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Forestry and IPM

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Is integrated forest pest management a new term for an activity already understood and practiced since the beginning of forest management? Although foresters have understood the management aspects associated with pests, the integrated systems approach in pest decision-making is new. The forest manager of today has the opportunity to develop a complete forest management plan that integrates all aspects of management, including pest management.

by Harold S. McNabb, Jr. and Elwood R. Hart

The acronym IPM (Integrated Pest Management) is encountered by the highest circles of national and international institutions as well as by individual growers and land users. To the forester, integrated *forest* pest management may appear to be a new term for an activity already understood and practiced since the beginning of forest management. This is both true and false! The long-term nature of forestry that defers financial return and causes the compounding of costs during the rotation age necessitates the *management* of pathogens and insects at economically tolerable levels. But, the concept of IPM goes much further than this understanding and practice of the term management. IPM also involves a systematic approach in making decisions in the development of pest management schemes. This approach not only facilitates the practical application of pathology and entomology research results but directs new research into areas of need for future improved pest management systems (Figure 1).

In addition, IPM involves the realization by the forest manager that potential pests need to be considered and their management integrated into the plan at the *beginning* of the development of a forest management plan for an existing stand or new plantation (Waters and Cowling, 1976). The current "crisis" management of pests wastes time, resources, and potential forest products and services. Too often, a slight change in earlier management practices would have managed the pest problems. For example, when planting red pine in Michigan, the site should be risk-rated for future Saratoga spittlebug injury (Heyd *et al.,* 1979). A moderate to high rating would present four options to the landowner: 1) accept risk and plant; 2) plant and monitor insect populations, spraying when needed; 3) plant and reduce insect alternate hosts, i.e., sweetfern; and 4) do not plant. Depending upon the risk-rating, monitoring and spraying may produce higher returns on the first rotation of red pine but reduction of alternate hosts also would benefit future rotations. Thus, if the potential for the pest is recognized at the time of stand establishment and the forest management plan developed accordingly, the problems may not arise or at least could be projected and thus minimized.

An IPM system has for its foundation an understanding of the host, the pest, and their interactions within variable, but to a degree, predictable biological, physical, and socioeconomic environments (Schmidt, 1978). Although past research has produced much information on insect and pathogen relationships, one critical area of research normally was neglected; the establishment of impact figures on host or host-stand values for different pest levels. Such information is necessary for the development of ecomically sound pest management schemes. Once an economic disease (pathogen) or injury (insect or mite) level is determined, the role of the pest in the specific forest ecosystem is better understood (Figure 2).

How is all this research information that is needed for pest management decisions assembled and evaluated? Present computer technology has been invaluable in making true IPM possible. For example, the Expanded Douglas-fir Tussock Moth Research and Development Program recently completed by the United States Department of Agriculture develolped a series of models that integrated such information (Brookes *et al.,* 1978). These models, in turn, were integrated, allowing the forest manager to visualize the effects of different management alternatives over a period of 180 years. This final integration of the "Probability of Outbreak Occurrence and Stand Involvement Model" (Outbreak Model), the "Model of Growth of Host Stands" (Stand-Prognosis Model), and the Socioeconomic Model illustrates the power of modeling in decision making using management systems. A caution should be noted, however; models are dynamic, not static, systems. Continuous updating as new data become available is a necessity. Not only is information becoming more refined but changes in the environments, especially the socioeconomic environment, can be expected over time. The complexity of the information needed for a pest management system and how models are developed with this information are best illustrated in the final report of the Douglas-fir tussock moth program (Brookes *et al.,* 1978). this synthesis of the Douglas-fir tussock moth injury problem presents the "anatomy" of an Integrated Forest Pest Management system better than ever before. Although this specific "anatomy" appears complex, in reality this problem is reatively simple when compared with other present major forest pest problems, i.e., Gypsy moth, southern pine beetle,

Harold S. McNabb and **Elwood R. Hart** have joined together in developing and teaching a two-quarter sequence in Forest Pest Management. The 1979-80 academic year is the fourth time they have offered this jointly taught endeavor. With their similar teaching philosophies, the interest and help of the students, and a supportive faculty, this cooperative teaching experience has been a career highlight for these two teachers. A two-volume work—a workbook on causal agents, symptoms and signs, and a book of pest management readings and simulation games—is being used and improved for possible wider publication and distribution.

Scleroderris canker, dwarfmistletoe, and spruce budworm.

This article has attempted to present a brief overview of the place Integrated Pest Management has in forestry. Although foresters have understood the management aspects associated with pests, the integrated systems approach in pest decision-making is new. The forest manager of today has the opportunity to develop a complete forest management plan that integrates all aspects of management, including pest management. Unless or until complete management integration becomes a reality in Forestry, the great potential that the IPM system has to offer will not be realized.

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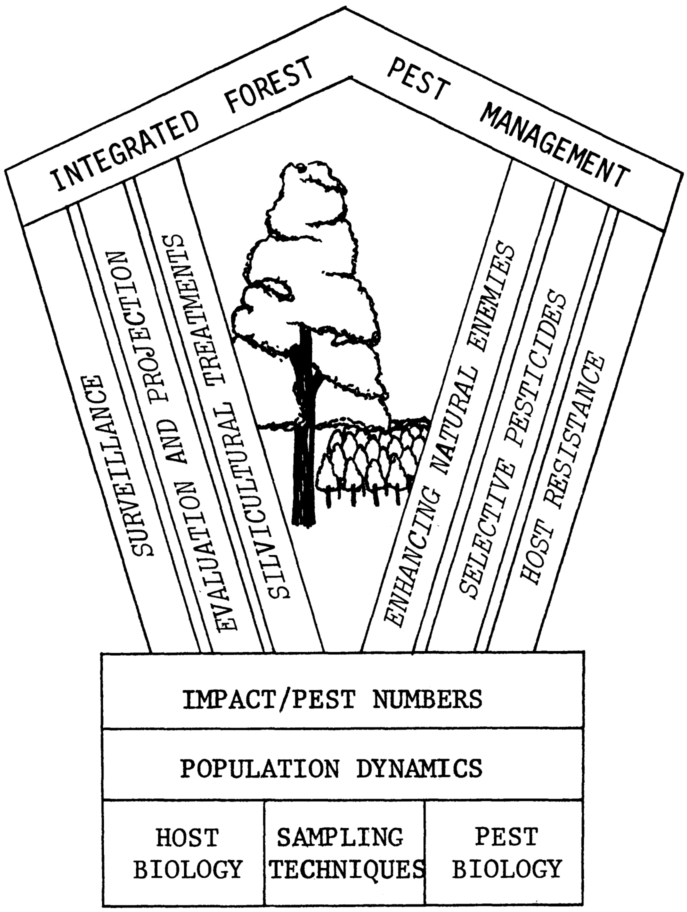

Figure 1.
Schematic drawing showing how Integrated Forest Pest Management is supported by a systematic problem solving approach of problem determination with integrated alternative solutions, all of which rest upon a firm foundation of basic research results (after Gonzalez, 1970; and Pedigo, 1975).

Figure 2.
Schematic graph of fluctuations of major pest (pathogens, insects, mites, weeds, etc.) types and their relationship to the economic disease or injury level (after Stern *et al.,* 1959; and Pedigo, 1975).