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TECHNOLOGY TRANSFER IN FOREST PEST MANAGEMENT: A CASE HISTORY

John A. Witter,¹ Gary A. Simmons,² Bruce A. Montgomery,¹ Randall G. Rogan²

ABSTRACT

The current approach being used in the spruce budworm technology transfer program for the Lake States is described. During 1981–1982, we concentrated on needs assessment surveys and the development and packaging of materials in five areas: general manual, chemical control handbook, silviculture handbook, instruction manual for remote sensing workshops, and technical reports on budworm impact on spruce-fir stands. We present a list of factors that researchers and technology transfer specialists should consider when planning a research and technology transfer program in forest pest management.

The major objectives of this paper are two-fold: to present our current spruce budworm technology transfer program for the Lake States, and to present a few basic comments on technology transfer procedures in forest pest management.

During the last 10 years, there have been a number of USDA research programs that have concentrated on forest pest management programs for gypsy moth, Douglas-fir tussock moth, southern pine beetle, and mountain pine beetle (Ketchum and Shea 1977, Berryman et al. 1978, Brookes et al. 1978, Thatcher et al. 1980, Doane and McManus 1981). The USDA has also been involved with the Canadian Forestry Service during the last five years in the Canada-USA Spruce Budworms Program (Grimble 1981). Two other important USDA research projects have concentrated on decay associated with tree wounds and ways to protect wood from termites and decay (Haverty 1977, Shigo 1979). At the state level, Gary Simmons, Louis Wilson, and Daniel Mosher organized the Michigan Cooperative Forest Pest Management Program in 1978. This group has helped immensely in improving the exchange of information between researchers, pest management specialists, and users in the State of Michigan. As part of each of these research programs, and the Michigan Cooperative Forest Pest Management Program, various technology transfer plans or approaches were developed or are in the process of being developed.

A SPRUCE BUDWORM TECHNOLOGY TRANSFER PROGRAM FOR THE LAKE STATES

For hundreds of years, the North American boreal forests have experienced periodic spruce budworm outbreaks. Fir and spruce usually regenerate after a spruce budworm outbreak, reaching a merchantable size in 40–60 years. Although the spruce budworm is an integral component of spruce-fir forests in North America, it normally does not prevent the continuity of spruce-fir forests.

In the Lake States, the spruce budworm was not considered a major problem until recent years. The expansion and addition of several pulp and paper mills has led to greater market demand for spruce and fir and has led to more intensive forest management practices. Forest managers are now quite interested in techniques to reduce the amount of impact of the spruce budworm on spruce-fir stands in the Lake States.

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DEVELOPMENT OF TECHNOLOGY TRANSFER PROJECT

The various agencies in the Lake States received numerous requests for spruce budworm information during summer and fall 1978. Therefore, pest management specialists representing eight different units organized and sponsored a one-day workshop on the spruce budworm which was held on 13 December 1979 in Escanaba, Michigan. It was quite obvious at the meeting that various user groups needed information on the spruce budworm in the Lake States. During the next year, informal discussions on implementation of a technology transfer program for the spruce budworm continued. This culminated with a meeting on Technology Transfer which was held in Ann Arbor in December 1980. After this meeting, a demonstration project on "Spruce Budworm Technology Transfer in the Lake States" was organized and a proposal was submitted to the Canada-USA Spruce Budworms Program for funding considerations. The proposal was approved and the program started on 1 June 1981. Numerous participants from Michigan State University and The University of Michigan have been involved with this technology transfer project.

GOALS

The overall project goal is to provide the land manager with pest management information on the spruce budworm in the Lake States.

Specific project goals are (1) to establish and maintain communication between scientists and users of spruce budworm management information, (2) to design and implement an education program on spruce budworm and spruce-fir management for a variety of professional and non-professional information users, and (3) to utilize the target audience feedback in the planning, implementation, evaluation, and modification of the effort.

APPROACH

Our approach to the technology transfer program can be described in eight steps: (1) Design of study plan. (2) Appointment and meetings with the Advisory Committee representing user groups such as the Departments of Natural Resources (DNR) of Michigan, Wisconsin, and Minnesota; U.S. Forest Service, National Forest System; and U.S. Forest Service, State and Private Forestry, Forest Pest Management. (3) Development and administration of Needs Assessment Surveys on Spruce Budworm and Spruce-Fir Management for pest management specialists and researchers, education specialists, and foresters. (4) Analysis and interpretation of Needs Assessment Surveys. (5) Listing of needs and methods for delivering the information. (6) Development and packaging of products for the users. (7) Periodic evaluation of technology content and process. (8) Modification of study plan for each year based on evaluation of content and process and new needs of user community.

