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Impact

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The goal of this study was to determine the extent to which the Silviculture Institute, a 12-week continuing education program for mid-career silviculturists, has influenced the practice of silviculture in the Pacific Northwest.

Desired impacts were determined in conjunction with the three major stakeholders in the Institute: program leaders charged with running the program, participants who have attended the program, and supervisors responsible for monitoring silvicultural practices in the Pacific Northwest.

Two mail surveys were administered: one to all silviculturists who completed the Institute during its first 10 years, and the other to all USDA Forest Service District Rangers and BLM Area Managers in the Pacific Northwest. Fixed-response questions were used to look for seven major impacts identified by program leaders and others, while open-ended questions were used to look for unanticipated impacts.

Response rates were very high: 82 per cent for the Supervisor Survey and 88 per cent for the Participant Survey. Responses from the two groups were similar to one another throughout the survey. Seven major impacts identified at the beginning of the study appear to have occurred at a significant level. Relatively few meaningful differences were noted in the responses of various sub-groups within the two survey populations.

Participants and supervisors were asked seven open-ended questions intended to let them express their thoughts about the Institute in their own words. Again, the response was high. Both groups noted many positive impacts of the Institute--on those who have participated in it, on the organizations for which they have worked, and on silviculture in general. Examples were given of significant economic returns resulting from the Institute. Increased stress on silviculturists was one important negative impact experienced by those who have attended the Institute. Organizational inertia was identified as the principal factor limiting the impact of the Institute. Although many respondents expressed strong support for the Institute, many also recommended ways to improve its effectiveness. Finally, the silvicultural certification process used by Region 6 of the USDA Forest Service received significant criticism, along with many suggestions for improvements.

**THE SILVICULTURE INSTITUTE:
AN ASSESSMENT OF IMPACT**

by

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THE SILVICULTURE INSTITUTE: AN ASSESSMENT OF IMPACT

INTRODUCTION

"The need to assess the impacts of adult and continuing education is one of the most important challenges confronting continuing educators today."

-Boone, Fox and Joseph 1979-

THE PRACTICE OF SILVICULTURE IN A CHANGING ENVIRONMENT

The Silviculture Institute is a 12-week long continuing education program aimed at mid-career silviculturists in the Pacific Northwest. It was developed in 1978 as one of a family of programs designed and conducted by various western universities at the request of the USDA Forest Service. Although descriptions of these programs can be found in the forestry literature (Beaufait et al. 1981, Ellen 1981, Puuri and Weinmann 1981), a brief recounting is needed to set the stage for this particular study.

The late 1960's and early 1970's was a time of political and environmental activism in the United States. The actions of few government agencies escaped critical public scrutiny, and those of the United States Forest Service were no exception.

The charge of the USDA Forest Service is relatively simple, at least in theory. It is, in the words of Gifford Pinchot (1910): to manage the forest lands of the

country to provide "the greatest good for the greatest number for the longest time." Within this framework, the job of the silviculturist is to "develop and implement area-specific plans for managing vegetation to achieve the objectives of resource management" (Puuri and Weinmann 1981). Until the late 1960's the silviculturist was relatively unchallenged in carrying out this mission, in part because of the remoteness of most National Forest land, and in part because of the low profile of forestry in general.

During the 1960's, however, management practices on several large and highly visible National Forests brought the forest management activities of the entire USDA Forest Service to the attention of a sizable, and vocal, segment of the American public (Puuri and Weinmann 1981). Suddenly, the agency found its practices falling under the scrutiny of "highly educated and knowledgeable people specializing in various parts of the forester's business" (Beaufait et al. 1981). No longer were silviculturists being left alone to manage forests as they saw fit.

Several other changes were occurring at the same time. First, timber was no longer king of the forest (Beaufait et al. 1981)--people wanted more from their forest lands than at any other time in history. In fact they demanded it--and they were not sure that the Forest Service was prepared, or even inclined, to give it to them. Second, the forests themselves were changing

(Beaufait et al. 1981). Extensive stands of large old timber were dwindling, and were being replaced by younger, thriftier stands. This posed different challenges and created new opportunities for those who managed the forests. However, many of the techniques that foresters had learned in school to handle trees of the large old forests simply did not work on the "new forests" of the 1960's and 1970's.

In 1973, to help silviculturists and other foresters meet the challenges described above, the Chief of the USDA Forest Service directed Regional Foresters "to establish procedures and guidelines for training and certifying personnel authorized to prepare silvicultural prescriptions" (Puuri and Weinmann 1981). The Northern Region of the USDA Forest Service (Region 1) was the first to respond, with both a certification process for its silviculturists and a continuing education program known as CEFES (Continuing Education in Forest Ecology and Silviculture) to help prepare them for certification. In 1978 the Pacific Northwest Region of the Forest Service (Region 6) responded with its own certification process and educational program, the Silviculture Institute. Other Regions developed certification processes and educational programs that addressed their own unique needs. Although each of these regional programs is independent of the others, and significant differences do exist among them, their histories and the

developmental processes that gave rise to them are interconnected.

THE SILVICULTURE INSTITUTE: ITS STRUCTURE AND FUNCTION

The Silviculture Institute is conducted jointly by Oregon State University (OSU) and the University of Washington (UW). Although it was developed at the request of the USDA Forest Service, the content and format were largely determined by the universities, with input from representatives from the USDA Forest Service. Likewise, although USDA Forest Service employees dominate the Institute's list of participants throughout history (Table 1), it has always been open to other agencies and private forestry organizations.

Table 1. Organizational affiliation of all Silviculture Institute graduates from 1978-1988 (SI I-X).

<u>Organization</u>	<u># Graduates</u>	<u>Per Cent</u>
USDA Forest Service	200	74
Bureau of Land Management	40	15
Bureau of Indian Affairs	13	5
Private Industry	9	3
State Agencies	7	2
<u>Educational Institutions</u>	<u>2</u>	<u>1</u>
Total	271	100

One session of the Institute has been offered each year since its inception in 1978-79. Each session is identified by a Roman numeral indicating its relationship to the first session; as a result, the first Institute is

commonly referred to as SI I, the second as SI II, and so on. Each Institute consists of six two-week modules, with each university (OSU and UW) responsible for three modules. Each university furnishes one overall Institute coordinator, and a module leader responsible for planning and implementing each of the three two-week modules for which the university is responsible. Overall leadership for the Institute rotates between the universities on a three-year cycle. Together, the coordinators, module leaders, and representatives from the Region 6 Office of the USDA Forest Service and the Oregon Office of the Bureau of Land Management comprise a program coordinating committee that determines policy, sets entrance requirements, establishes content, and monitors effectiveness of the Institute.

Although the Institute was not developed around a set of concisely worded educational goals and objectives, its 1989 advertising brochure states that its primary objective is:

"to develop and refine participants' capabilities for making sound, cost-effective forest management decisions through application of basic concepts of biology, statistics, and economics."

Although not stated explicitly within this objective, it is clear that the Institute has also continuously tried to broaden the perspective of participants beyond timber, and to improve their abilities to make decisions that will withstand the close scrutiny of others. In an

operational sense the Institute has continuously focused on improving the abilities of participants to produce "ecologically and economically defensible prescriptions" (Beaufait et al. 1981).

Although the exact content of each module has varied from year to year, with changes in instructors and feedback from participants, the overall structure of the Institute has remained relatively constant throughout its history. Module 1 has always dealt with forest autecology, the physical and biological foundations of forests. Module 2 has always dealt with integrated forest ecosystems, in which participants learn to integrate the physical and biological components of the forest into the forest ecosystem. A third module (sometimes called Module 3 and sometimes Module 4) has always included statistics and forest measurements, in which participants learn to collect and analyze quantitative data, and to use various models to help them make decisions. A fourth module (sometimes called Module 3 and sometimes Module 4) has always combined economics and problem-solving, in which participants examine the principles of economics and decision-making as they apply to forest decisions. Module 5 has always encompassed regeneration and stand management, in which students integrate biological and economic concepts into a framework that can be used to solve typical forestry problems. The final module, Module 6, has always focused

on a single major real-world problem that requires participants to synthesize and apply much of what they have learned earlier in the Institute. In this final module participants work in small groups to produce written prescriptions that are evaluated in the field by a team of module leaders, instructors, and invited guests. This project is of special use to USDA Forest Service personnel who face a similar challenge when they attempt to become certified silviculturists.

Teaching strategies vary from module to module, but are dominated by lecturing in all but the final module. Lab exercises and field trips are included where appropriate. Classes generally run eight hours a day, five days a week, but night and weekend sessions are not uncommon. Instruction is intended to be at the "graduate level," although this is more true of modules dealing with technical forestry subjects than those dealing with statistics and economics. Exams and course grades are given for individual modules. Modules completed at the University of Washington automatically receive graduate credit, while those at Oregon State receive credit only under special circumstances.

In contrast to many continuing education programs, interested individuals must actually apply for acceptance into the Silviculture Institute. Because of the desire to conduct instruction at the graduate level, academic

credentials are an important requirement for acceptance into the Institute. Participants in the Institute have all been college graduates; of the 214 who responded to this survey, 189 (88%) had Bachelors degrees at the time they attended the Institute, 23 (11%) had Masters degrees, and 2 (1%) had doctorates. Most had degrees in forestry, although a few had degrees in related fields with compensating experience in forestry. Because of the cost associated with each module (approximately \$1600 per module per student in tuition and lodging alone), employers have been careful to nominate candidates who were likely to succeed within the Institute, and who were likely to repay their organizations through improved practices when they returned to work.

Professional experience is also a selection criterion. Originally the Institute was intended for silviculturists (or other foresters who have significant silvicultural responsibilities) in "mid-career"--those who had graduated from college at least ten years prior to attending the Institute. However, as that population has been re-educated, the mid-career criterion has become more loosely defined. Currently, only two years of field experience are required for admission, although most candidates have more.

Organizational affiliation is not an entrance requirement, per se. Although the Institute was originally developed for USDA Forest Service personnel,

others have always been encouraged to attend. Of the 271 people who completed the Institute over its first 10 years, 74 per cent were from the USDA Forest Service and 15 per cent were from the Bureau of Land Management; the remainder were from the Bureau of Indian Affairs, the Oregon State Department of Forestry, the Washington Department of Natural Resources, and private industry (Table 1). Although the majority of participants from within the USDA Forest Service came from within Region 6, about 6 per cent came from Region 10 (Alaska) and about 2 per cent came from Region 5 (California); a few came from other regions (more accurate figures are not available).

Although most participants complete all six modules of the Institute within a single 12-month period, it is possible to participate in individual modules. In the first 10 years of the Institute about 100 people completed at least one module without completing all six. About six people completed all six modules over a span of more than 1 year (more exact figures are not available).

Instructors in the Institute are, for the most part, faculty members of Oregon State University and the University of Washington, although specialists from outside the universities are sometimes called upon to deliver short segments of instruction. The roles of individual instructors vary dramatically from module to module; some modules have as few as four instructors who

teach for several days at a time, while others have as many as 25 instructors who each teach for 1 or 2 hours. It is generally the role of the module coordinator to tie individual segments of instruction together and to assess the level of learning that has occurred.

SILVICULTURAL CERTIFICATION AND THE SILVICULTURE INSTITUTE

Throughout most of the Silviculture Institute's history, silvicultural certification has been a process unique to the USDA Forest Service; to my knowledge, no other organization or agency in North America had a similar program. Within the past several years, however, the United States' Bureau of Indian Affairs and the Canadian province of British Columbia have experimented with certification, but neither had a fully-developed program at the time this study was conducted. Therefore, for the remainder of this paper silvicultural certification will refer exclusively to the process used by the USDA Forest Service.

Although the Silviculture Institute and the USDA Forest Service's silvicultural certification process are independent of one another, their histories, as well as people's perceptions about them, are so closely linked that a brief description of certification is warranted.

The purpose of silvicultural certification is to "attest to an individual's competence in prescribing treatments in designated areas such as regions or

national forests" (Puuri and Weinmann 1981). Specific requirements for certification, and regulations governing the exact role of certified silviculturists within USDA the Forest Service, vary from Region to Region within the organization. In Region 6 (the Pacific Northwest) the goal is to have at least one certified silviculturist on each District Forest within the Region. The certified silviculturist is then responsible for checking each silvicultural prescription developed within that District and for certifying its viability.

Candidates for certification within Region 6 are selected based on a combination of educational and silvicultural experience. Although the Silviculture Institute is the most common way of meeting the educational requirement, it is not the only way; some meet the requirement through traditional graduate programs, while others meet it through a combination of formal and informal training and educational activities.

During the certification process each candidate presents a specially-prepared silvicultural prescription to a review panel composed of specialists both from within and outside the USDA Forest Service; faculty who teach within the Silviculture Institute are typically included on this panel. The presentation consists of a fully-documented written prescription, followed by an oral defense to the review panel. Candidates who meet the certification requirements are certified for five

years, after which they must reapply for certification. Candidates who fail to meet certification criteria are usually encouraged to try again.

Because the Silviculture Institute was developed at the request of the USDA Forest Service, and because the Forest Service has provided three-fourths of the Institute's participants, academic preparation for the certification process has played a large, but not exclusive, role in determining the form and function of the Institute. The driving force behind the Institute has always been improving the silvicultural skills of those who attend, regardless of their organizational affiliation or any hurdles they must cross within those organizations. For the most part, the goals of preparing better silviculturists and helping specific silviculturists prepare for the certification process have not conflicted. Perhaps the one area in which non-Forest Service silviculturists feel the greatest concession has been made to the certification process is in Module 6, which focuses almost entirely on the development and defense of a single silvicultural prescription. Although this is similar to the certification prescription in intent and scope, the Institute's prescription is a group project while the USDA Forest Service's certification prescription is an individual project. Program leaders of the Institute

have frequently discussed this issue and have continually reaffirmed their convictions that defending prescriptions is an important part of any silviculturist's education, regardless of their organizational affiliation.

THE SILVICULTURE INSTITUTE: PAST EFFORTS AT EVALUATION

Since its inception, leaders of the Silviculture Institute have collected information from a variety of sources to improve their program. Program leaders meet annually as a group, and sometimes more frequently in smaller units, to discuss successes and failures, and to restructure segments of instruction based on feedback they have received. The most common source of information is participants who have completed the program in the preceding year. However, the forestry community in the Pacific Northwest is small enough that instructors and other program leaders frequently receive feedback from former participants, from those who supervise former participants, and from other officials within the organizations who send participants to the Institute.

The most common form of evaluative information is participant feedback collected during the Institute, itself. For example, near the end of most modules, participants are asked to provide feedback on the quality of instruction they have received during the previous two weeks. Most often this is done in writing, via a brief

course evaluation form administered by the module leader or one of the instructors. Less commonly, module leaders choose to collect information via small-group feedback sessions, often administered by a neutral third party. In some cases student feedback is not collected at all.

