Abstract: Decisions about dwarf mistletoe control are made by a process common in forest pest management and, indeed, common in forest resource management. The decision-making process is examined in detail, to show its logic, to demonstrate that landowners or resource managers are the decisionmakers, to review what inputs and decisions have to be made in the process, and to clarify the responsibilities of forest pest management (and other) specialists in the process. The point is made that today's landowners and resource managers typically need information that only specialists can provide, and that specialists are not informed enough to make sound land management decisions.

INTRODUCTION

In this panel we are to discuss the topic "Control Planning and Decisionmaking" -- or the how, when, and where of control decisions and the information base needed to make sound decisions. The essential steps of the control decision process will be outlined, with the objectives of 1) indicating that there is a logical sequence of events leading to control decisions, and 2) providing a reference framework into which the remarks and contributions from others in the field may be placed.

The control-decision process is made up of a logical sequence of steps leading to answers to the questions, "Do I control?" and, "How do I control?" The answers to these questions should be based on information about the stands, pest-caused losses, management goals, environmental and social considerations, and control options. As I briefly go through the steps in the control-decision process, I will indicate which steps are information gathering -- and what information is needed and where you might best get it -- and those steps that are decisionmaking. I will indicate who should make the decision, and what kinds of decisions might be made.

What I am describing -- the processes of informed decisionmaking which are used by forest landowners and resource managers -- is not unique to dwarf mistletoe work. Whether and how a landowner or resource manager reacts to dwarf mistletoe is determined by processes used in deciding what to do about many other things affecting him and his forest resources. Those who provide technical advice and assistance to landowners and resource managers, therefore, should know the kinds of information needed and the value of this information to the decision-making process.

PATHWAY TO CONTROL DECISIONS

The steps in the decision process are arranged into a flowchart (fig. 1) and will be discussed in the logical order in which they occur in the process.

Step 1: "Detection of Pest Activity." -- A pest activity on the forest is detected. I say "pest activity" because, at this point, it is yet to be determined if it is a problem. Pest detection takes place in several ways. For example, it may occur as a casual observation, as in the course of a forest management inventory; or, it may be the result of a pest survey. Indications of pest activity include the appearance of the pest, signs of tree damage, loss of growth, or tree death.
Figure 1--The pathway to control decisions is a logical step-wise progression in 13 steps.
Step 2: "First Control Decision." -- At the time the pest activity is detected, or shortly thereafter, someone is required to make the first control decision, and this decision begins the process. Essentially, this first decision is based on the question, "Might this pest activity be important in the management or ownership of this forest or stand?" If the answer is "no" -- that is, if the owner or manager's estimation the pest does not pose a problem to his ownership or management objectives -- the process ends and no further action is required. A "no" answer can result from such things as low damage levels, damage to noncommercial species, and management constraints. If the answer is "yes," we proceed to Step 3.

Step 3: "Definition of the Pest Problem." -- At this step the biological information needed for decisionmaking is assembled. Because so much else depends on it, this information must be sound. It is not necessary, however, for the total biological information package to be prepared only by pest management specialists. To clarify, the work of getting the biological information falls in two categories. Learning where the problem is, what host trees are affected, and the current losses are jobs that can be done by the forest resource manager or landowner, as well as by specialists in Forest Insect and Disease Management (in the Forest Service), State forest pest control units, and private industry (consulting forest entomologists and pathologists). The expertise of pest management specialists should be used, however, to get the other biological information needed: the interrelationships of insects and diseases with forest conditions that have caused the situation, and the prediction of what will happen if no action is taken -- that is, expected pest-caused losses and stand development.3

Step 4: "Definition of Management Goals." -- The determination of management goals is one of the most frequently overlooked steps in the control-decision process. In many single-purpose management units, the goals may be easy to define, but in multiple-use forest management units, they may be quite varied. The land and resource management plans at various administrative levels should be a good source of information for defining the objectives of the particular unit.

Step 5: "Pest Effects on Management Goals." -- Now that the landowner or resource manager has information on the effects of the

3/When pest management specialists undertake all the work described in this step, they refer to it as "biological evaluation."
are available from forest pest management specialists (Forest Service, State, and private industry) in identifying the environmental and social effects of control options.

