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## A New Approach to Forest Pest Management

The Integrated Forest Pest Management Cooperative (IFPMC), located at the School of Forest Resources and Conservation of the University of Florida, was established in 1981 as a joint effort of the University of Florida (departments of forestry and entomology-nematology), the USDA Forest Service (Southeastern Forest Experiment Station), state forestry organizations (Alabama and Florida), and six major forest industry organizations. IFPMC is a research organization committed to developing and testing pest management strategies for the managed forest ecosystems of the southern United States and brings together the resources and expertise necessary to address the significant forest pest problems in the South. This cooperative effort is unique to forest pest management, although similar programs in tree improvement, nursery practices, vegetation control, and soils in the South (usually university cooperatives) served as models. This new approach to forest pest management was stimulated by the realization that pests were having an increasingly detrimental impact on managed pine forests in the South.

### Forestry in the South

The importance of forests, forestry, and forest-related industries in the South is difficult to overemphasize. The wood products industries together with the equally important but less direct values associated with recreation, wildlife, water and soil management, and aesthetics contribute significantly to the economies of the southern states.

The South currently has about 40% of the commercial timberland in the United States. These lands provide about one-half of the wood used in the pulp industry, almost one-third of that used in

the lumber industry, and approximately 40% of that used for plywood and veneer (1). Furthermore, a large portion of the increases in the wood products industries over the next 20 to 30 years is expected to occur in the South.

Some statistics from Florida, a state usually associated with beaches, orange trees, and tourists, point up the importance of forests and forest industries in the South. According to a report by the Florida Division of Forestry at the 1984 Florida Forestry Association annual meeting, 17.1 million of the state's 35 million acres are forested, with commercial forests accounting for 15.7 million acres (5.8 million nonindustrial, 4.7 million industrial, 3 million "other private," 1.6 million federal, 0.5 million state, and 40,000 county/city). During 1979-1983, 138 million seedlings were planted annually on 190,000 acres per year; during 1981, 416 million cubic feet of fiber were harvested from these operations. Also in 1981, the number of forest industry firms was 2,655, with 52,614 employees and an annual payroll of \$752 million. Total income generated in 1981 was \$5.6 billion, and total wholesale manufacturing value was \$1.4 billion.

Over the past several decades, forestry in the South has evolved from the extensive management of primarily natural stands of slash (*Pinus elliotii* Engelm. var. *elliotii*), loblolly (*P. taeda* L.), longleaf (*P. palustris* Mill.), and shortleaf (*P. echinata* Mill.) pines, or mixed pine-hardwood stands, to intensive management of pine plantations. Plantations are usually planted with loblolly or slash pine seedlings produced from the seed of parent trees selected for a variety of desirable characteristics, such as increased growth rate, bole straightness, and disease resistance. Stand sites are intensively prepared by both mechanical and chemical means, and many are also thinned and fertilized one or more times over an average rotation of about 25 years. In effect, we have chosen to manage southern pines by a modified agricultural crop system.

With the change from a relatively balanced ecosystem of natural stands with mixed ages and species to large acreages of even-aged, rapidly growing, closely spaced stands of largely two pine species, the forest pest situation worsened. Outbreaks became increasingly severe and widespread. The growing incidence of fusiform rust is an example.

Over the past 50 years, fusiform rust, caused by *Cronartium quercuum* (Berk.) Miyabe ex Shirai f. sp. *fusiforme*, has changed from a minor disease of only localized importance to one of the most widespread, destructive, and economically ruinous forest tree pests in the southern United States (Fig. 1). In large areas of the South, especially across central Alabama, Georgia, and South Carolina, this disease frequently dictates the forest management decisions relating to a given stand of pines. The increased incidence of fusiform rust and the damage caused by other forest tree pests, such as the Nantucket pine tip moth (*Rhyacionia frustrana* (Comstock)) (Fig. 2) and *Fusarium moniliforme* Sheld. var. *subglutinans* Wr. & Reinke, the cause of pitch canker (Fig. 3), are frequently concurrent with increased intensity of forest management.

### Establishment of IFPMC

An important stimulus to the establishment of IFPMC was the conclusion by several industrial organizations that a large proportion of the gains from their intensive management efforts was being lost to forest pests, especially fusiform rust. As a result, and based on the success of the existing forestry cooperatives, several of these organizations initiated discussions with the School of Forest Resources and Conservation of the University of Florida on the possibilities of establishing a forest pest management cooperative.