Regardless of the format chosen, these evaluative efforts focus on instructional events immediately surrounding the module (e.g. effectiveness of instructors, testing procedures, appropriateness of content, quality of food and lodging), rather than on long-term implications of the instruction. Distribution of the results from these evaluative efforts rests in the hands of the individual module leaders; they are free to share the information with whomever they wish. Some share it with other instructors; some share it with other program leaders; some share it with no one. In short, although participant evaluation is common in the program, and plays an important role in program improvement, there are no standard policies or procedures to guide its collection or use.

Evaluative information is also collected by instructors and program leaders who continue to have professional contact with former participants long after they have completed the Institute. Although such contacts typically provide highly selective feedback, they can, and often do, provide insights that lead to improvements in subsequent offerings of the Institute.

The Silviculture Institute and its sister programs around the country have also been reviewed in a larger context, however. Two review teams from the Washington, D.C., office of the USDA Forest Service have been assembled, at least in part, to evaluate the effectiveness of the Institute and similar programs in meeting the needs of the USDA Forest Service.

The first of these review panels was appointed in 1979 to appraise progress that the USDA Forest Service was making toward its goal of "training and certifying personnel authorized to prepare silvicultural prescriptions" (Puuri and Weinmann 1981). Although the focus of this panel was on the larger issue of certification, significant attention was focused on the educational programs that had been established to help prepare silviculturists for the certification process. While the findings of this panel that pertained directly to the effectiveness of the Silviculture Institute were undoubtedly shared with leaders of the Institute immediately following the review, formal documentation of those findings apparently did not occur.

The second review panel convened in the mid-1980's and focused more closely on the Silviculture Institute. In this effort a panel composed of representatives from the Washington, D.C., and the Region 6 offices of the USDA Forest Service toured the Pacific Northwest Region,

meeting with program leaders of the Institute, former participants in the program, and various supervisory personnel at the District and Forest levels of the Forest Service. Again, the emphasis was on certification and the role that the Institute played in helping silviculturists prepare for that process, but much attention was focused on the Institute itself. As with the first review panel, findings were shared with leaders of the Institute, but formal documentation of those findings apparently did not occur.

THE NEED FOR THIS STUDY

The Silviculture Institute has been offered annually since 1978. By the completion of its tenth class in 1988, 271 participants from forestry organizations and agencies from around the Pacific Northwest had completed the 12-week course of study; another 100 had completed more than one but less than six modules. During that time, sponsoring agencies spent nearly \$3,000,000 on tuition and fees alone; if salaries for participants, costs for food and travel to program sites, and indirect costs of filling-in behind participants who were away from their jobs for almost a quarter of one year were added to the costs of tuition and fees, the price-tag would surely double.

When compared with the cost and effort devoted to conducting the Silviculture Institute, efforts aimed at

determining its effectiveness have been limited.

Although each of the evaluative efforts described in this section contributed to program improvement in different ways, none sought a rigorous, systematic answer to the question of whether the Institute had a significant impact on those who attended it; none sought to determine whether the Institute actually changed how participants practiced forestry once they returned to their jobs. This study attempted to remedy those shortcomings.

THE PURPOSE OF THIS STUDY: GOALS AND OBJECTIVES

The goal of this study was to determine the impact of the Silviculture Institute on the professional activities of those who completed the program during its first 10 years, on the organizations for which they worked, and on the practice of silviculture in the Pacific Northwest.

To meet this goal, two specific objectives were established:

1. to determine the extent to which a particular set of desired outcomes had resulted from the Silviculture Institute, and
2. to determine the extent to which other, unanticipated, outcomes had occurred.

LIMITATIONS OF THIS STUDY

While it is important to understand what this study attempted to accomplish, it is just as important to understand what it did not attempt to accomplish.

1. This study was not a comprehensive evaluation of the Silviculture Institute. It ignored important program features such as quality of instructional staff, validity of instructional goals and objectives, effectiveness of particular segments of instruction, quality of facilities and support services, and cost-effectiveness of the program. Instead, it sought to determine what impact the instruction had on the actions of participants once they returned to their jobs.

2. This study was not comparative in nature; it did not seek to compare the Silviculture Institute with other continuing education programs in silviculture from across the country. Instead, it sought to determine the effectiveness of the Silviculture Institute in bringing about changes that were important to that particular program.

3. This study was not intended to be predictive or generalizable; it did not seek to determine who is likely to experience the greatest impact from future Institutes, or what others should do in establishing or conducting their own continuing education programs. Instead, it

focused on the success of the Silviculture Institute in accomplishing certain specific goals.

4. Finally, this study was not intended to be judgmental in nature; no conclusions were drawn about the overall success or failure of the Silviculture Institute.

Instead, it was intended to provide program leaders with information that would help them improve the program in the future.

If any of these purposes had been the primary intent of this study, different methods would have been used.

LITERATURE REVIEW

"Evaluating the impact of education means going beyond the measures of satisfaction and learning gain, to assessment of practical application in terms of changed performance and societal benefits."

-Knox 1979-

THE ROLE OF CONTINUING EDUCATION IN FORESTRY

Continuing education has long been accepted as an integral part of the professional forester's development. Numerous studies have documented the need for it (e.g. Bullard and Straka 1987, George and Dubin 1971, Krygier 1982, Puuri and Weinmann 1981), articles about it permeate the forestry literature (e.g. Beaufait et al. 1981, Hampton and Stauffer 1981, Straka 1983, Vaux 1972, Zabel 1984), major symposia have been dedicated to it (e.g. Krygier 1973), forestry programs at major universities devote thousands of hours to it annually (Oregon State University alone offers approximately 25 programs each year), and the Society of American Foresters actively and continuously supports it (e.g. Berntsen 1981, Cristensen 1981, Flinchum 1981). Clearly continuing education occupies a significant portion of the time and energy of the foresters responsible for managing natural resources, as well as the time and energy of the people responsible for educating those foresters.

Continuing education programs in forestry span the gamut of issues and skills important to natural resource managers in today's rapidly changing world. Some programs focus on skills that foresters were exposed to as undergraduates but did not have time fully to develop. Some focus on issues that had not yet arisen while they were in school. Still others focus on broad-based skills, such as decision-making, personnel management, and communications, that at one time did not seem important to their jobs. Regardless of their breadth and scope, continuing education programs in forestry, like those in other professions, typically have two principal missions: 1) to impart knowledge to their participants, and 2) to change the behavior of those participants once they return to their jobs (Morris and Fitz-Gibbon 1978). Although most of the time associated with any single continuing education program is likely to be spent on the first of these endeavors, the second is generally perceived to be the ultimate goal of most programs (Patton 1978, Boone et al. 1979).

Although continuing education programs in forestry have many strengths, most share one significant shortcoming--they are designed and implemented by people who are experts in their technical specialties but who have little or no training in education. One result is that few programs include evaluation procedures that enable them to determine whether they have accomplished

the objectives they have set for themselves. This is not unique to continuing education programs in forestry; in fact, in other professions, such as medicine, dentistry, and librarianship, it seems more common than not (Boone et al. 1979, Hiatt 1979, Knox 1979, Pratt 1979, Raizen and Rossi 1981, Weiss 1972c). Although there are many factors working against the concept of program evaluation in continuing education, perhaps the most important is the "assumption of good" that accompanies most programs (Pratt 1979). Program leaders who operate under this premise often equate exposing people to information with changing their behavior, a fact seldom borne out by research (Pratt 1979).

THE ROLE OF EVALUATION IN CONTINUING EDUCATION

Evaluation means many things to many people, a feeling effectively captured by Carol Weiss (1972a), who described evaluation as "an elastic word that stretches to cover judgments of many kinds." It may be conducted for a multitude of purposes (sometimes referred to as the "roles" of evaluation), may have a variety of goals (from internal decision-making to external judgments), may be directed toward many different aspects of the design or conduct of the particular program under review (e.g. inputs, processes, products, outputs, or outcomes), and may rely on a number of different frames of reference for making judgments (e.g. comparisons with other

programs, with fixed standards, with stated goals, or with past performances).

Finding where one fits in the grand scheme of evaluation is perhaps the first, and most crucial, step in conducting an evaluation of any type; there is simply no such thing as an all-purpose evaluation (Weiss 1972a). Although it is beyond the scope of this paper to review the entire field of evaluation, readers interested in such a review might wish to check one or more of the following: House (1980), Kaufman and Thomas (1980), Popham (1975), Rossi and Freeman (1979), Scriven (1973), Stake (1976), Weiss (1972a), Wolf (1984), or Worthen and Sanders (1973).

Two fundamental decisions that must be made at the beginning of any evaluation process are whether the study will be developmental or judgmental in nature--"formative" or "summative" in the language of evaluation (Scriven 1967)--and whether it will focus on inputs into the educational process or outputs from it (Kaufman and Thomas 1980). Each of these distinctions is significant in determining what to look for, where and how to look, and how to use the information once it has been collected. Formative evaluations seek to provide information that will help program leaders improve the program in the future. Summative evaluations typically seek to provide information that will help decision-

makers outside the program decide whether to continue or terminate the program. Evaluations that focus on inputs examine features important to offering the program, such as qualifications of instructional staff, time spent on various aspects of content, participant selection, support services, appropriateness of instructional goals and objectives, and budgets, while evaluations that focus on outputs examine the accomplishment of program objectives, either in the classroom or after participants have returned to their home environment.

This study of the Silviculture Institute is formative and outcome-oriented in nature. Its underlying purpose is program improvement, rather than program judgment, and it focuses on outcomes that result from the educational process, rather than on inputs into the process, or the conduct of the educational process itself. In educational jargon this type of study is commonly referred to as impact evaluation, outcome evaluation, or impact assessment. Impact assessment was chosen for this study because it reduces the threatening connotation so often associated with the term "evaluation."

Although impact assessment is described differently by different authors, there is general agreement that it strives to assess the effectiveness of a program in accomplishing its terminal objectives (Rivera et al. 1983, Smith and Straughn 1983). Typically those

objectives lie well beyond the classroom, either in time or space; they focus not on the success of participants in learning what was presented to them during the program, but on how that information influenced what they did once they left the classroom (Knox 1979). In essence, impact assessment seeks to determine the extent to which intended changes have taken place, and the extent to which the program under investigation is responsible for those changes (Raizen and Rossi 1981). Although most commonly thought of as being summative in nature (Knox 1979), impact assessments may be formative as well, as long as their focus remains on program improvement (Scriven 1967, Cronbach 1982).

The need for impact assessment is readily acknowledged by continuing educators and evaluation specialists alike. Some have called it "one of the most important challenges confronting continuing educators today" (Boone et al. 1979). In spite of this, there is little in the literature that will help anyone interested in conducting an impact assessment. Relatively few studies are ever published, perhaps because they tend to be "recent and local" (Knox 1979), perhaps because they seldom succeed in identifying any significant impacts (Weiss 1972a), perhaps because of political ramifications (Pratt 1979), and perhaps because much of the best work is accomplished by doctoral students who move on to other

things once their degree has been obtained (Mann 1972). Of the few studies that are published, most occur in such disparate sources that they are hard to find (Mann 1972). As a result, the true extent of impact assessment is largely unknown, and those who seek to conduct such studies find little help in the literature (Corbett 1979, Hiatt 1979, Pratt 1979). Only a few specialized sources, such as Airasian (1974), Knox (1979), Le Breton et al. (1979), Patton (1978, 1980, 1981, 1982, 1983) and Weiss (1972a, 1972b) offer practical advice and share examples from real-life impact assessments.

IMPACT ASSESSMENT: PROCEDURES AND PITFALLS

Impact assessment is based on three assumptions: 1) that program effects can be identified, 2) that program effects can be measured, and 3) that program effects can be separated from other effects not resulting from the program (Smith and Straughn 1983). Although simple in theory, each step presents significant obstacles. Some arise because continuing education programs are conducted in an "action setting" (Weiss 1972a) in which the emphasis is on the next offering rather than the last. Others occur because continuing education programs are seldom designed or conducted in a manner that lends itself to evaluation.

Identifying possible program impacts is the first step in conducting an impact assessment. Although most

evaluation literature would lead one to believe that this hurdle can be easily cleared by referring to existing program goals, those involved in program evaluation have generally not found this to be true (Weiss 1972b). In practice, this procedure is complex, time-consuming, and frustrating--often the most difficult task for the evaluator to complete. There are a number of reasons for this:

1. Program leaders commonly think in terms of information presented, rather than the impact they hope the information will have on their learners (Knox 1979).
2. Outcomes may be experienced directly by those who have participated in the educational program, but also indirectly by those two or three times removed from the actual program (Corbett 1979, Patton 1980, Sanders 1982), or by organizations for whom the participants work (Weiss 1972a).
3. Some significant impacts that arise from a program are likely to be unanticipated by program leaders (Sanders 1982).

Once potential impacts have been identified, it must be determined how and where to look for them. If the desired impacts are immediate and directly observable, this would be an easy task, but this is seldom the case. Often, desired impacts occur so long

after the educational program that they are difficult to trace back to their origins (Corbett 1979). Often the desired impacts involve thought processes, rather than observable behaviors. And often a desired impact is to help participants deal with an uncertain, and rapidly changing, future (Matarazzo 1971), a goal that defies measurement. To some extent each of these represent goals of the Silviculture Institute, and therefore presented obstacles that had to be resolved in this impact assessment.

Once desired impacts have been identified, and methods of measurement have been determined, the final challenge is to separate effects of the program under investigation from those of other factors. This is especially difficult for continuing education programs because the professional activities of those who participate in them are so complex, and there can be an almost infinite array of intervening variables to cloud the picture (Knox 1979).

How, then, does one overcome these numerous obstacles to program assessment? Key concepts used in this study include stakeholder involvement (Weiss 1983), triangulation (Green and Walsh 1979, Patton 1980), indicators of impact (Hamilton and Mamory 1983), and the use of both quantitative and qualitative evaluation methods (Patton 1980).

The central premise of stakeholder evaluation, also called utilization-focused evaluation by Patton (1978), is that evaluations will only be successful to the extent that those interested in and affected by the results are included in the entire process. Stakeholders must be used to help focus the evaluation, determine possible impacts, determine methods of measurement, interpret results, and implement recommendations.

Triangulation--also called convergence (Mark and Shotland 1987) and establishing a chain-of-evidence (Palola and Lehmann 1976)--simply means collecting information from a variety of sources about impacts of the program. Most often, this means combining direct measurements and personal observations with the observations and opinions of a variety of others.

Indicators of impact are useful when the impacts, themselves, are not directly observable. When this situation occurs, as it often does in continuing education programs, investigators must rely on observations or measurements of activities that permit them to make inferences about the occurrence of the desired impacts. Although they would always prefer to have proof of impact, they are often forced to settle for the likelihood of impact (Knox 1979).

Finally, when some significant impacts are likely to be subtle, and others are likely to be unanticipated or even opposite of what might be hoped for, those who

look for program impacts should use a combination of quantitative and qualitative methods. While quantitative methods result in data that are succinct, systematic, and easily aggregated for analysis, qualitative methods encourage depth and detail, and are more likely to capture unanticipated results of the program under investigation.

So, there are no easy solutions when trying to assess the impact of a continuing education program--no models to follow and no ready-made strategies, either for identifying desired impacts or for determining whether they have occurred. Still, the questions asked during an impact assessment deserve answers; in fact, in many cases the process involved in formulating the questions is as important as the answers that are found (Patton 1978). In impact assessment, as in so many facets of life, the journey is often as important as reaching the destination.