Step 9: "Identification of Benefit/Cost Relationship." -- In this final input step, the economic effects of taking no action at all and of taking each of the alternative control options are determined. Economic values are applied to information from Steps 3 and 5: current and predicted effects of the pest on management goals. Assigning realistic economic values to damaged or undamaged forest resources, and human values are more than just monetary, measurable in dollars. Examples of things that have difficult-to-measure human values include: seeing wildlife, experiencing peace, feeling solitude, having a forest setting for recreation, identifying with the living force of a forest environment, feeling the great ages represented in forests, and witnessing the cycle of life and death in forest ecology. Complicated and controversial or not, human values involved in a pest situation must be identified and weighed by the decisionmaker in any benefit/cost relationship.

The role of pest management specialists in this Step is to identify the resources affected by the insect or disease and to help quantify the damage to those resources of concern to the landowner or resource manager. When the benefit/cost relationships have been clarified, the decisionmaker is ready to take the next step.

Step 10: "Comparison of Alternatives." -- In this Step the landowner or resource manager compares the control options available to him. He examines and contrasts the biological, environmental, social, and economic consequences of taking no action at all, and of taking each of the alternative control actions that were identified for him.

In the Forest Service it is at this step in the decisionmaking process that the Environmental Analysis Report is written. Missing from the completed report, of course, is a statement of what the decision is, and why; that comes at the next Step. At this step, the job is to assemble all of the information that will be considered in making that decision. This documentation of the information considered in making decisions that affect the environment is a requirement of the National Environmental Policy Act.

Step 11: "Selection of Control Options." -- After comparing the various alternative actions he might take and the consequences of each, the landowner or resource manager makes his decision at this Step. He may decide on no control action at all. Or he may select more than one option -- he might select a chemical control for immediate suppression and a cultural control for long-term prevention.

Step 12: "Integration of Control Options with Land and Pest Management Programs." -- In this Step, the landowner or resource manager plans the meshing of the control activities into his program of work in order to reach his objectives effectively, efficiently, and with as little disruption of his other resource management activities as possible. The investment of manpower, equipment, and dollars for control must be timed and given whatever priority is appropriate. The planned action could clash with other pest management programs in the same forested area. For example, a thinning operation for pine dwarf mistletoe control would produce slash in which Ips beetles could build up, later attacking the residual stand. Timing the thinning operation would be one of several possible ways to prevent that problem. In general, a pest management specialist should assist the landowner or resource manager in planning the implementation of the control action.

Step 13: "Implementation, Including Post-Treatment Evaluation." -- The planning and decisionmaking processes should lead to action. It has been argued that sound business and sound management result, as a matter of course, in an examination of whether or not the objectives of any particular action are met. Nevertheless, that does not happen often enough. Yet a pest management specialist must invest resources where there are pay-offs, and must document them. Therefore, the pest management specialist needs to work with resource managers who will use his expert knowledge, and needs to make sure that results of control actions are evaluated.

Post-treatment evaluation is achieved by planning, for each project, how to determine whether control objectives were met, and then making that determination. The work involved may be very simple in some projects; in others it may be complex enough to require the assistance of specialists, both in planning and in field work.

The post-treatment evaluation includes the results of any monitoring activities that were part of a project. Many projects today include monitoring as a result of the decisionmaking process. That is to say, the decisionmaker has examined the information available to him and
decided on a particular action that is to have either no adverse environmental impact or else an acceptable level of impact. Without monitoring the project, he cannot demonstrate that any environmental impact was within the limits that he decided were acceptable. In the Forest Service, the Environmental Analysis Report or Environmental Impact Statement prepared for a project often states that monitoring will take place. In such projects, post-treatment evaluation is even more important.

CONCLUSIONS

This, then, is a view of the control-decision process in detail. Some of the steps described can be taken almost automatically, and others may be combined with one another in actual practice. Any process looks complicated and even artificial until it is examined in detail. Knowing what the process is, however, is essential for identifying who is responsible for doing what, and when. Too often, the roles of pest management specialists are confused with the responsibilities or prerogatives of landowners or resource managers. We do better work when we each do our own job.