IFPMC was initiated in 1981 with seven full members: Alabama Forestry Commission (AFC), Buckeye Cellulose Corporation, Container Corporation of

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# Research in the South

America, Georgia-Pacific Corporation, International Paper Company, Owens-Illinois Incorporated, and Union Camp Corporation. The seven members agreed to support IFPMC for 5 years, after which further participation would be evaluated. Brunswick Pulp and Land Company and Weyerhaeuser Company joined during the second and third years. Georgia-Pacific Corporation withdrew in 1985, and Mobay Chemical Corporation became an associate member in 1986. All members except AFC are privately owned forest industry companies. Participation by AFC and the Florida Division of Forestry is significant because they provide guidance in pest management to the nonindustrial landowners who control a large proportion of the forest land in the South.

Now in its sixth year, and with a commitment from the members to a second 5-year program, IFPMC has an annual budget of approximately \$49,000, which supports a project manager, cooperative management, and eleven research studies. Although meager compared with the tasks, these funds allow for the creation of a forum and vehicle for research on forest pest management. The monetary value of the resources committed to the cooperative by the contributing members, excluding the membership fee (currently \$5,460), provides the real budget statement of IFPMC but, unfortunately, cannot easily be computed. The contributing members are responsible for study installation and maintenance and often for data collection and thus provide untold amounts of land, labor, equipment, and expertise.

In addition to full membership, associate and contributing memberships are available. For example, a chemical company could become an associate member of IFPMC and an ex officio member of the advisory council by contributing the membership fee and resources (e.g., chemicals) but, because chemical companies usually do not have significant forest land resources, would not be obligated to install experiments.

## Organization and Functions

The administrative and technical organization of IFPMC (Fig. 4) appears formal but is a loosely structured system that has been effective in other cooperatives. There are ample opportunities for conflicts, but the system works because all those who are involved have a common goal—to reduce the losses caused by forest pests.

IFPMC publishes a periodic newsletter, an annual report, and interim research reports. Most studies require 3 to 5 years, and the interim reports were started to keep members informed of progress until projects are completed and final reports and publications are prepared. No restrictions are placed on publication of project results, and all appropriate results eventually find their way into research publications available to all interested parties. Members, however, receive preliminary information and final results long before the data appear in scientific journals. Also, the data are

specific to the sites and species of the members who have participated in a project.

IFPMC holds one advisory council meeting each year at which progress and plans are reviewed and the budget is presented. This meeting is preceded by one or more meetings of the executive committee. In addition, ad hoc technical committees meet to develop and revise study plans.



Fig. 1. Fusiform rust-infected slash pine in central Georgia.



Fig. 2. Tip moth damage on loblolly pine.



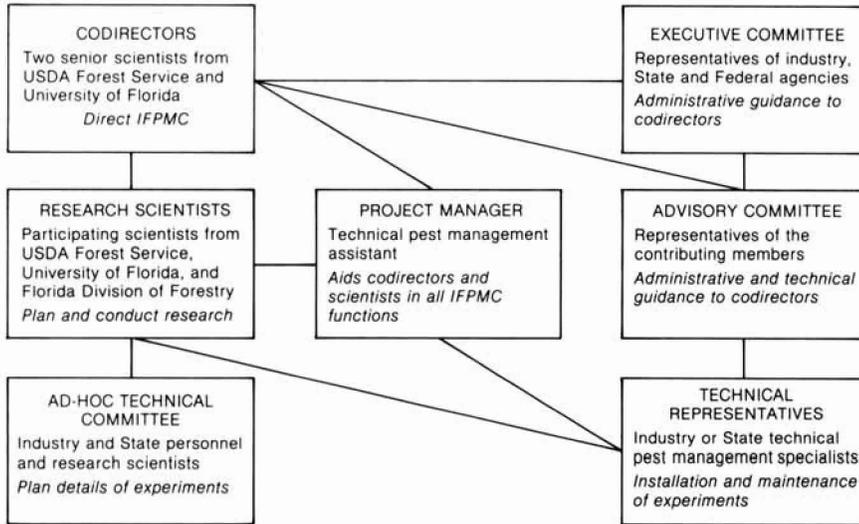
Fig. 3. Pitch canker on slash pine in northern Florida.

Scientists from the University of Florida, the USDA Forest Service, and the Florida Division of Forestry make up the research staff, which currently consists of five plant pathologists, four entomologists, and a silviculturist. The codirectors have no administrative authority over the scientists other than

reviewing proposed studies and allocating funds. Scientists remain under the administrative control of their respective organizations, and their commitment to the cooperative research studies is in addition to or part of their normal responsibilities.

The cooperative studies are proposed

and prepared by institution and/or industry scientists to meet specific needs in pest management and are reviewed by the codirectors. The members can choose the studies in which they wish to participate and assist the IFPMC staff in installing research plots and collecting data. New studies are solicited, approved, and established as funds become available.