PROCEDURES

We cannot overstress the difficulty of undertaking impact evaluations."
- Rossi and Freeman 1989 -

The idea of assessing the impact of educational programs is generally perceived as an important one, both within evaluation literature (Boone et al. 1979, Fox 1984, Weiss 1972a) and among those who conduct such programs. Unfortunately, although the literature contains a number of useful concepts and principles to guide those interested in conducting impact assessments, it contains relatively few concrete suggestions. As a result, the procedures used in this study were the conclusion of a lengthy trial-and-error process. So that this document will be useful to others interested in conducting impact assessments, it describes a few of the problems encountered along the way, and a few of the dead-ends explored, as well as their final solutions.

PROCEDURAL CHALLENGES

There were two principal procedural challenges associated with this study: 1) determining what impacts to look for, and 2) determining how to look for them. Somewhat unexpectedly (given the long and successful history of the Institute), the first of these challenges was by far the more difficult to resolve.

A number of factors were particularly important in limiting the ability of this study to both identify and assess impacts that have occurred as a result of the Silviculture Institute. While some are unique to the Institute, some are likely to apply to other continuing education program.

1. The Institute is an on-going program; as a result, program leaders have their attention focused on what will happen in the future rather than on what has happened in the past. For the most part, program assessment is viewed as being different from, and generally less important than, program development and implementation. As a result, only limited time, resources, and energy are devoted to program assessment.

2. The Institute is ever-changing; although the overall structure has remained fairly constant through time, instructors and content have changed from year-to-year. As a result, no two offerings have been the same and there are no clear lines of demarcation within the history of the program.

3. The Institute is generally viewed as an educational program rather than a training program. As a result, much of the instruction has no immediate application, or has applications that are not directly observable. In addition, program leaders and instructional staff often

view application as a responsibility of the participants rather than as their own. Such a view makes it difficult to determine whether specific outcomes have occurred.

4. Since its beginning, the Institute has been conducted around a set of loose educational understandings, rather than a clearly-stated set of measurable goals and objectives. As a result, one of the most difficult steps in this study was to get program leaders to identify, and agree upon, a set of desirable outcomes.

5. Participants enter and leave the Institute with dramatically different job responsibilities, and therefore dramatically different chances to apply their new-found knowledge. Not everyone who attends the Institute is a silviculturist; not everyone who arrives as a silviculturist leaves as one, or remains one for a significant period of time following completion of the program; and even those who are silviculturists may have dramatically different job responsibilities depending on the organization and the unit for which they work. Such variety makes it difficult to establish criteria for success that will apply to all graduates of the Institute.

6. The Institute is only one factor that influences the on-the-job performance of those who graduate. Much of what they do when they return to work is heavily

influenced by management directives, organizational constraints, budget limitations, the availability of a particular technology, the actions of colleagues who are responsible for critical actions that precede or follow those of the Institute graduate, and the receptivity of peers and supervisors to new ideas. In addition, Institute graduates constantly receive information from sources other than the Silviculture Institute that influences their behavior. Together, these factors make it exceedingly difficult to isolate and identify impacts that have resulted from the Silviculture Institute itself.

7. No control group exists with whom Silviculture Institute graduates can be readily compared. Within the Pacific Northwest, silviculturists who have attended the Institute generally have different academic qualifications and professional credentials than those who have not attended. In many respects Institute participants are the best and brightest that their organizations have to offer, and they would be likely to make a difference within their organizations regardless of their participation in the Institute. Outside the Northwest, silvicultural challenges, and the operating environment for silviculturists, are different enough from those within the Northwest that it would be

difficult to accurately compare silviculturists from different regions.

8. Not being able to compare people who have attended the Institute with those who have not attended leaves the alternative of looking at individuals before and after their participation in the Institute, but this approach carries its own set of problems. People change with time; maturation and life experiences may result in at least as many changes as participation in the Institute. In addition, so many other sources of information are likely to influence the participants' professional activities that it becomes difficult to separate effects of the Institute from other factors.

9. Finally, assessments of impact typically rely on the perceptions and memories of those who have participated in the programs under review; this study was no exception. Individual perceptions are dramatically influenced by opportunities and challenges that present themselves to participants following completion of the program, and memories, as we all know, are commonly faulty.

These limitations are not presented as excuses for shortcomings of this particular study, or as insurmountable barriers to conducting impact assessments in general; nor are they significantly different from the

challenges faced by others who have attempted to assess the impact of other continuing education programs (Knox 1979, Smith and Straugh 1983, Weiss 1972a). Instead, they are presented to help readers understand important factors that shaped this particular study, from the procedures chosen to the conclusions drawn.

IDENTIFYING DESIRED IMPACTS

Perhaps the first, and most logical, step in attempting to assess the impact of an educational program is to identify the impacts the program seeks to have (Smith and Straugh 1983). Given the long history of the Silviculture Institute, and the fact that it is generally perceived to be a successful program, identifying desired outcomes might seem like an easy step. Nothing could be farther from the truth. Without question this was the most difficult and trying stage in this study. Apparently this is neither a new nor unusual circumstance when evaluating educational programs (Freeman and Sherwood 1965, Weiss 1972a).

Although evaluation literature attaches great importance to identifying desired impacts, it provides little concrete guidance for accomplishing that task. For the most part, suggestions are limited to general strategies such as checking existing goals and objectives, or asking those who conduct the program what impacts they would like it to have (Smith and Straugh

1983). However, these methods will only work to the extent that the program has been designed and conducted around a set of measurable goals and objectives, or to the extent that program leaders are willing and able to think in terms of desired impacts rather than in terms of content presented. Regardless of these shortcomings, this approach provided a reasonable place to begin.

Initial attempts to use the Institute's existing goals and objectives proved fruitless. Goals and objectives for the Institute exist at several levels: 1) the overall program, 2) individual modules, and 3) individual segments of instruction. None of these proved particularly useful when looking for impacts beyond the classroom, however. The single overall program objective states:

"the primary objective is to develop and refine participants' capabilities for making sound, cost-effective decisions through application of basic concepts of biology, statistics, and economics".

Although this helps describe what the program is trying to accomplish in broad terms, it is neither comprehensive enough to describe the range of instruction that takes place, nor specific enough on which to base an assessment of impact. Objectives written at, or below, the module level typically describe information that participants will be exposed to within the module, or instructional processes that will be used, rather than impacts the instruction is intended to have on the learners once the

module is over. Although such objectives are useful within the instructional setting, they do little to describe changes in behavior or thought processes desired beyond the classroom.

The second plan of attack was to work with the three major stakeholders in the Institute--program leaders, participants in the program, and those who supervise participants on-the-job--to derive a set of desired impacts. This approach was attractive since it is conceivable, and even likely, that each group might have its own expectations for the program (Patton 1978, Weiss 1983).

A good deal of effort was devoted to this stakeholder-based approach, with multiple and sometimes lengthy group sessions held with various sets of program leaders and participants in the Institute. Although several long lists of potential impacts were generated from this effort, no one seemed satisfied that a meaningful, comprehensive set of impacts was identified.

The principal problem with this approach was that the stakeholders had relatively few expectations beyond the classroom itself. In greatly over-simplified terms, it seemed enough for program leaders that the Institute itself was a rigorous and challenging academic experience; whether, and how, participants made use of the information presented in the Institute was someone else's responsibility. Along similar lines, participants

seemed satisfied that the program was academically interesting, and readily accepted the fact that it was necessary for their professional advancement; few had thought how it might actually change their actions when they returned to work. Supervisors readily accepted the fact that their districts needed certified silviculturists, and that the Institute was the typical way to get them, but they had not given much thought to long-term impacts beyond this.

In short, although valuable information about desired impacts was gathered from each of the stakeholders during this process, no formal lists of desired impacts were developed from these efforts. Although the idea of major long-term impacts seemed intriguing to each of the principal stakeholders, there was little success in agreeing what those impacts might actually be.

The approach finally selected combined information collected from the stakeholders with knowledge that I gained from being a participant-observer during Silviculture Institute VII. Apparently this combination of techniques is the one most often employed by those who commonly practice program evaluation (Weiss 1972a). As a result of this effort, approximately 65 potential desired impacts gathered from program leaders and participants were combined into seven major impacts--six of which

pertained to individual silviculturists, while the seventh pertained to silviculture in general (listed in next paragraph). Each of these seven impacts was, in turn, further defined by a set performances, attitudes, or attributes that helped describe and define each major impact. Eventually, these performances, attitudes, and attributes would serve as indicators of whether the major impacts were being achieved.

This set of seven major impacts and their indicators was shared with four principal program leaders (rather than the 12-14 program leaders originally assembled) who were asked to evaluate their accuracy and sufficiency in describing desired outcomes from the Institute. Minor modifications resulted in the following list of impacts:

- A. The Silviculture Institute hopes to produce silviculturists who:
 - 1. make more defensible silvicultural decisions,
 - 2. have broader silvicultural perspectives,
 - 3. are better problem solvers,
 - 4. practice more innovative silviculture,
 - 5. exhibit more confidence in their silvicultural decisions, and
 - 6. are more influential within their organizations and the forestry profession.
- B. The Silviculture Institute also hopes that as a result of its program, silviculturists and silvicultural decisions will be held in higher esteem, both within and outside the forestry profession.

The list of performances, attitudes, and attributes that help define each of these major impacts may be found in Appendix A.

Although at first glance this list of desired impacts and indicators appears reasonably specific, closer inspection reveals that individual items are open to widely varying interpretations. At the beginning of this study it was hoped that some specific, concrete measures of the Institute's success could be identified--perhaps by directly observing silviculturists on the job, by examining reports they use to document their daily activities, or by checking the success of activities for which they are responsible (such as reforestation or thinning practices). Many factors conspired against this, especially the realization that the Institute simply has not been conducted in a manner likely to bring about specific, identifiable changes, and the realization that although many silvicultural activities have improved throughout the history of the Institute, factors in addition to the Institute have contributed to those improvements (such as the effect of improved nursery stock on regeneration success).

As a result of these many problems, the lists of major impacts and indicators described above were settled upon as the best, most specific outcomes that could be identified for the Institute. In addition it was conceded that this study would need to rely on perceptions about the role of the Silviculture Institute in bringing about these changes, rather than on more direct measures.

LOOKING FOR IMPACTS

Impact assessments typically rely on collecting information from multiple perspectives, rather than from a single source, especially when the intended outcomes are difficult to observe directly. Some refer to this process as "establishing a chain of evidence" (Palola and Lehmann 1976), while others call it "triangulation" (Green and Walsh 1979, Patton 1980) or "convergence" (Mark and Shotland 1987). Regardless of its label, the principal of multiple observers of multiple events is the same.

A number of methods for collecting information were considered for this study before the final selection was made: mail surveys, phone surveys, personal interviews, in-field observations of Institute graduates, field prescriptions prepared by participants on-the-job, and even successful court appearances, to name but a few. Mail surveys were chosen as the preferred method for a variety of reasons, especially the desire to reach a high percentage of Institute graduates, the desire to explore potential impacts in significant detail, and the difficulty of reaching individual members of the population because of their wide-spread locations and the field-oriented nature of their jobs. Again, although more directly observable sources of information such as field inspections and examination of treatment

prescriptions were desirable, they were ruled out because the nature of the education offered by the Institute simply does not lend itself to direct observations.

Once mail surveys were selected, the question remained about whom to survey. Again, a number of possibilities were considered: all participants in the history of the Institute, only participants who had completed all six modules, only participants from certain years, people who supervise participants, colleagues and peers of participants, and interested outside observers, among others.

The final decision was made to develop two parallel surveys: one for participants who had completed all six modules of the Institute during its first 10 years, and one for supervisors who were directly responsible for monitoring silvicultural activities within their organizations. Participants were chosen because they experience the impact of the Institute most directly; only those who had completed the entire Institute were chosen because only they were in a position to have experienced its full impact. Supervisors were chosen because they are responsible for sending individuals to the Institute, for monitoring the performance of participants once they return to work, and because they have observed the practices of numerous silviculturists throughout their careers. For purely practical reasons supervisors were limited to USDA Forest Service District

Rangers located within Regions 6 (Pacific Northwest) and 10 (Alaska), and Area Managers of the Bureau of Land Management located within Oregon, since these organizations have provided almost 90 per cent of the Institute's participants.

In summary, this study was based on the principle of multiple-perspectives. Observations were collected from two principal sources--former participants in the Institute and supervisors of silviculturists--about a variety of impacts, and were combined with first-hand observations made by a participant-observer.

Participant Survey

The Participant Survey (see Appendix B) contained five sections--four with fixed-response questions (similar to multiple-choice questions), and a fifth with open-ended questions (similar to essay questions). Each section had a unique purpose.

Sections I and II of the questionnaire were intended to help assess how much participants learned during the Silviculture Institute. Because this study focused on the impact of what was learned during the Institute, rather than on how much was learned, these sections were important only to the extent that they helped explain why desired impacts had not occurred. For example, if a particular impact had not occurred to the extent desired, the fault may, or may not, have been

that of the instructional program; Sections I and II helped determine this. Section I asked participants how they would have rated themselves in 11 areas prior to attending the Institute. Section II asked them how much the Institute improved their ability to perform a variety of tasks or understand particular issues. Although the distinction between learning and the application of that learning is a subtle one, respondents did not appear to have any trouble grasping it, or in responding to the questions.

Section III was the principal section of the Participant Survey. It was intended to help determine how participation in the Institute actually influenced the actions and perceptions of participants once they returned to their working environment. Questions in this section were derived directly from the lists of major impacts and impact indicators described earlier in this paper (see Procedures and Appendix A). Thirty-nine of the 46 survey questions dealt with impacts that occurred directly to the participants themselves, while the remaining seven dealt with impacts experienced by their organizations, or by silviculture in general. Multiple questions were asked about each of the seven major impacts identified at the beginning of the study because it was thought that the major impacts were too large and open-for-interpretation to be covered by a single

question. During analysis of the results, these 46 observations were "added together" to help estimate the extent to which the seven major impacts had occurred.

Section IV of the Participant Survey consisted of seven open-ended questions. Its primary purpose was to allow participants to express their thoughts about the Institute in their own words, so they would not feel constrained by the structure of the questions asked in the remainder of the survey. More specifically, they were asked: 1) to describe which of the Institute's major impacts were most important, 2) to identify any impacts (positive or negative) not addressed in other parts of the survey, 3) to quantify any impacts they had experienced, 4) to identify factors that had limited the impact of the Institute for them, 5) to make suggestions for improving the Institute, and 6) for members of the USDA Forest Service, to comment on the certification process that is so closely associated with the Institute. This final question was suggested by reviewers during the pilot-testing phase and drew the most passionate responses of any question asked.

Section V asked questions about the professional backgrounds of the participants, and was intended to help categorize and understand their responses. Questions focused not only on the professional histories of participants before and after they attended the Institute, but also asked them to assess their

capabilities in several areas, to rate the success of the Institute, and, for members of the USDA Forest Service, to describe how they stood with respect to silvicultural certification. Each question included in this section was chosen with the belief that it would help interpret results of the survey, and each was as carefully reviewed by the program leaders and pilot-testers as the questions within the survey itself.