We have concentrated our efforts on the intermediate information movers (i.e., forest pest management specialist, technology transfer specialist) as key people who need the updated material and who will then supply this information to the user in their area. We chose this approach because we are dealing with an entire region instead of a smaller area such as a county or state. Another major premise in our technology transfer program is that feedback from our users is essential and must occur at each step in our approach.

FIRST YEAR OF PROJECT (1981-1982)

During 1981-1982, we have concentrated our efforts on six items: needs assessment surveys, development of manuals and handbooks, development of remote sensing workshops, development of media packages, telephone conference with advisory committee, and evaluation of processes and products.

Needs Assessment Surveys. The first major task of the technology transfer program was the preparation of two needs assessment surveys. The surveys were aimed at the information mover and the forester. The objectives of the surveys were to determine the patterns of

communication, channels of communication, information needs, and best methods for packaging the information.

In the first survey, 42 pest management and information specialists in the Lake States were interviewed during August through October 1981. Preliminary analysis of the survey data has revealed some interesting features associated with the needs, attitudes, and techniques of Lake States technology transfer specialists. Most interviewees obtain their spruce budworm information from the U.S. Forest Service, State and Private Forestry; Canada-USA Spruce Budworms Program; and state DNR's. The major obstacle in obtaining information was the time required to review budworm material. Other obstacles for some respondents in obtaining information were lack of good information, and for others, overabundance of information. The participants commented that the lack of feedback and insufficient staff were their major problems in disseminating information.

According to 50% of the interviewees, their clients most often requested information on spruce budworm control. Other heavily requested items were information on salvage and utilization, prevention techniques, and methods for monitoring spruce budworm populations. Future subject areas of concern to the interviewees were prevention, hazard-rating, insect monitoring, economics, and control. The major ways respondents wanted to receive information were by agency bulletins such as "how-to's" and handbooks; scientific periodicals; workshops, conferences, and meetings; and technical manuals.

In the second survey, over 400 foresters in the Lake States were interviewed in a telephone survey during January through April 1982. The results of the forest managers' survey is currently being compared with the results of our information movers' survey. This will give us a comprehensive picture of the various communication channels between information movers and forest managers, along with a breakdown of specific information needs. During our first year of operation, the development and packaging of materials for users was based on the information movers' survey. In our second year of operation, we will have the information available from both surveys to help us in developing and packaging information for our users.

Development of Manuals and Handbooks. A second major task in 1981-1982 was the development and packaging of materials for our users. We have concentrated our efforts on four areas: general manual, chemical control handbook, silviculture handbook, and technical reports on budworm impact on spruce-fir stands.

A preliminary version of the *Spruce Budworm Manual for Technology Transfer Specialists in the Lake States* was published in November 1981 for pest management specialists, researchers, and information and education specialists (Montgomery et al. 1981). Converting specific, sometimes controversial, highly technical material into a readable and informative manual is difficult. We wanted to be certain that the revised manual's format, writing style, and content best served the intended audience. Using the feedback mechanism, the preliminary manual was mailed to over 150 budworm specialists in North America for their review. The objective of this mailing was to promote technology transfer, to request comments and criticisms, and to obtain more current information from other regions. Thirty-five pest management specialists and researchers, including 15 from the Lake States sent comments. Overall, the reviews were positive with the only major conflict between reviewers related to the length of the manual and the intended audience.

One group of reviewers was satisfied with the length and amount of information while a second group of reviewers felt the manual was too long, and contained too much general information and not enough condensed, application-oriented material. From a decision-making point of view, the feedback on the manual was very helpful. We found out there were two intended audiences and they could not be provided the needed information in only one format. Therefore, two manuscripts were developed: a long version somewhat similar to the preliminary manual and a condensed "how-to" handbook. An updated, greatly revised *Spruce Budworm Manual for the Lake States* (Montgomery et al. 1982) was distributed in June 1982. A condensed "how-to" handbook will be available for distribution in December 1982.

Two additional 6 by 9 inch handbooks on *Insecticides for Control of the Spruce Budworm* and *The Relationship of the Spruce Budworm to Spruce-Fir Silviculture in the Lake States* are currently being completed.

Analysis of the first four years of a seven-year research study on the impact of the spruce

budworm on spruce-fir stands in Michigan's Upper Peninsula was recently completed. Four technical reports that present the impact information in a condensed, applied manner for the land manager have been published (Lynch et al. 1982 a,b,c,d).