**Fig. 4. Organization and functions of the components of the Integrated Forest Pest Management Cooperative (IFPMC).**

### A Representative Study

The manner in which IFPMC plans, proposes, and establishes studies may be best illustrated by describing one research study, "Best Management Practices (BMP) to Reduce the Incidence of Fusiform Rust in Newly Established Pine Plantations." The object of the research is to assess various silvicultural treatments, alone and in combination, for rust management in young pine plantations established in areas of high rust incidence. Treatments include: species (loblolly and slash pines), rust-resistant and rust-susceptible pine families, inoculum management (control of the alternate oak host [*Quercus* spp.]), pine growth enhancement (fertilization and/or chemical control of competing vegetation), chemical control of rust on pine, and the use of a systemic insecticide for tip moth control. Each study site

consists of 9.0 acres of treated plots surrounded by approximately 60 acres of an oak-free buffer. A similar site with oaks is set aside as the control. Three such sites will be installed in each of 3 years to provide for replication in time and space. In all, the nine sites will encompass in excess of 1,000 acres in four states (Alabama, Georgia, Florida, and Mississippi), and the study will span 10 years. Data will be collected in years 1, 3, and 5; additional time will be required for installation and analyses.

The study was developed as follows:

1. Research scientists and an ad hoc technical committee prepared the study plan and the codirectors reviewed and funded it.

2. The study plan was submitted to members for consideration and possible participation.

3. Cooperators agreed to select sites, prepare them for planting, and install the study.

4. From information provided by associated forest genetics cooperatives, rust-resistant and rust-susceptible pine families were selected, and seed was collected and donated by industrial cooperators.

5. During a 3-year period, 60,000 seedlings will be grown in an industrial nursery, lifted, and packaged for distribution (20,000 seedlings were produced and planted at three sites during both 1985 and 1986).

6. Participating companies will plant the study sites, apply the treatments, maintain the area, and aid in data collection in years 1, 3, and 5.

7. Research scientists will aid in installation and data collection, summarize and analyze data, and publish results.

8. Evaluation and utilization of results are the responsibility and prerogative of each company, since management objectives and economic considerations differ among organizations.

The total cost of establishing and maintaining study plots and collecting and analyzing the data from the nine BMP sites will probably exceed several hundred thousand dollars. It is highly unlikely that such a project would be possible without the joint effort and the collective strength provided by IFPMC.

Other IFPMC studies include seed orchard pest monitoring, management of the redheaded pine sawfly, management of pitch canker disease, evaluation of control methods for annosus root rot (*Heterobasidion annosum* (Fr.) Bref.), efficacy of salvage-sanitation in fusiform rust-infected plantations, shelterwood management for fusiform rust control, the role of inoculum in fusiform rust epidemics, development of a life table and pest inventory system, virulence mapping for fusiform rust, and timed-release fertilizer-pesticide for fusiform rust and tip moth management.

## The Importance of IFPMC

The research accomplishments of this new cooperative—now in its sixth year—represent only a single measure of its value and utility to southern forestry. Less obvious but equally important measures include: 1) enhanced cooperation among scientists and research groups, 2) a means for increasing interactions between the public and private sectors, and 3) access to large industrial data bases that otherwise might not be made available for general distribution. We are hopeful that the presence and activities of IFPMC will heighten awareness of the critical need for pest management in southern forests, increase financial support for research, enhance the employment opportunities for forest pest management specialists, and, of greatest importance, move forest pest management into the woods as an integral component of silviculture and forest management.

Disease and insect pests cause millions

of dollars in losses in the managed forests of the South. These losses diminish the gains obtained in other areas of silviculture. Integrated forest pest management has the potential to reduce the losses and thereby increase forest productivity. IFPMC was established because of a recognized need to research, test, and implement integrated pest management strategies on an operational level within the confines of appropriate silviculture and forest management. The ultimate goal of IFPMC is to identify and recommend the opportunities to enhance forest productivity through more effective and planned preventive pest management.

## Literature Cited

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Robert A. Schmidt

Dr. Schmidt is professor of forest pathology at the University of Florida. He has been codirector of IFPMC at the University of Florida since the cooperative's beginning in 1981. He has taught and conducted research at the University of Florida, with a joint appointment in forestry and plant pathology, since 1967. Previously, he was employed by the USDA Forest Service. He received his B.S. degree in forestry and his M.S. (1961) and Ph.D. (1964) degrees in plant pathology from Pennsylvania State University. His primary area of research has been in the epidemiology of forest tree diseases, especially fusiform rust in intensively managed southern pine forests.