Once the structure of the questionnaire was established, many different versions of the survey questions were tested and discarded before the final one was selected. Although several sources proved helpful in considering different formats for the questions (Cavendish 1983, Converse and Presser 1986, Dillman 1978, Sudman and Bradburn 1982), none adequately prepared me for the difficulty of writing questions that were likely to elicit the types of responses desired. The amount of trial-and-error involved cannot be overstated. Not only did the trial questions focus on different types of impacts, but they were presented to reviewers in many different formats with many different types of scales. In spite of the large amount of work involved, this effort was crucial to the success of the final survey.

Once the overall approach to the survey was selected, and the basic question formats were established, survey construction began. With few

exceptions, the "Total Design Method" developed by Donald Dillman (1978) was followed. Principal deviations came in the physical size of the survey and the color of paper chosen, neither of which was thought to be a crucial departure from Dillman's suggestions, and in the inclusion of open-ended questions, which Dillman discourages.

Cover letter design (see Appendix B) also followed Dillman's "Total Design Method." The principal challenge was deciding whom to have sign it. The desire was to find signers who would be likely to convey the importance of the survey, thereby increasing the likelihood that participants would respond enthusiastically and thoughtfully. One line of thinking suggested that the signers be close to the program participants, such as instructors or module leaders from within the Institute, while another suggested that they be authority figures who would convey importance merely by their signatures. The issue was resolved by those who pilot-tested the survey and cover letter. They suggested that the highest-ranking authority figures possible be selected--so the Regional Forester of Region 6 of the USDA Forest Service, the Dean of the College of Forestry at Oregon State University, and the coordinator for the Silviculture Institute were chosen.

Perhaps the single most important concept within the "Total Design Method" is its emphasis on quality

throughout the survey design process. Regardless of whether one is designing a cover, selecting a format, writing instructions, or developing questions, clarity, conciseness, and attractiveness are crucial. I am firmly convinced that the professional look of the final questionnaires used in this study contributed greatly to the high response rate and enthusiastic responses received.

Pilot-testing, a review process always recommended but seldom actually used by survey designers (Dillman 1978), was a crucial part of this survey development process. Again, it followed the "Total Design Method" of Dillman (1978). Early drafts of the survey were reviewed by colleagues and friends, both within and outside the Silviculture Institute. The final draft was reviewed by a set of four program leaders, several colleagues, and a survey design specialist with Oregon State University's Survey Research Center. After these reviews, minor adjustments were made and the survey was fully pilot-tested by a group of ten Institute graduates who were thought to be representative of the larger population. Pilot-testers were contacted by phone and asked to complete the entire survey, just as if they had received it in the mail; following that, they were asked a separate set of questions intended to provide specific feedback about the survey itself. This final review and

pilot-testing phase was crucial in fine-tuning both instructions and questions, but the importance of the many versions that were reviewed and modified prior to the final one cannot be over-emphasized.

The small number of Institute graduates (271) made it possible to survey the entire population, rather than a sample of the population. This eliminated many of the perplexing decisions commonly associated with selecting representative samples from large and diverse populations. Surveys were mailed to all 271 Institute graduates, using a mailing list based primarily on participants' addresses at the time they attended the Institute. Although this was the best mailing list available, its outdatedness resulted in much mail forwarding, and many "Return To Senders." In the final analysis, over 25 per cent of the mailing list addresses had changed; in spite of this, only 8 per cent (22 surveys) were unable to be delivered.

Securing a good response is crucial to the success of any survey. In this study, one inducement--the promise of a summary of results one year in the future--and three follow-up appeals (see Appendix C) were used, as prescribed by the "Total Design Method" (Dillman 1878). One week after the original mailing, postcard reminders were sent to all 271 participants who received the original mailing. Three weeks after the original mailing, a second appeal and a second questionnaire were

sent to the 125 people who did not respond to the first mailing. Finally, ten weeks after the original mailing, a third appeal and a third questionnaire were sent to each of the 40 participants who had not yet returned a questionnaire. Responses to each of these appeals were tracked using a code attached to each survey; results are presented in the "Results and Discussion" section of this report. Although it required a great deal of effort to track responses in this fashion, clearly it paid dividends in terms of surveys returned.

Supervisor Survey

Design and implementation of the Supervisor Survey paralleled that of the Participant Survey, and so is only briefly recounted here. The principal challenge associated with this particular survey lay in the phrasing of the questions; clearly supervisors would need to make comparisons in order to assess impact of the Institute, but what were they to compare-- silviculturists who had completed the Institute with those who had not, or the same individuals before and after attending the Institute? This was a difficult choice at best, but it seemed that the latter comparison was preferable. This would cause supervisors to focus their attention on individuals who had completed the Institute, rather than encourage them to make broad generalizations. Although this distinction was a subtle

one, apparently it worked; ten supervisors either responded that they did not have enough first-hand knowledge to complete the questionnaire, or answered the more general questions about the Institute but declined to answer the more specific ones because of limited observations--just as intended.

The Supervisor Survey (see Appendix D) included four sections--three with fixed-response (multiple choice) questions, and one with open-ended questions.

Sections I and II of the Supervisor Survey were virtually identical to Section III of the Participant Survey; the principal difference was that questions in the Supervisor Survey were phrased more generically than those of the Participant Survey, since supervisors were asked to combine their impressions of more than one Institute graduate. These two sections in the Supervisor Survey were separated merely to make the survey look less imposing, a crucial factor in getting busy people to complete it (Dillman 1978).

Section III of the Supervisor Survey was identical to Section IV of the Participant Survey; the same open-ended questions were asked with the same purposes in mind.

Section IV of the Supervisor Survey asked for background information intended to help interpret responses. Questions focused on the professional histories of the respondents, their supervisory

responsibilities, and their overall assessment of the Institute.

As with the Participant Survey, both the Supervisor Survey and cover letter were reviewed at numerous times by colleagues and friends. The final prototypes were reviewed by the same four program leaders who reviewed the Participant Survey, and were pilot-tested by five District Rangers and Area Managers who were thought to be representative of the larger population.

Surveys were sent to all USDA Forest Service District Rangers in the Pacific Northwest (86) and Alaska (12), and to all Bureau of Land Management Area Managers in Oregon (21). Surveys were addressed to individuals, rather than to their more generic titles, such as "District Ranger," in the hope that a more personal appeal would result in a higher response rate, and that supervisors would respond personally rather than asking subordinates to do it for them. For the most part, that is what happened, although it did result in a few surveys being forwarded to people who were no longer District Rangers, and in a few being returned because the Ranger to whom the survey was addressed had changed locations.

As with the Participant Survey, three follow-up letters were used to ensure a good response; the only inducement offered was the promise of a summary of results a year in the future, an offer that was accepted by 54 per cent of those who responded to the survey.

INFORMATION PROCESSING AND ANALYSIS

This study was clearly descriptive in nature. Its primary purpose was not to judge the success or failure of the Silviculture Institute, to construct models that others could use in their attempts to assess the impact of their own programs, or to predict anything about future offerings of the Institute; rather, its purpose was to collect information that would help program leaders increase the effectiveness of the Institute in the future. Because of this, no hypotheses were tested (although questions were asked and answered), no regressions were run, and no sophisticated statistical treatments were used to help draw conclusions from the data. Although this may be disconcerting to those who typically deal in the arena of research, it is not unusual for those involved with the evaluation of on-going educational programs, where the primary purpose is to convey information that will help program leaders improve their programs, rather than to deliver irrefutable truths (Weiss 1983).

Because of the relatively small populations involved in this study (271 participants and 120 supervisors), the decision was made to survey each of the entire populations, rather than to sample smaller representative subsets of the populations. As a result, numerical descriptors derived from the data in this study

were population parameters rather than statistics. This presented a tremendous advantage over conventional studies when interpreting results. Any differences between measures of central tendency or measures of dispersion, such as means or frequency distributions, represented true differences in the populations; there was no need to rely on statistical estimates of how different the values really were. For example, in this study if two means were different from one another, it could be assumed that the difference was real, without using additional statistical procedures. Although this eliminated several major sources of error that plague typical research studies, it did not eliminate the need to determine which differences were meaningful. For this determination, it was necessary to rely on personal judgment, just as those who utilize statistical procedures to determine which values are different from one another must rely on their own judgment to determine whether the differences they find are meaningful.

Means and frequency distributions of responses were calculated for each question in the two surveys using an IBM-PC version of the SAS statistical package (SAS 1985). To determine the extent to which specific impacts have occurred, means and frequency distributions for responses to individual questions were combined in various ways. For example, in Section III of the Graduate Survey, questions 1-4, 7-10, 12-13, and 19 were used to help

determine the extent to which the Institute has helped silviculturists make more defensible silvicultural decisions, while questions 11 and 33-39 were used to help determine the extent to which the Institute has helped broaden the silvicultural perspectives of graduates (see Appendix E for a complete listing). Details on how questions were combined are provided in "Results and Discussion."

RESULTS AND DISCUSSION

"In utilization-focused evaluation...the question is as important as the answer."
-Michael Quinn Patton 1978-

This study sought to answer two principal questions:

1. To what extent has the Silviculture Institute influenced the actions of individual participants once they have returned to their jobs?
2. To what extent has the Silviculture Institute influenced the perceptions of others (non-participants) about silviculture and silviculturists?

To answer these questions, information was collected from two sources: 1) individuals who had completed the entire Institute, and 2) individuals who supervised silviculturists within the two principal agencies sending participants to the Institute (District Rangers within the USDA Forest Service and Area Managers within the Bureau of Land Management). Separate, but similar, surveys were administered to each group. In interpreting results, data from the two surveys were treated equally, and were combined with personal observations made by the author while a participant-observer in Silviculture Institute VII.

This section summarizes information collected from the two surveys described above. It describes characteristics of supervisors and participants who responded to each of the surveys, and then summarizes the information they provided. In presenting results, it first examines overall impressions derived from the two separate populations, and then stratifies those impressions by factors that are likely to have helped shape them.

Before results from the two surveys are discussed, several issues relating to the quality of the data gathered must be addressed, especially the validity and reliability of the survey instruments themselves, and the significance, or meaningfulness, of the numbers generated from the surveys.

Validity, whether a test or survey actually measures what it purports to measure, is probably the most important indicator of quality associated with survey development (Moore 1983, Wolf 1984). In the realm of surveying and testing, there are a number of different measures of validity, some qualitative and some quantitative. The one most appropriate for this particular study is content validity, which measures the degree to which a set of questions actually measures what it attempts to measure (Moore 1983).

In this study two sets of experts were used to help determine the validity of each of the two surveys: 1) a

panel of program leaders, who carefully reviewed each of the survey instruments at several stages of their development, and 2) selected members of each of the two target populations, who thoroughly pilot-tested each of the two survey instruments and were asked to assess their validity (see page 49 of Procedures for details). The responses of these two groups to a series of open-ended questions about the clarity, completeness, and accuracy of the survey questions, led to the conclusion that each of the survey instruments demonstrated a high degree of content validity.

Reliability, on the other hand, addresses the consistency with which a particular instrument measures what it purports to measure (Moore 1983, Rossi et al. 1979). Again, there are a number of different measures of reliability. Unfortunately, although the concept of reliability is an important one, none of the techniques used to assess it apply well to evaluation studies (Wolf 1984). Most require that alternate forms of the survey be administered to separate portions of the population, or that the same form be re-administered to the same people at different times (Moore 1983). Neither of these approaches was practical for this study. Instead, reliability of the survey instruments used in this study was based on the consistency with which people within the two survey populations responded to the survey questions,

a type of reliability called internal consistency (Rossi et al. 1979).

The internal consistency of the two survey instruments used in this study was determined using group estimates, rather than individual estimates, a process common in evaluation studies (Wolf 1984). To simplify the explanation of this procedure, the Participant Survey will be used as an example, although the same procedure was used for the Supervisor Survey. To estimate internal consistency of the Participant Survey, participants were asked two questions which addressed the success of the Institute in defining and accomplishing its educational mission. The average responses to these two questions were then compared with the average responses to the eight sets of questions that comprised the main body of the survey. For the surveys to be internally consistent, the group of participants who described the Institute as being highly successful in the two overall questions must also have rated it highest on the eight sets of questions dealing with individual impacts; and the group who rated it least successful on the two overall questions must also have rated it lowest on the eight sets of questions dealing with individual impacts. This did, in fact, happen--the group of participants who rated the Institute highest on the two overall questions also rated it higher on each of the eight sets of impact-related questions than did the groups who rated it as "moderate" or "low"

on the two overall questions, and the group who rated the Institute as "moderate" on the two overall questions rated it higher on each of the eight sets of questions than the group who rated it as "low" on the two overall questions (see Appendix H for the numerical comparison). This fairly remarkable degree of internal consistency led to the conclusion that the Participant Survey was a reliable measure of what it intended to measure, at least from the standpoint of internal consistency.

The same procedure for assessing reliability was used for the Supervisor Survey, with the same conclusion.

Finally, the meaningfulness, or importance, of any differences found between the various means and frequency distributions generated from the two surveys must be considered. In studies in which random samples have been selected from a population, this is typically handled through statistical procedures. For example, if two means are shown to be significantly different through statistical procedures, they are often (and mistakenly) thought of as being meaningfully different. However, because entire populations were surveyed in this study, rather than random samples selected from the larger populations, common measures of statistical significance did not apply. In fact, there was no need to rely on statistical measures to help estimate which differences were significant--because entire populations were

surveyed, any differences found were significant. However, the challenge of determining which differences were meaningful still had to be faced. For this determination, personal judgment and clear thinking were relied on, just as they are in studies forced to infer significance through statistical procedures.

RESPONSE RATES AND RESPONDENTS

Participant Survey

Of the 271 surveys mailed to graduates of the Silviculture Institute, 215 (79%) were completed and returned. Of those who did not return surveys, 1 had died, 4 had been promoted to District Ranger and chose to complete the Supervisor Survey rather than the Participant Survey, and 22 were unable to be located, despite multiple attempts. Removing these 27 surveys from the original base left an effective response rate of 88 per cent, a rate much higher than those achieved in surveys of the general public, but within the range commonly achieved with specialized segments of the population (Dillman 1978). The high response rate made it reasonable to assume that the responses received were representative of the entire population of Institute graduates.

Non-response is an issue in any survey because it introduces uncertainty into the results. In this particular study non-respondents fell into two

categories: those who could not be reached (8% of the total population), and those who presumably were reached but chose not to respond (11% of the total population). Although it was not possible to predict exactly how either of these groups would have responded to the survey, it could be speculated that those who could not be reached would have responded similarly to those who were reached and who did respond to the survey, while those who chose not to respond would have been likely to respond similarly to those who responded late in the survey process (slightly more negatively than those who responded earlier). If these predictions are accurate, then it is unlikely that the lack of response by these two groups dramatically influenced the results of this study.

