both public and private concern over the future of forestry in the South, and a third forest emerged. This third forest, representing a real triumph of public and private investment guided by technical skill, has supported a tremendously vital forest industry while providing a host of environmental, recreational, and esthetic benefits over the years.

Today, we recognize that the third forest is beginning to wane and that it will need to be renewed if we are to expect a continuation of the benefits we have grown to enjoy in the past.

That forests can be renewed, even greatly improved in the process, is not at issue. The third forest proved that this could be done. But what we must not forget is that renewal was no accident. It was, in fact, a gift to our generation from our forefathers. It was spurred by New Deal soil-conservation and tree-planting programs, the growth of State forestry agencies, the emergence of industrial forestry programs, the Soil Bank, and a host of public and private efforts.

That is the key word: **effort**. The challenge for the South's fourth forest is not whether or not the

region needs a productive, thriving forest--or whether or not we know how to assure that such a forest will exist in the future. The challenge is whether or not we will be willing to exert the **effort** to make it happen.

As we face that challenge, several aspects of the problem must be considered. First, we need facts about forest lands and forests, about what is happening today and what trends are affecting both lands and forests. We need some insight into where those trends seem to be leading and what, if anything, we can do to change trends that seem to be leading in the wrong way. That is why the study we are reviewing today is so important, and why the outstanding public-private cooperation that has gone into its preparation is so heartening.

In addition to information, though, we need to have a **vision** about what we want the fourth forest to be. That vision must be developed with some forethought about who and what will benefit if the vision is realized. These are not simply technical questions. The social distribution of benefits among all the citizens of this region--and beyond--are vital aspects of any proposal for future land use and management options.

The vision needs to be based in reality. We need to understand the probable limits that we face and not build a plan based on the vain hope that these limits will somehow disappear. We have only so much land, and there are other claims that will prevent every potential acre from being used for intensive timber production. These tradeoffs must be assessed.

We have technological and economic limits, too, that must be viewed realistically. We can grow a tree virtually anywhere, provided we give it the proper support. But if we are going to sell that tree as fiber on the market, we must keep the costs of growing it low enough to be competitive. This means that, on a straight economic basis, there are lands that are not now, and are not likely to ever be, feasible for use as commercial timber lands. That doesn't mean these are not valuable forests, providing a wide variety of forest benefits. It just means that we should recognize the fact that not all forests are--or should be--seen as commercial timber-growing sites.

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(1) R. Neil Sampson is Executive Vice President, American Forestry Association.

We also need to face political realities. Many soils are excellent commercial timber sites, but the land is owned by a private owner whose land-use goals lie elsewhere. That owner may favor wildlife, or wilderness, or recreation, or may simply want to leave the land alone. Despite the urges of foresters who want to see that land placed under intensive timber management, this isn't going to happen. Political reality dictates that it will be the desires of the landowner, not those of the government or any particular technical discipline or agency, that will determine what actually happens.

Recognizing these limits should not discourage us. It should strengthen our commitment to create the best possible forest within the limits we face. Meeting tomorrow's needs, and staying within realistic limits, means we need the best possible management of the available resources. This will demand a significant contribution from several sectors.

The governors are key. These political leaders can make people aware of the vital role forests play in each State. They can tie research agencies, universities, economic development programs, State resource agencies, private industry, and State infrastructure programs such as highways together in ways that no other leader--at any level of government--can do. And the governors can do the most critical job of all. They can develop a vision of the future and convince citizens that their vision is not only desirable but attainable. This is the highest art of politics, and the ultimate challenge for a political leader.

State and Federal agencies must work together. There is no room for bureaucratic turf wars; each agency can find more than enough to do. And agencies must lose their fear of working with the private sector, for there is much that can be done through public-private partnerships.

By the same token, the private sector must be willing to work with public agencies. Much needs to be done; it does more good to dig in and help do the work than to criticize government for failing to meet all expectations. And the private sector needs to look beyond the bottom line profit for 1 year (or one quarter). They need to lead the way in investing in the future, with new plants and equipment, with reforestation and timber-stand improvement, with research and development.

The facts just reviewed leave no doubt that the people of the South can build the future they want, and that the South's fourth forest can be a major

part of that future. Building the future we want is within our grasp--

- If we believe...

... In the economic and political system that we have crafted in the United States, and carry out our efforts so that we maximize the best parts of that system;

... In the land, and in its enormous capacity to heal, to renew, and to produce when we give it proper treatment and care;

... In ourselves, and the amazing variety and depth of intellectual resources we can bring to bear on a problem if we will cooperate to achieve a commonly-expressed goal.

- If we invest...

... The capital that is required to build, to repair and restore, to replant, and to manage.

... The skills that are needed to understand the land, to assemble capital and manpower, to manage and protect the investments we have made.

... The energy, both of people and of institutions.

- If we persevere...

... By establishing our efforts, and our expectations, in line with the cycles that affect forests and civilizations, rather than those that affect individuals and their daily lives. Political terms last only a few years, economic and business cycles seldom last a decade, and climatic extremes such as droughts come and go. But trees take decades to live a life cycle; good societies last for centuries; and the land will be there forever. These are the time lines we must place on our work because the emergence of a strong fourth forest in the South is not just a political victory for one leader or a business opportunity for some companies. It is a vital part of a strong society and a productive landscape in this region, not for years or decades, but for all time.

I realize foresters are the wrong audience for this message--you are trained to think in terms of the long-term future. But you must get this message to all Americans today because without it, this country could squander a major part of its resource inheritance and sell off its future through short-sighted forest management. If that happens, it will

be done by people who don't understand the critical need for wise resource management and invest-

ment, but it will be our fault for not better educating those people.