Remote Sensing Workshops. During 1981-1982, we planned, developed, and conducted two workshops on "Spruce Budworm Damage Assessment with 35mm Air Photos." The workshops were intended for practicing foresters and forest pest management specialists dealing with spruce budworm damaged stands or forest stands susceptible to such damage. The workshops were held in Sault Ste. Marie, Michigan, and Norway, Michigan, on 22-23 April 1982, and 26-27 April 1982, respectively. In each workshop, emphasis was placed on the principles of obtaining and interpreting 35mm color air photos for damage assessment and hazard-rating of spruce-fir stands under Great Lakes conditions. A programmed instruction manual for self-study was prepared and used in the workshop (Olson, Witter et al. 1982). The workshop and instruction manuals were well received by the workshop participants. The final revision of the self-study instruction manual is completed (Olson, Sacks et al. 1982).

Development of Media Packages. Recently two popular articles describing the spruce budworm problem and research efforts to combat it (Gosling 1981, Witter et al. 1981) were published in Lake States' periodicals that reach a large number of small landowners who would normally not seek out information on forest insects. Likewise, news releases on the spruce budworm were distributed throughout Michigan. Many newspapers featured the articles which gave readers a general idea of the spruce budworm problem and the current status of the infestations.

Visual media packages are being planned for the future. Slide-tape shows will be used as educational devices for classes, clubs, and professional societies, and to accompany presentations at teleconferences and workshops. Videotapes will be used to introduce general subject matter to small groups at workshops, for public and affiliated television programs, and as a training aid for various agencies that need to learn or review specific techniques when dealing with the spruce budworm.

Telephone Conference With Advisory Committee. The preparation of a seven-month progress report provided us with an opportunity to implement a relatively innovative technology transfer technique, the telephone conference. We assessed the telephone conference's potential as a viable medium for future information exchange between researchers, planners, pest management specialists, and users. The evaluation procedure was two-fold: obtaining pre- and post-conference feedback from the participants regarding their expectations and satisfaction with the telephone conference call, and conducting a cost-benefit analysis of the telephone conference in comparison to a standard conference meeting. Preliminary analysis of the telephone conference indicated that the telephone conference is an excellent way to exchange information between managers and pest management specialist if the number of participants is under 15.

Evaluation of Processes and Products. Process evaluation is concerned with assessing the way project activities are undertaken and completed. Product evaluation is concerned with the assessment of product output. These types of evaluations are useful in helping to determine what works and what does not work. It enables project staff to make the necessary changes so that the project operates more efficiently and effectively.

Project staff conducted a follow-up survey on the process evaluation of the information movers' needs assessment survey. The objectives of the follow-up interviews were to determine how respondents felt about the needs assessment survey questions, the interview session itself, and the needs assessment approach. Respondents generally felt that the questions were adequate for assessing their particular needs. Nearly all considered the survey to be a worthwhile and efficient use of their time, as well as a pleasant experience. Most respondents felt that the survey was a rational approach for the design of future project activities, as long as the information is used. Future evaluations will include both product and process evaluation.

DISCUSSION

Until recently, technology transfer in forest pest management most often operated in a hit-or-miss fashion rather than in a planned approach. The major objective of a technology

transfer plan is to transfer developed technology to the users. The goal of all technology transfer plans is to deliver valuable research results to the user through various types of media that will ensure the information is easily understood and used in the shortest time possible (Nicholls and Prey, in press).

Marx (1980) discussed seven items or ingredients of a simple technology transfer plan. The ingredients are (1) message—what is being transferred, (2) objective—expected accomplishments, (3) team—identify people and skills needed, (4) audience—potential users, (5) media—mechanisms for transferring the technology, (6) budget—cost in dollars and time, and (7) evaluation—assessment of program.

After reviewing numerous articles on technology transfer, we prepared the following list of factors that researchers and technology transfer specialists should consider when planning a research and technology transfer program: (1) Plan the technology transfer efforts at the beginning of the research program instead of waiting until the end (Allen et al. 1982). (2) The researcher should involve the user at the beginning of the research program instead of waiting until near the end of the research program (Witter and Mog 1981). (3) The researcher should work very closely with the technology transfer specialist in developing the technology transfer plan (Nicholls and Prey, in press). (4) The researcher should have a better understanding of the factors that help or hinder technology transfer efforts (Nicholls and Prey, in press). (5) The researcher should have a better understanding of the innovation process and factors that affect it (Moeller and Shafer 1981, Muth and Hendee 1980). (6) The researcher should have a better understanding of how innovations are diffused among potential users (Muth and Hendee 1980). (7) More emphasis must be placed on packaging the product: how and what type of media. See Marx (1980) for a checklist of media appropriate for agriculture and natural resources. (8) More emphasis must be placed on advertising the results of your program to the user community (Nicholls and Prey, in press).

There is a much better chance of having a successful research and technology transfer program when the above factors are seriously considered by the researcher and technology transfer specialist.

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