A number of factors concerning both Silviculture Institute graduates and their working environments were thought likely to influence their responses to the survey: 1) the year in which they completed the Institute 2) the organizations for which they worked, both during and following their participation, 3) their primary job responsibilities, both before and after their participation, 4) their forestry experience before attending the Institute, 5) their level of formal education prior to attending, 6) the support received from supervisors and peers before and after attending, 7) their reasons for attending, 8) their own assessments of

their professional abilities prior to attending, and 9) for USDA Forest Service employees, their status with respect to silvicultural certification following the Institute. Although summaries for each of these factors are presented below, complete enumerations may be found in Appendix F.

Given that both the Silviculture Institute and the working environment of silviculturists have changed dramatically during the first ten years of the Institute, it is often speculated that the year in which a participant attended the Institute will have a significant bearing on his or her perception of the experience. To test this theory, respondents were asked to indicate the year they attended the Institute; their responses were then combined into three groups. Each of the ten Silviculture Institute classes conducted prior to the beginning of the survey process was well-represented in the results. Of the total number of responses received, 30 per cent came from people who attended the Institute during its first 3 years, 40 per cent came from people who attended during its next 4 years, and the remaining 30 per cent came from people who attended during its next 3 years (the 3 years immediately preceding this study).

Organizational affiliation is another factor that might influence responses. Of the 215 respondents to

this survey, 74 per cent worked for the USDA Forest Service at the time they attended the Institute, 15 per cent worked for the Bureau of Land Management, 2 per cent worked for other federal agencies, and 8 per cent worked for private industry or state agencies. These figures closely match the composition of the entire population of Institute graduates described in Table 1. Because of the high response in each category, it seemed relatively safe to draw conclusions about impacts within these various organizational groups based on the surveys returned.

Work history is another factor that might influence responses. Of the 215 respondents, 79 per cent categorized themselves as silviculturists (or foresters with significant silvicultural responsibilities) at the time they attended the Institute, 14 per cent categorized themselves as general foresters (with responsibilities well beyond silviculture), 1 per cent categorized themselves as non-timber resource specialists, and 6 per cent categorized themselves as "other." Of those responding to the survey, 42 per cent held the same position they held during the Institute, 22 per cent had been promoted within the silvicultural ranks, 15 per cent had been promoted into non-silvicultural positions, 19 per cent had made lateral transfers, accepting new duties at the same level, and 3 per cent had made some other job change. Of the 215 respondents, 96 per cent worked for

the same organization as when they attended the Institute.

Forestry experience, both in total and in the Pacific Northwest, is another factor that might influence responses to the survey. In terms of full-time forestry experience prior to attending the Institute, 9 per cent of the respondents had fewer than 5 years of experience, 48 per cent had from 5 to 10 years of experience, and 42 per cent had more than 10 years of experience. In terms of forestry experience within the Pacific Northwest, 22 per cent had fewer than 5 years of experience, 39 per cent had between 5 and 10 years of experience, and 39 per cent had greater than 10 years of experience. Therefore, for the most part, Institute participants were well-experienced prior to attending the Institute, both in terms of forestry and the Pacific Northwest.

Support within the working environment is another factor that might influence impact of the Institute, and therefore responses to this survey. Of those responding to the survey, most (56%) described their supervisor at the time they attended the Institute as being highly supportive; however, 25 per cent described them as being moderately supportive, and 18 per cent described them as providing low support. When asked to describe their supervisors' receptivity to new ideas following their participation in the Institute, 46 per cent described it as high, 39 per cent described it as moderate, 13 per

cent described it as being low, and 2 per cent described it as being highly variable. When asked the same questions about their peers, 48 per cent described their receptivity to new ideas as being high, 47 per cent described it as moderate, 4 per cent described it as low, and 1 per cent described it as variable. From this it appeared that the colleagues of Institute graduates were slightly more receptive to new ideas than were supervisors, but that both groups were generally receptive.

A participant's reason for attending the Institute is another factor that might influence his or her perception of impact. When asked to describe their primary reason for attending the Institute, 73 per cent of the participants chose "to improve my ability to practice silviculture," 19 per cent chose "because it's a necessary step for professional advancement" or "because it's required by my employer," and 8 per cent chose other reasons. Although forcing respondents to pick only one answer may overstate the importance of this particular set of numbers, it appears that most respondents chose to participate in the Institute because of their desire to improve their silvicultural skills, rather than from a sense of obligation.

Participants' self-perceptions about their abilities to manage forest resources prior to attending

the Institute might also influence their perceptions of impact. In assessing their own abilities prior to attending the Institute, 22 per cent of those responding to the survey rated their ability to manipulate forest vegetation to accomplish specific timber-related objectives as high, 67 per cent rated it as moderate, and 10 per cent rated it as low. With respect to their ability to manipulate forest vegetation to accomplish specific non-timber objectives, they rated themselves significantly lower; 12 per cent rated their ability as high, 52 per cent rated it as moderate, and 34 per cent rated it as low. In describing their personal orientation with respect to timber and non-timber resources, 56 per cent described themselves as "primarily oriented toward timber production," 2 per cent described themselves as "primarily oriented toward non-timber resources," and 42 per cent described themselves as being "well-balanced" between the two. It appears as though this was a group of people who were comfortable with their knowledge of traditional forestry practices (those aimed at producing trees for timber), but who accepted the importance of non-timber uses of the forest and the challenges associated with managing the forest for those purposes.

The status of respondents with respect to silvicultural certification is another factor that might influence their responses to this survey, especially for

USDA Forest Service employees who face the certification process once they complete the Institute. Of the 160 USDA Forest Service employees responding to the survey, 67 per cent had already been certified, 17 per cent had not yet been certified but hoped to be in the future, and 7 per cent had not been certified and did not intend to be; 9 per cent chose to list "other," which most often meant that they had attempted to become certified, but had failed and had chosen not to pursue it.

Finally, the rate at which the Participant Surveys were returned is of some interest, both as a crude index of interest in the survey and because late responses often differ significantly from early responses. Of the 215 Participant Surveys completed and returned, 64 per cent were received within the first three weeks, an additional 27 per cent were received during the next three weeks, and the remaining 9 per cent trailed in over the subsequent nine weeks.

Supervisor Survey

Of the 119 surveys mailed to USDA Forest Service District Rangers and BLM Area Managers, 86 (72%) were completed and returned. Of those not completed, three were unable to be delivered, one was returned by a supervisor who was also a Silviculture Institute graduate and who chose to respond to the Participant Survey rather than the Supervisor Survey, and ten were returned by

supervisors who lacked sufficient information to make the judgments asked for in the survey, usually due to their newness to the Pacific Northwest. Removing these 14 surveys from the base leaves an effective response rate of 82 per cent, a rate much higher than those achieved in surveys mailed to the general public, but approximately the same as those for more specialized segments of the population (Dillman 1978). This high response rate makes it reasonable to assume that the responses received are representative of the entire population of USDA District Rangers and BLM Area Managers in the Pacific Northwest.

Non-response was an issue with the Supervisor Survey, just as it was for the Participant Survey. In this survey non-respondents fell into three categories: those who could not be reached (3% of the total population), those who chose not to respond because they lacked sufficient information (9% of the total population) and those who presumably were reached but chose not to respond (16% of the total population). Although it was not possible to predict exactly how any of these groups would have responded to the survey, it could be speculated that those who could not be reached, and those who lacked sufficient information to complete the survey, would have been likely to respond similarly to those who did respond to the survey, while those who chose not to respond would have been likely to respond

similarly to those who responded late in the survey process (slightly more negatively than those who responded earlier). If these predictions are accurate, then it is unlikely that the lack of response by these three groups dramatically influenced the results of this study.

Of the 86 responses received, 69 came from District Rangers or Acting District Rangers (70% of the number originally mailed, and 82% of those who actually received them and felt qualified to respond), and 17 came from Area Managers (95% of those originally mailed). These high response rates from each organization made it reasonably safe to draw conclusions about the respective sub-populations from the surveys returned.

Several characteristics of the supervisors surveyed were thought likely to influence their responses to the survey: whether they themselves had ever been silviculturists, whether they themselves were graduates of the Silviculture Institute or some other Region's silvicultural program, and the extent of their supervisory experience. Although summaries for each of these factors are presented below, complete enumerations may be found in Appendix G.

Of the 86 supervisors who responded, approximately half (53%) had significant silvicultural responsibilities prior to their current positions, while approximately half (47%) had not. Nine percent had completed the

Silviculture Institute; 21 per cent had completed similar programs in other Regions; 69 per cent had not completed any of the regional silvicultural programs. Taken together, this group of supervisors seemed to be reasonably well-versed in silviculture, but not likely to be overly influenced by their personal connection with the Silviculture Institute, or any other regional silvicultural programs.

Of the 86 supervisors who responded to the survey, 21 per cent had supervised silviculturists for fewer than 5 years, 41 per cent had supervised them for 5 to 10 years, and 38 per cent had supervised them for more than 10 years. The total number of silviculturists supervised by any single supervisor ranged from 1 to 30, with a mean of 7.2. Although this seems like a great deal of supervisory experience, the number of Silviculture Institute graduates supervised by any one supervisor was small. Three-fourths of the supervisors who responded to the survey had supervised fewer than three Institute graduates in their careers; fewer than one-fourth of those responding had supervised more than two silviculturists both before and after they attended the Institute. Because supervisors were asked to respond to most questions in the survey based on their observations of the same individuals before and after attending the

Institute, most were drawing conclusions based on relatively few observations.

As with the Participant Survey, the rate at which Supervisor Surveys were returned was of interest, both because it indicates interest in the survey itself and because late responses often differ significantly from early responses. In this study 70 per cent of the Supervisor Surveys were returned within the first 3 weeks of their mailing; an additional 22 per cent were received in the following 3 weeks; the final 8 per cent straggled in over the next 7 weeks. These rates of return were similar to those experienced for the Participant Survey.

DETERMINING THE INSTITUTE'S IMPACT ON INDIVIDUALS

Both surveys used in this study included 39 questions about the extent to which the Silviculture Institute has influenced the actions, thought processes, and attitudes of those who have completed the program. In the Supervisor Survey, these questions appeared in Section I (see Appendix D), while in the Participant Survey they appeared in Section III (see Appendix B). Although the response to each of these individual questions was interesting in its own right, and should help program leaders understand where changes might be made to improve the Institute, there were simply too many individual questions to be useful in drawing conclusions about major impacts achieved by the Institute. To

simplify the analysis, the major impacts identified by program leaders at the beginning of this study were used as indices of impact (see Procedures for details).

Although only the combined indices are presented here, readers who wish a complete listing of means and frequency distributions for each of the 39 individual questions may refer to Appendix F for the Participant Survey and Appendix G for the Supervisor Survey.

At the beginning of this study, program leaders of the Institute identified six major impacts that they hope to have on silviculturists who complete their program.

In brief, they hope to help silviculturists:

1. make more defensible silvicultural decisions,
2. have broader silvicultural perspectives,
3. become better problem solvers,
4. practice more innovative silviculture,
5. exhibit more confidence in their decisions, and
6. become more influential, both within their

organizations and the forestry profession.

A seventh major impact, to help raise the esteem for silvicultural decisions both within and outside the forestry profession, represents a different level of impact, and is dealt with later in this section.

To analyze responses within these six major areas, individual questions from each survey were grouped according to the major impact to which they relate. For example, questions 1, 2, 3, 4, 7, 8, 9, 10, 12, 13 and 19

from Section I of the Supervisor Survey were grouped to serve as an index of the extent to which the Institute has helped silviculturists make more defensible silvicultural decisions. The same questions from Section III of the Participant Survey were grouped together for each major impact. Readers may refer to Appendix E for other groupings. Means were then calculated for each group of questions and used as an index for the extent to which each of the impacts had occurred.

To calculate these means, individual responses to each survey question were assigned a numerical value: "5" represented the greatest impact, "3" represented moderate impact, and "1" represented no impact, just as they did in each of the survey scales. Missing values, and those marked "uncertain," were not included in the calculation of means, but may be determined by subtracting the number of responses received for each question (the "n" in Appendices F and G) from the total number of surveys returned for each group of respondents (215 for Participant Survey and 86 for Supervisor Survey).

Again, because these means were based on surveys of the entire populations they were intended to represent, differences between them were interpreted as true differences. The challenge remained, however, to determine which differences were meaningful--that is, which were great enough to warrant action.

Participant Survey

This section describes results from the Participant Survey. First it examines the success of the Institute in achieving six major impacts identified by program leaders. Then it stratifies the responses of participants to examine differences in perceptions among various subgroups of Institute participants.

Table 2 summarizes how participants responded to the set of questions comprising the six major impacts the Institute hopes to have on individual participants. It includes the number of questions comprising each impact, the average number of participants who responded to each set of questions (n), the average response of participants to the entire set of questions comprising each impact (mean), and the average distribution of responses to each set of questions.

The average response of participants to each set of questions (mean) and the distribution of those responses are both useful for developing impressions of the Institute's impact on individual silviculturists. Distributions present a clearer picture of the extent of the impact, while means make it easier to compare results between the two surveys used in the study, and within individual surveys, although they mask the variety contained within the responses.

Table 2. Response of Institute participants to groups of questions regarding major impacts of the Silviculture Institute.

Impact ¹	Number of Questions n		Mean ²	Distribution of Responses (%)				
				5	4	3	2	1
1	11	207	3.22	12	29	34	18	7
2	8	209	3.25	13	32	31	19	6
3	8	209	3.37	16	32	31	15	6
4	3	211	3.62	27	32	24	11	6
5	6	207	3.44	17	34	31	13	5
6	4	205	2.80	12	21	25	19	23

- ¹ Impact 1: More defensible silvicultural decisions
 Impact 2: Broader silvicultural perspectives
 Impact 3: Improved problem solving
 Impact 4: More innovative silviculture
 Impact 5: More confident silviculturists
 Impact 6: More influential silviculturists

- ² Means based on a 5-point scale in which 1=no impact, 3=moderate impact, and 5=great impact.

Looking at the distribution of responses presents a very positive picture of impact. On average, roughly 75 per cent of former participants described the Institute's impact on their own thoughts and actions as "moderate" or greater; roughly 16 per cent described its impact as "great." Clearly significant impacts have occurred to a sizable portion of the population.

On the other hand, roughly 25 per cent described the Institute's impact as less than moderate; of these, roughly 9 per cent described it as having "no impact" (note, however, that Impact 6 had a disproportionate effect on the entire set of responses). Although these relatively low responses may cause alarm in some circles,

they must be interpreted with care. First, it must be recognized that these lower responses are not negative responses; all values above "1" indicate a positive impact. Second, it must be remembered that participants were not asked to evaluate the effectiveness of the Institute itself, but the impact that has resulted from the Institute--a subtle but important distinction. Reasons for relatively low impacts may lie with the Institute itself, with those who have participated in the Institute, or with the organizations for whom former participants have worked. Finally, it must be understood that it is not uncommon for impact assessments to show no impact from programs under investigation (Weiss 1972a), and this is clearly not the message here; in fact, the Institute has had a positive impact on a majority of its participants in each of the six areas examined in this portion of the study.

Looking at the means for the six impacts provides an easy way to compare various impacts. For example, it appears that the Institute had the greatest impact on the innovation and confidence of former participants (Impacts 4 and 5 in Table 2). It is interesting to note that these are not factors that can actually be taught, but they may be acquired in conjunction with skills and knowledge that are taught. This result provides an important philosophical insight into this, and perhaps other, continuing education programs.

It is also interesting to note that participants gave their lowest rating to the Institute's impact on their influence within forestry and within the organizations for which they work (Impact 6 in Table 2). Again, influence is not something that is actually taught during the Institute, but something that Institute leaders hope that participants are able to achieve within their organizations because of their participation in the Institute. The relatively low rating for this set of questions is examined more closely in the following paragraphs.

Although means give a snapshot of survey results by focusing on the central tendency of the responses, it is also important to look at the variation surrounding those means. There are, of course, a number of different ways of doing this. One focuses on the variation that each question contributes to each major impact, while another focuses on the variation that each individual respondent contributes to the mean for each question (and therefore to the overall mean for each impact). Each provides potentially useful information for interpreting results of the study.

The variation that individual respondents contributed to each question in the Participant Survey is summarized by the frequency distributions presented in Appendix F; there are simply too many to present here.

However, Table 2 summarizes the distribution of responses for each set of questions comprising each impact; it demonstrates clearly that such variability does exist. For example, in assessing the Institute's impact on their influence within forestry and the organizations for which they work (Impact 6), 12 per cent of the participants responded to the four questions comprising the impact with a "5," similar to the number who responded with a "5" to Impacts 1 and 2; however, 23 per cent responded to the four questions comprising Impact 6 with a "1," far more than for Impacts 1 and 2. The implication is that the impact associated with the four questions comprising Impact 6 has occurred to a great extent for some participants, but not at all for others (as opposed to a moderate level for all participants). Potential causes for this dichotomy must be carefully considered before drawing conclusions or prescribing solutions regarding Impact 6.

A second type of variation is contributed to the overall mean by the individual questions that comprise each of the six major impacts. Figure 1 demonstrates that such variation does, indeed, exist, and that it does influence the picture drawn from examining the means by themselves. For example, Impacts 1, 2, 3, 5 and 6 all have questions whose means fall well below the overall mean for each impact. In addition, for Impact 6 the individual question means are uniformly, but widely

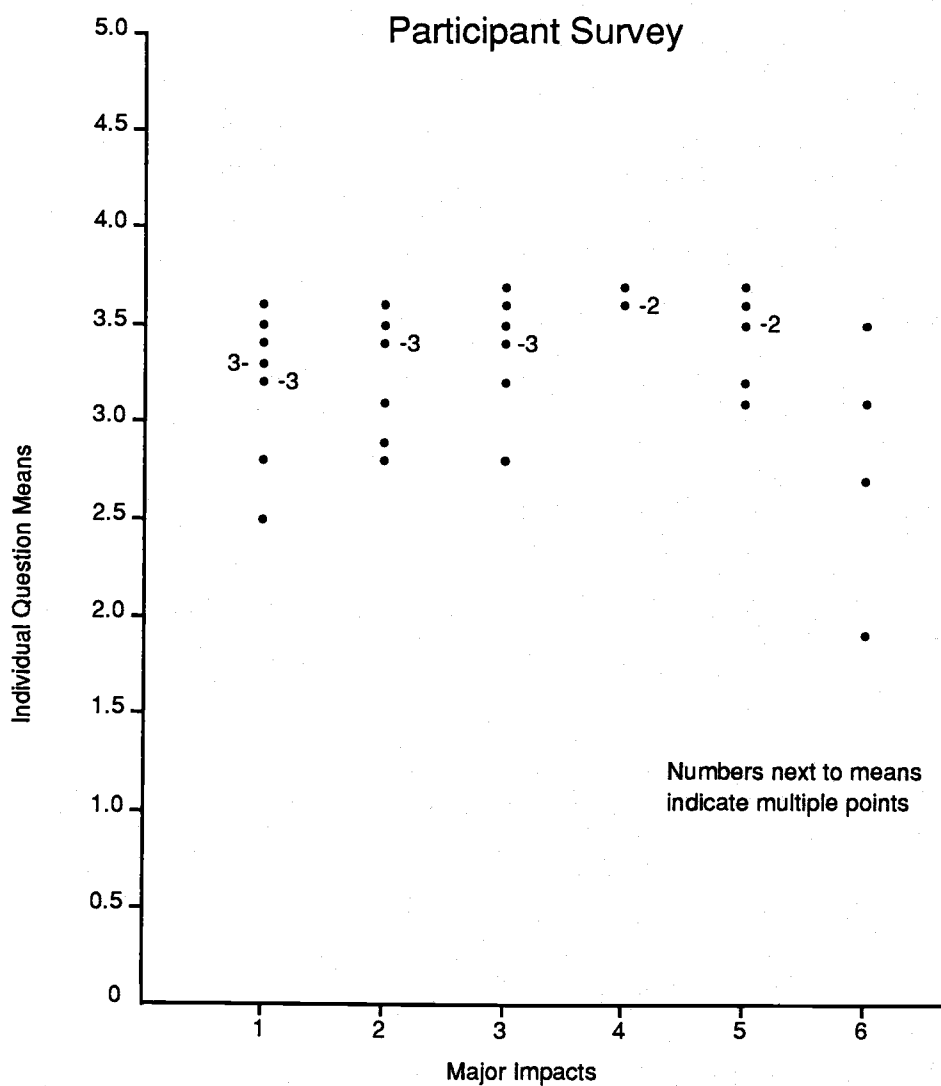


Figure 1: Means for individual questions comprising six major impacts. Based on results from the Participant Survey.

- ¹
- Impact 1: More defensible silvicultural decisions
 - Impact 2: Broader silvicultural perspectives
 - Impact 3: Improved problem solving
 - Impact 4: More innovative silviculture
 - Impact 5: More confident silviculturists
 - Impact 6: More influential silviculturists

distributed. Although the mean for Impact 6 does indeed fall midway between all four values, it does a relatively poor job of reflecting the response of participants to the four questions that comprise the impact. In each of these cases, the individual questions with relatively low ratings must be carefully examined.

Care must be taken in interpreting questions with relatively low means. First, responses below "3" must not be interpreted too negatively. On the five-point survey scale, a response of "1" indicated "no impact," while a response of "3" indicated "moderate impact;" therefore, any response above "1" indicated a positive impact. Second, there are numerous potential explanations for the low means to individual questions, and each of these possibilities should be explored before drawing conclusions. One possible explanation is that the Institute has done a less effective job of teaching participants about the topics represented by questions with low means. A second possible explanation is that participants entered the Institute with relatively high skill levels in the areas represented by low means, and the Institute made relatively small improvements in those entering abilities. A third possible explanation is that the Institute did, in fact, significantly improve the abilities of participants in the areas in question, but that other factors (such as organizational constraints)

limited their abilities to apply what they learned. Finally, it is possible that items with dramatically different means actually measure something different from the others with which they are grouped, in spite of the fact that program leaders grouped them together at the beginning of the study; if this is the case, they should be removed from that particular set of questions.

For Impact 1--helping silviculturists make more defensible silvicultural decisions--the two questions significantly below the others relate to the practicality of silvicultural decisions from the standpoints of engineering and logistics (questions 9 and 10 in Section III of the Participant Survey). To interpret these low means several questions must be asked: 1) are these two items important components of good silvicultural decisions, 2) what were the skills of participants in these areas when they entered the Institute, 3) what did the instructional program of the Institute do to improve the skills that participants entered with, and 4) if the Institute did improve the skills of participants, did participants return to situations in which they were free to apply those skills? In this particular case, the two questions with low means clearly are important components of good, defensible silvicultural decisions. Therefore, program leaders must ask themselves about the entry level skills of participants, and whether they have done enough

to improve those skills. Their answers should help them decide whether to increase instruction in these two areas, decrease it, or leave it the same. At the same time, organizations who send participants to the Institute must ask whether they have created a climate in which Institute graduates have the freedom to apply what they have learned in the Institute; if not, they are working against themselves and the instructional program that they sponsor. If the cause of the problem seems to be instructional, and it is serious enough to require action, there are two possible solutions--either increase the level of instruction in these two areas to the point where the skills and abilities of the participants improve enough to have a greater impact on what they do, or eliminate instruction in these areas altogether, making way for other topics where the return is likely to be greater.

For Impact 2--helping broaden the silvicultural perspectives of silviculturists--the two questions well below the others relate to how forests process water, and the long-term impacts of forest fragmentation (questions 36 and 38 in Section III of the Participant Survey). Again, these seem to be important parts of broadening the perspectives of silviculturists. Therefore, the same set of questions about the causes for the lower impacts in these two areas must be asked that were asked in the

preceding paragraph. The answers, however, may well be different. As will often be the case, the problems are likely to be a combination of inadequate instruction during the Institute, inadequate motivation for changing practices once back on-the-job, and operational constraints that inhibit implementing new ideas. Again, a close look at the causes will help determine the appropriate solutions.

For Impact 3--helping silviculturists become better problem-solvers--the question with the lowest mean relates to the extent to which Institute graduates have actually used test plots and pilot studies to answer specific silvicultural questions (questions 20 in Section III of the Participant Survey). Again, the questions that must be asked are the same as those previously described. And the answers are likely to be a combination of inadequate instruction, lack of motivation, and organizational constraints, only one of which lies entirely under the control of the Institute.

Impact 6--helping silviculturists become more influential within forestry and within their own organizations--contains one of the highest rated questions in the survey and two of the lowest. The highly-rated question (question 29 in Section III of the Participant Survey) suggests that participants have become much more influential members of working groups and interdisciplinary teams within their own

organizations. The two low-rated questions (questions 31 and 32 in Section III of the Participant Survey) suggest that participants have not become much more active in their professional organizations, and that they do not consider themselves much more promotable within their own organizations (although it must be remembered that the means for both questions fall well-above the "no impact" level). Again, the questions that must be asked are the same, and the answers are likely to contain instructional, motivational, and organizational components.

Once these overall impressions of major impacts of the Institute have been formed, it might be asked how different subsets of participants responded to the survey. For example, did responses vary significantly between people who attended different sessions of the Institute, did the responses of those employed by the USDA Forest Service differ significantly from those employed by other organizations, or did the responses of more experienced silviculturists differ from those with less experience?

Before attempting to answer these questions, a quick way was needed to analyze responses to the many survey questions; looking at each of the six major impacts for each question was simply too cumbersome. Instead, the high degree of internal consistency with

which participants responded to the survey questions provided a reasonable alternative. Although the concept of internal consistency is explained in the Procedures section, it is briefly reviewed in the following paragraph.

In addition to being asked 39 questions that related to the six major impacts defined in the study, participants were asked a number of questions in the Background Section of the survey. Two of these asked participants to evaluate the success of the Institute in defining an educational program that is important to them and to their organizations, and to evaluate the success of the Institute in accomplishing the educational program that it has defined (questions 16 and 17 in Section IV of the Participant Survey). On average, participants who rated the success of the Institute highest on these two questions also rated the impact of the Institute highest in each of the six major impact areas in the main portion of the survey; and those who rated the success of the Institute lowest on these two overall questions also rated the impact of the Institute lowest in the six major impact areas (see Appendix H for numerical values). Because of this high degree on internal consistency, it appears that either of these two overall questions can serve as a good (but not perfect) index of how participants in particular subgroups responded to questions regarding the six major impacts. Therefore,

for the remainder of this section responses to one of these background questions--"How successful has the Institute been in accomplishing the educational program that it's defined?"--serves as an index of how participants responded to each of the six major impact variables.

Two cautions must be noted before continuing, however. First, the question, "How successful has the Institute been in accomplishing the educational program that it's defined?" was used to estimate how participants responded to the 39 questions comprising the six major impacts of the study; in spite of this, attention should remain on the impact of the Institute in changing actions, rather than on general perceptions of success. Second, the scale used for the background questions was a three-point scale in which "1" indicated "very successful" and "3" indicated "not very successful"--just the reverse of the five-point scale used to assess impacts in the main portion of the survey.

Given the long history of the Silviculture Institute, and the many changes that have occurred both within the Institute and within the working environments of silviculturists during that time, a question often asked is, "How do perceptions of impact vary between those who attended early sessions and those who have attended more recent sessions?" To answer this question

respondents were divided into three groups, those from SI I-III (1978-81), those from SI IV-VII (1981-85), and those from SI VIII-X (1985-88). Table 3 indicates remarkably little difference in the responses of the three groups.

Table 3. The relationship between Institute attended and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Institute Attended</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
I-III	61	1.56	50	45	5
IV-VII	82	1.56	46	51	2
VIII-X	62	1.55	47	52	2

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Because of the Institute's strong ties to the USDA Forest Service, and its emphasis on written prescriptions that are required by few agencies or organizations besides the Forest Service, it is common to hear the opinion that the Institute is more valuable to USDA Forest Service employees than it is to others. To investigate this opinion the question was asked, "How do the assessments of those employed by the USDA Forest Service compare with those employed by the other governmental agencies or private industry?" Table 4 shows no consistent pattern. Although 31 BLM employees rated the success of the Institute slightly lower than

did 153 employees of the USDA Forest Service, 21 employees of other federal agencies, state agencies, and private industries rated it slightly higher than USDA Forest Service employees. From the standpoint of those who have participated in the Institute, there appears to be no clear evidence that the Institute is more successful for USDA Forest Service employees than for others.

Table 4. The relationship between employing organization and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Organization</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
USDA Forest Service	153	1.54	48	50	2
BLM	31	1.71	39	52	10
Other Federal Agencies	5	1.40	60	40	0
Other	16	1.50	50	50	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Although titled the Silviculture Institute, many participants have responsibilities that extend far beyond silviculture, and a few have no formal silvicultural responsibilities at all. As a result, one might ask, "How do actual job responsibilities following completion of the Institute affect perceptions of its impact?" To investigate this question, respondents were divided into four categories: silviculturists (or general foresters whose primary duties are silvicultural in nature), general foresters (whose duties extend well beyond

silviculture), non-timber resource specialists who have no formal silvicultural responsibilities, and "others." Table 5 indicates that silviculturists, general foresters, and non-timber resource specialists all rated the success of the Institute approximately the same. Although those who marked "other" rated the success of the Institute well below the other respondents, too few described what "other" meant to draw any conclusions.

Table 5. The relationship between job responsibilities and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Job Responsibility</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Silviculturist	164	1.54	48	50	2
General Forester	27	1.52	52	44	4
Non-timber Specialist	2	1.50	50	50	0
Other	12	1.75	33	58	8

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Many Institute graduates change positions within a few years of completing the Institute. Some are promoted within the silvicultural ranks, some are promoted into non-silvicultural positions, and some make lateral transfers away from silviculture. As a result, one might ask, "How do changes in job status following completion of the Institute affect perceptions of its effectiveness?" Table 6 indicates that the differences

in opinion were not large, but that those who were promoted within the silvicultural ranks clearly viewed the Institute as being more successful than did others; other differences were small. Table 6 also indicates that 74 Institute graduates (36% of those who responded to the survey) were no longer practicing silviculture at the time they completed the survey, although many were likely to still have strong ties with silviculture in their new positions, and a few were actually supervising silvicultural activities from positions such as District Ranger.

Table 6. The relationship between changes in job responsibilities following the Institute and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Job Status</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Retained same position	84	1.61	43	54	4
Promoted within silvi.	46	1.39	63	35	2
Promoted outside silvi.	29	1.55	48	48	3
Made a lateral transfer	40	1.65	37	60	3
Other (e.g. >1 change)	5	1.60	40	60	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

It is often speculated that the amount of professional experience that participants bring to the Institute will affect their perceptions of its usefulness. To test this theory, participants were asked to characterize their level of professional experience

prior to attending the Institute, both in forestry and in the Pacific Northwest. Table 7 indicates that differences in perceptions were small, but that participants with less than 10 years of total forestry experience, and less than 10 years of forestry experience in the Pacific Northwest, viewed the Institute as being slightly more successful than did those with more than 10 years of experience. This is equivalent to saying that participants who were relatively early in their careers, and relatively new to the Pacific Northwest, experienced slightly greater impact from attending the Institute.

Table 7. The relationship between forestry experience prior to attending the Institute and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Forestry Experience</u>	<u>n</u>	<u>Mean¹</u>	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Fewer than five years	19	1.42	58	42	0
Five to ten years	101	1.51	50	50	1
More than ten years	84	1.63	43	51	6
<u>For. Experience in PNW</u>	<u>n</u>	<u>Mean¹</u>	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Fewer than five years	44	1.45	57	41	2
Five to ten years	82	1.55	46	52	1
More than ten years	78	1.63	42	53	5

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Although most participants have entered the Institute with Bachelors degrees in Forestry,

approximately 12 per cent have entered with graduate degrees. This raises the question, "How does prior academic preparation influence the perception of impact?" Table 8 indicates little difference in perceptions of success (and therefore impact) between those of different educational levels--certainly not as much as one might anticipate.

Table 8. The relationship between formal education prior to the Institute and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Highest Degree</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Bachelors Degree	181	1.55	48	49	3
Masters Degree	22	1.59	41	59	0
Doctoral Degree	2	1.50	50	50	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Another potentially important factor in shaping the perceptions of participants about the effectiveness of the Institute is the amount of support they have received from within their working environment. To help assess the importance of this support, participants were asked to characterize the support they received from their immediate supervisors during their participation in the Institute, and the receptivity of both their supervisors and their peers to new ideas following the Institute. Results from Tables 9 and 10 clearly indicate that

support from within the work environment was an important factor in shaping perceptions of impact, and presumably in the actual impact itself. Two other interesting observations arise from these two tables. First, participants rated the support they received from their supervisors during the Institute (Table 9) higher than the receptivity of their supervisors to new ideas after the Institute (Table 10). Given the importance of supervisor support to whether participants apply what they learned during the Institute, this should send an important message to those who supervise graduates of the Institute. Second, it appears that peers were perceived as being slightly more supportive of new ideas than were supervisors (Table 10), another important message for organizations who participate in the Institute.

Table 9. The relationship between support received from supervisors during the Institute and the response of participants to the question, "How successful has the Institute been in accomplishing the program it's defined?"

<u>Support Received</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
High	119	1.50	50	50	0
Moderate	49	1.55	51	43	6
Low	37	1.76	32	60	8

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Table 10. The relationship between the receptivity of supervisors and peers to new ideas and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Receptivity of Superv.</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
High	96	1.44	56	44	0
Moderate	79	1.57	46	52	3
Low	26	1.76	19	65	15

<u>Receptivity of Peers</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
High	99	1.41	61	37	2
Moderate	96	1.69	34	63	3
Low	7	1.86	29	57	14

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Perceptions that participants have of themselves prior to attending the Institute are also likely to influence the impact they experience. To help analyze this factor participants were asked how they would have characterized their professional abilities and orientations prior to attending the Institute. These self-perceptions were used to stratify their overall assessments of the Institute. Table 11 indicates very little difference in the perceptions of success among any of the groups examined. Although those who characterized themselves as having a non-timber orientation rated the Institute's success the highest of any of the groups, there were only two respondents in this category.

Table 11. The relationship between participants' assessments of their own abilities and orientations prior to attending the Institute and their responses to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Ability to Accomplish Timber Objectives</u>	<u>n</u>	<u>Mean¹</u>	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
High	44	1.50	50	50	0
Moderate	140	1.57	46	50	4
Low	20	1.55	50	45	5

<u>Ability to Accomplish Non-Timber Objectives</u>	<u>n</u>	<u>Mean¹</u>	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
High	24	1.54	50	46	4
Moderate	109	1.54	50	45	5
Low	68	1.59	41	59	0

<u>Principal Orientation</u>	<u>n</u>	<u>Mean¹</u>	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Timber Production	115	1.58	45	51	3
Non-timber Resources	2	1.00	100	0	0
Well Balanced	87	1.53	49	48	2

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Motivation for attending the Institute might also influence the impact that participants perceive from it. To investigate the influence of motivation on impact, six possible responses from the survey were grouped into three categories for analysis: 1) those who attended the Institute primarily to improve their ability to practice silviculture, or for the educational experience itself, 2) those who attended primarily because they felt it was necessary for advancement, because it was required by their employer, or because it gave them a break from

their normal routine, and 3) those who attended for some other reason. Table 12 indicates that those who attended primarily for self-improvement perceived the Institute as being only slightly more successful than those who attended because they viewed it as necessary for professional advancement or because they were required to attend. Unfortunately, not enough participants explained why they checked "other" to draw any firm conclusions from the high success indicated by this group, although a few indicated that they attended primarily to test their interest in attending graduate school.

Table 12. The relationship between motivation for attending the Institute and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Motivation for Attending</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
For self-improvement	157	1.55	47	50	3
It was necessary	39	1.62	44	51	5
Other	9	1.33	67	33	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Silvicultural certification following completion of the Institute is another important issue associated with the Institute, and one often thought likely to influence participants' perceptions of the program's effectiveness. Table 13 indicates that participants who had already become certified by the time they responded to the survey

perceived the Institute as being most successful. Somewhat surprisingly, there is little difference between those who planned to become certified in the future, those whose organizations did not offer certification, and those who described their status as "other," primarily those who had tried to be certified but failed. Those within the USDA Forest Service who did not intend to become certified rated the Institute as least successful, although they were few in number.

Table 13. The relationship between certification status and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Certification Status</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Already certified	105	1.47	55	43	2
Plan to become certified	28	1.64	36	64	0
Do not intend to be certified	8	1.87	25	63	13
Certification not offered by organization	50	1.62	44	50	6
Other	14	1.64	36	64	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

Finally, it is interesting to see how responses from surveys that were returned early compare with those that were returned later. To explore this, Participant Surveys were divided into three categories: those returned within the first three weeks from the date of mailing, those returned within the second three weeks,

and those returned after more than six weeks. Table 14 indicates relatively little difference between any of responses, but late-responders tended to rate the Institute as slightly less successful than early-responders. This finding helps predict how non-respondents to the survey (those who chose not respond to the survey, and those who could not be reached), might have responded.

Table 14. The relationship between date of return and the response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Week Returned</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
1-3	132	1.53	47	48	5
4-6	55	1.49	51	49	0
>6	17	1.65	35	64	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, 3=not successful.

So, what has been learned from this particular section of the Participant Survey about how graduates of the Silviculture Institute view its impact on their thoughts and actions? First, it appears that all six of the major impacts identified by program leaders have occurred, and that although the impact is not overwhelming, it is significant. Second, graduates of the Institute have experienced greater impact to their creativity and self-confidence than they have to their

technical skills and knowledge. They have experienced the least impact (although still a substantial one) to their influence within their organizations and within forestry in general; however, much of this can be attributed to the Institute having done little to increase their activity in professional organizations, a factor beyond the control of the Institute itself (but none-the-less identified as an indicator of a desirable impact by program leaders). Finally, although there are differences in how subgroups of participants viewed the impact of the Institute, in most cases the differences are surprisingly small.

The response of participants to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?" was used as an index to how they responded to the questions regarding the six major impacts. The following factors seemed to influence participants' perceptions of success (and therefore impact) at least to some extent. Participants from the USDA Forest Service, other federal and state agencies, and private industry viewed the Institute as being slightly more successful than did their counterparts in the BLM. Silviculturists who were promoted within the silvicultural ranks viewed the Institute as being slightly more successful than those not promoted, those promoted outside of silviculture, and those who made some other job change. Participants with

fewer than 10 years of professional experience viewed the Institute as being slightly more successful than those with more than 10 years of experience. Participants who received a high level of support from their supervisors and colleagues, both during and after attending the Institute, viewed the Institute as being more successful than those who received less support. Participants who attended the Institute primarily for self-improvement viewed it as being slightly more successful than those who attended out of a sense of obligation. And, finally, those who had already attained certification clearly perceived the Institute as being more successful than those who had not yet been certified, those whose organizations did not offer certification, those who did not intend to be certified, and those who tried to be certified and failed.

On the other hand, a number of factors did not seem to influence participants' perceptions of impact: 1) whether they were silviculturists or general foresters at the time they attended the Institute, 2) whether they entered the Institute with a Bachelors or Masters degree, and 3) how they assessed their own abilities to accomplish specific forestry objectives prior to attending the Institute, and 4) whether they attended the Institute during its early, middle, or late years.

Supervisor Survey

This section describes results from the Supervisor Survey. First, it examines the success of the Institute in achieving six major impacts identified by program leaders. Then it stratifies the responses of supervisors to explore differences in perceptions among various subgroups of supervisors.

Table 15 summarizes how supervisors responded to each of the six sets of questions comprising the major impacts that the Institute hopes to have on individual participants. It includes the number of questions comprising each impact, the average number of supervisors who responded to each set of questions (n), the average response of supervisors to the entire set of questions comprising each impact (mean), and the average distribution of responses to each set of questions.

As with the Participant Survey, both the means and the distribution of responses are useful for developing an impression of the Institute's impact on individual silviculturists. Distributions are especially useful for developing a picture of the overall impact of the Institute, while means are useful for making comparisons between the various impacts.

The distribution of responses presents an even more positive picture of impact than it did for the Participant Survey. On average, 84 per cent of the supervisors who responded to the survey described the

Institute's impact on the thoughts and actions of silviculturists as "moderate" or above; roughly 11 per cent described its impact as "great." Clearly, in the minds of those who supervise silviculturists, significant impacts have resulted from the Institute.

Table 15. Response of supervisors to groups of questions regarding major impacts of the Silviculture Institute.

<u>Impact</u> ¹	<u>Number of Questions n</u>		<u>Mean</u> ²	<u>Distribution of Responses (%)</u>				
				<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
1	11	80	3.46	10	40	36	11	2
2	8	80	3.44	10	39	37	10	3
3	8	80	3.47	11	42	33	12	3
4	3	82	3.46	13	37	36	11	3
5	6	81	3.35	11	35	35	16	3
6	4	81	3.13	9	29	37	16	9

- ¹ Impact 1: More defensible silvicultural decisions
 Impact 2: Broader silvicultural perspectives
 Impact 3: Improved problem-solving
 Impact 4: More innovative silviculture
 Impact 5: More confident silviculturists
 Impact 6: More influential silviculturists

- ² Mean based on a 5-point scale in which 1=no impact, 3=moderate impact, and 5=great impact.

On the other hand, roughly 17 per cent of the supervisors responding to the survey described the Institute's impact on individual silviculturists as less than moderate; of these, roughly 4 per cent described it as having "no impact." As in the Participant Survey, these responses may cause some concern, but again they must be interpreted with care. First, it must be

remembered that they do not represent negative responses; all values above "1" indicate that the Institute has had a positive impact. Second, supervisors were not asked to judge the effectiveness of the Institute itself, but rather its impact on the actions of silviculturists--a subtle but important distinction. And finally, it must be remembered how difficult it is to accurately assess the impact of educational programs--many such assessments fail to find any impact (Weiss 1972a), and this is clearly not the message here.

Looking at the means for the six impacts provides an easy way to compare impressions, both within and between the two surveys. Three trends in the Supervisor Survey are apparent from Table 15. First, the means for the six major impacts are relatively uniform; the range of means for the Supervisor Survey is only 0.34, compared with 0.82 for the Participant Survey. In addition, in the Supervisor Survey four of the six impacts have virtually identical means. Second, in four of the six areas, supervisors noted slightly greater impact than did participants in the Institute. Finally, Impact 6--silviculturists who are more influential within forestry and within their organizations--is the only one "significantly different" from the others, and this may be the result of one or two questions, as it was for the Participant Survey.

As with the Participant Survey, the variation associated with the means presented in Table 15 should also be examined. The variation associated with each of the 39 questions in the Supervisor Survey is presented in Appendix G; however, there are too many to be presented here. Instead, Table 15 summarizes the distribution of responses for each set of questions comprising each impact. Although some variation certainly exists, the responses of supervisors are less variable than those of the participants (Table 2). For the Supervisor Survey the means for each impact seem to accurately reflect the variation contributed to those means by individual participants.

A second type of variation surrounding each of the six major impact means is contributed by the individual questions that comprise those means. Figure 2 demonstrates that such variation does exist for the Supervisor Survey, but it is generally much less than for the Participant Survey (Figure 1). Again, the means for each of the six major impacts do a reasonably good job of describing the variation contained within each set of questions; none of the individual means is radically above or below the impact means.

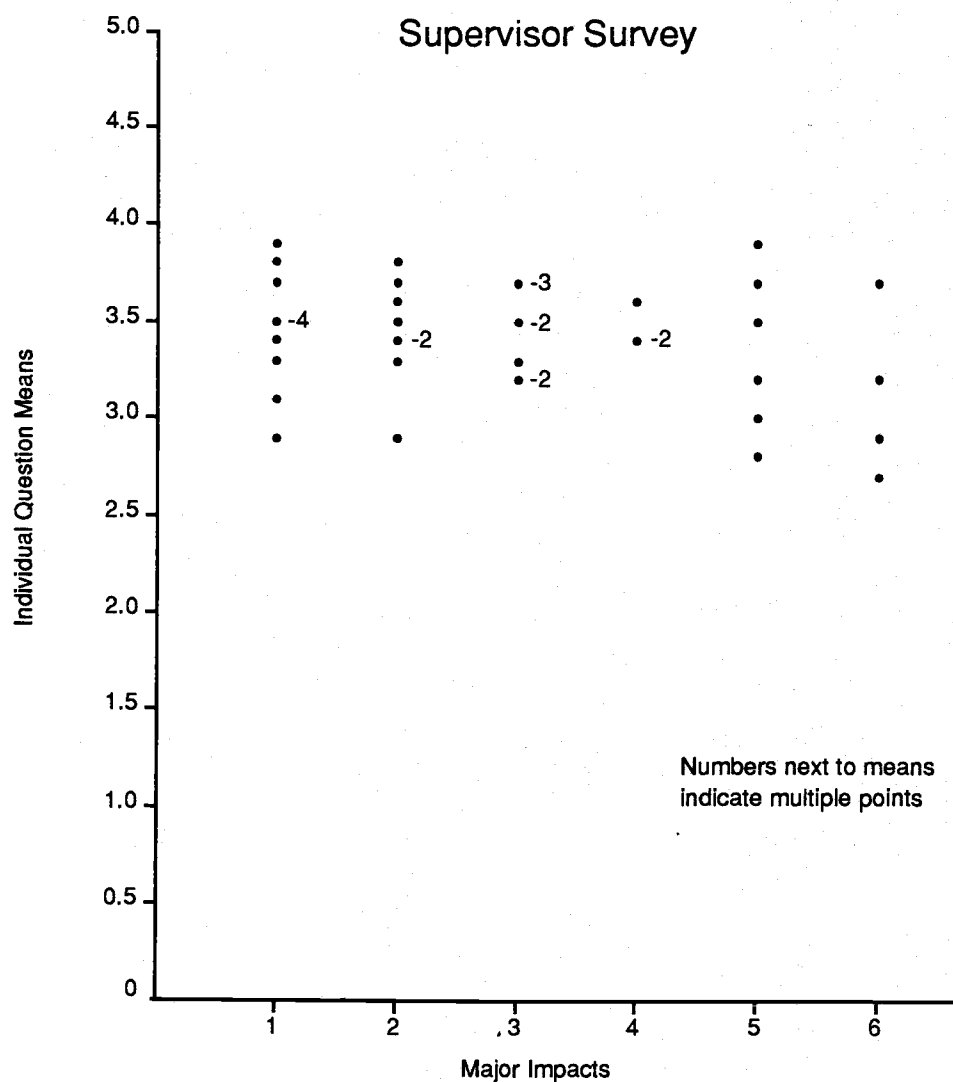


Figure 2: Means for individual questions comprising six major impacts. Based on results from the Supervisor Survey.

- ¹
- Impact 1: More defensible silvicultural decisions
 - Impact 2: Broader silvicultural perspectives
 - Impact 3: Improved problem-solving
 - Impact 4: More innovative silviculture
 - Impact 5: More confident silviculturists
 - Impact 6: More influential silviculturists

Once these overall impressions were formed based on the combined responses of all supervisors, a number of questions were asked concerning the views of smaller segments of the population of supervisors. For example, did supervisors from the USDA Forest Service respond differently from those from the BLM, did those with more supervisory experience respond differently from those with less experience, or did those who have been silviculturists in past respond differently from those who have not been silviculturists?

As with the Participant Survey, a quick way was needed to analyze responses to these various questions; and, once again, the internal consistency with which supervisors responded to this survey provided a solution. As with the Participant Survey (refer to pages 86-88), responses to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?" were used as an index to how supervisors responded to the 39 questions comprising the six major impacts. Although the relationship is not perfect, it is strong enough to serve as a useful index (see Appendix H for details). In reviewing the section that follows, it is important to remember that the single question regarding the success of the Institute in accomplishing its mission was used to estimate how

supervisors viewed the Institute's impact on the thoughts and actions of silviculturists.

Because the Institute is commonly viewed as being dominated by the USDA Forest Service, one might ask, "How do the opinions of supervisors in the USDA Forest Service differ from those in the BLM?" Table 16 indicates that Area Managers from the BLM viewed the Institute as being more successful in accomplishing its mission than did their counterparts in the USDA Forest Service. Although it would be easy to make too much of this difference, it is still somewhat surprising given that many people view the Institute as catering to the needs of the USDA Forest Service, sometimes at the expense of its other clients. Apparently supervisors within the BLM did not share this concern.

Table 16. The relationship between employing organization and the response of supervisors to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Organization</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
USDA Forest Service	67	1.63	46	45	9
BLM	17	1.24	76	24	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, and 3=not successful.

A second question that might be asked is, "Do supervisors who have been silviculturists themselves view the Institute differently from those who haven't been

silviculturists?" Although the difference is small, Table 17 indicates that supervisors who have been silviculturists themselves view the Institute as being slightly more successful (and therefore having slightly greater impact) than supervisors who have not been silviculturists.

Table 17. The relationship between personal silvicultural experience and the response of supervisors to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Silvicultural Experience</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Significant experience	45	1.51	53	42	4
Minor or no experience	40	1.60	50	40	10

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, and 3=not successful.

A third question that might be asked is, "Do supervisors who have attended the Silviculture Institute view it differently from those who have attended similar programs in other regions, or from those who have not attended any silvicultural program?" Results in Table 18 present a mixed picture; ratings of supervisors who have attended the Institute fall between those who have attended other programs and those who have not attended any silvicultural training program. However, the differences are probably too small to draw any meaningful conclusions from them.

Table 18. The relationship between supervisors' silvicultural training and their response to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

<u>Experience</u>	<u>n</u>	<u>Mean</u> ¹	<u>Responses (%)</u>		
			<u>1</u>	<u>2</u>	<u>3</u>
Graduate of SI	8	1.63	50	37	13
Graduate of other program	18	1.72	33	61	6
Not a graduate of any program	58	1.50	57	36	7

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, and 3=not successful.

Another question that might be asked is, "Do supervisors with more supervisory experience assess the Institute differently from those with less supervisory experience?" To answer this question, supervisors were divided into two groups: those who had supervised five or fewer silviculturists in their careers, and those who had supervised more than five. Table 19 indicates that more experienced supervisors rated the Institute as being slightly more successful than those with less experience. This may have occurred because those with more experience have had the opportunity to observe silvicultural practice prior to the advent of the Institute, or perhaps because they have observed more Institute graduates.

Table 19. The relationship between supervisory experience and the response of supervisors to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

Silviculturists		n	Mean ¹	Responses (%)		
Supervised				1	2	3
Five or fewer		42	1.64	45	45	10
More than five		43	1.47	55	42	3

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, and 3=not successful.

Another question that might be asked is, "Do supervisors who have observed the same individuals both before and after they attended the Institute view it differently from those who have not had that opportunity?" To answer this question, supervisors were divided into three groups: those who had not viewed any of the same individuals both before and after attending the Institute, those who had viewed one or two individuals, and those who had viewed three or more. As one would hope, Table 20 clearly indicates that the more opportunities supervisors had to observe silviculturists both before and after attending the Institute, the more successful they considered the Institute to be. This should be gratifying to those who conduct the Institute.

Table 20. The relationship between supervising the same individuals both before and after they attended the Institute and the response of supervisors to the question "How successful has the Institute been in accomplishing the educational program that it's identified?"

Silviculturists Supervised		n	Mean ¹	Responses (%)		
<u>Both Before and After SI</u>				<u>1</u>	<u>2</u>	<u>3</u>
0		16	1.69	37	56	6
1-2		43	1.60	51	37	12
3 or more		18	1.39	61	39	0

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, and 3=not successful.

Finally, those interested in the results of surveys in a more general sense might ask, "How do early responses differ from late responses?" To answer this question, responses were divided into three categories, those received within the first three weeks from the date of mailing, those received in the fourth through sixth weeks, and those received more than six weeks following the original mailing. Table 21 indicates little difference between those who responded within the first six weeks. However, those who took more than six weeks to respond viewed the Institute as being less successful than those who responded earlier, although so few responses fell in the late-response category that firm conclusions are difficult to draw.

Table 21. The relationship between date of return and the response of supervisors to the question, "How successful has the Institute been in accomplishing the educational program that it's defined?"

Weeks Before Return	n	Mean ¹	Responses (%)		
			1	2	3
1-3	60	1.53	53	40	7
4-6	17	1.41	59	41	0
>6	7	2.00	29	43	29

¹ Based on a 3-point scale in which 1=very successful, 2=moderately successful, and 3=not successful.

So, what has been learned about how District Rangers and Area Managers view the impact of the Silviculture Institute on individuals who have completed the program? First, it appears that all six major impacts identified by program leaders have occurred, and although the impact is not overwhelming, it is significant. Second, it appears that progress has been made toward all six impacts at roughly the same level; none was achieved at the expense of others. Finally, it appears that the supervisors involved in this study viewed the success of the Institute fairly uniformly; two exceptions are that BLM supervisors rated the success of the Institute (and by implication, its impact) higher than their counterparts in the USDA Forest Service, and supervisors with more supervisory experience (i.e. those who had supervised more silviculturists and more Institute graduates) viewed the Institute as being more successful than those with less experience.

Comparisons Between The Two Surveys

One of the underlying principles of this study was that of multiple perspectives--different observers viewing the Institute from different points in time and space. What, then, was learned from comparing results from the two surveys just described?

There are a number of ways in which results from the Participant Survey and Supervisor Survey were similar:

1. The responses of both groups were extremely consistent within each survey. Those who rated the Institute as being highly successful on two general questions also rated it highly based on six groups of individual questions dealing with the major impacts identified by program leaders (see Appendix H). Those who rated it low on two general questions also rated it low on the basis of the six major impact groups (see Appendix H). This finding created faith in the survey instruments themselves, and also demonstrated that participants and supervisors alike were quite consistent in their assessments of the Institute.
2. Perceptions of impact were roughly the same in the two surveys. With one exception, supervisors and participants rated the six major impacts of the Institute between a "3.1" and a "3.7" on the five-point survey

scale (Tables 2 and 15). Although these numerical values give the perception of moderate impact, it is important to realize that in both surveys over 75 per cent of the respondents described the Institute's impact on its graduates as moderate or greater. Further, when asked to rate the Institute's success in a single question, former participants and their supervisors responded almost identically (Table 22).

3. Of the 39 questions comprising the main portion of each survey, there was great consistency between the responses of participants and supervisors. Of the 12 most highly-rated questions, 8 were the same in the two surveys (Appendix F and G). Of the ten questions receiving the lowest ratings, seven were the same in the two surveys (Appendix F and G). Again, this points to a high degree of consistency between the views of those who have attended the Institute and their supervisors.

Differences between the two surveys were minor. Perhaps the most interesting is that former participants ranked the Institute's impact on their technical skills and knowledge among the lowest of the six major impacts, while supervisors ranked it at the top of their list.

Table 22. The overall assessment of supervisors and participants of the Silviculture Institute.

1) How well has the Institute defined an educational mission that's important to your organization?

<u>Respondents</u>	<u>n</u>	<u>Mean</u>	<u>Responses (%)</u> ¹		
			<u>1</u>	<u>2</u>	<u>3</u>
Participants	203	1.59	46	49	5
Supervisors	86	1.53	52	42	6

2) How successful has the Institute been in implementing the educational program that it's defined?

<u>Respondents</u>	<u>n</u>	<u>Mean</u>	<u>Responses (%)</u> ²		
			<u>1</u>	<u>2</u>	<u>3</u>
Participants	205	1.56	47	50	3
Supervisors	85	1.55	52	41	7

¹ For Question 1: 1 = very well; 2 = moderately well; 3 = not well at all; 4 = undecided.

² For Question 2: 1 = very successful; 2 = moderately successful; 3 = not at all successful; 4 = undecided.

DETERMINING THE INSTITUTE'S IMPACT ON SILVICULTURE

In addition to affecting how individual graduates of the Institute think and act, leaders of the Institute hope to affect how others view silviculture and silviculturists. To investigate the degree to which this has occurred, supervisors and participants were asked seven questions about the changing status of silviculture and silviculturists within forestry, and the degree to which the Institute has affected that status.

These were difficult sections of the surveys to develop, and they were even more difficult to interpret. Although program leaders were unanimous in their desire

to have impacts that extend beyond individual participants, it was difficult to define those impacts. Even once there was agreement in principle about what these impacts might be, it was difficult to write specific questions that would elicit appropriate responses. Further, it was clear from their responses that supervisors and participants had difficulty making the judgments that were sought. In spite of these difficulties, responses to this set of questions are examined in this section to see what can be learned from them.

Each of the seven questions in this section contained two parts. The first part of each question asked the extent to which a particular factor had changed over the 10 years preceding the study. The second part of each question asked the degree to which the Institute was responsible for that change.

As in previous sections of this study, the emphasis in this section is on the major impact desired by program leaders--the impact of the Institute on how those outside silviculture view silviculture and silviculturists--rather than on the individual questions that comprise the major impact. However, because only seven questions comprise this section, they are listed below to give readers a better sense of the types of impacts that were sought in this section.

1. To what extent do you sense a higher regard for silvicultural decisions within your own organization?
2. To what extent do you sense a higher regard for silvicultural decisions by those from outside your organization, or from outside of forestry altogether?
3. To what extent do you sense a desire by other resource specialists within your organization for programs similar to the Institute within their own disciplines?
4. To what extent has your organization increased the number of silviculturists promoted into decision-making or managerial positions outside of silviculture?
5. To what extent has your own organization increased its commitment to more creative, innovative silviculture?
6. To what extent is there better communication and cooperation among all resource specialists within your organization?
7. To what extent has your organization increased its commitment to forest management practices that are truly integrative and long-term?

The second part of each question asked readers to assess the Institute's responsibility in bringing about these changes. Specific wording for each set of questions can

be found in Section III of the Participant Survey (Appendix F) and Section II of the Supervisor Survey (Appendix G).

Results from the two surveys are summarized in Table 23. In this table, "extent" refers to the extent to which the seven factors in question changed in the 10 years preceding the Institute, and "responsibility" refers to the Institute's effect on that change. Also presented are the average number of respondents for each set of questions (n), the average response of each population to the entire set of questions comprising the impact (mean), and the average distribution of responses for the entire set of questions comprising the impact.

Table 23 again shows great consistency between the two surveys, regardless of whether means or the distribution of responses are examined.

Again, the distribution of responses should be used to develop an overall picture of impact--and again that picture is one of significant impact. For the Participant Survey, roughly 70 per cent of the respondents described the extent of change in the seven areas in question as moderate or above; almost 80 per cent of the supervisors who responded described it as moderate or above. In both surveys, roughly 70 per cent of the respondents described the Institute as being at least "somewhat" responsible for those changes. It

should also be noted, however, that 20-30 percent of the respondents indicated only small changes in the areas in question, and described the Institute as being less than "somewhat" responsible for those changes. Therefore, although the overall picture was one of significant change over the 10-year period in question, and significant impact resulting from the Institute, there were many who did not share that view (as reflected by means very close to 3.0).

Table 23. The response of participants and supervisors to seven questions regarding the impact of the Institute on silviculture in general.

Participant Survey:

<u>Question</u>	<u>n</u>	<u>Mean</u> ³	<u>Distribution of Responses (%)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
Extent ¹	200	3.04	10	28	31	18	13
Responsibility ²	177	2.98	13	24	30	13	19

Supervisor Survey:

<u>Question</u>	<u>n</u>	<u>Mean</u> ³	<u>Distribution of Responses (%)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
Extent	82	3.32	14	30	35	15	6
Responsibility	73	3.07	9	27	36	15	12

¹ Extent = extent of change in 7 items over 10 years.

² Responsibility = SI's responsibility for those changes.

³ Based on a 5-point scale in which in which 5=great change or great responsibility, 3=moderate change or moderate responsibility, and 1=no change or no responsibility.

Perhaps the only surprise in Table 23 is that there was not a stronger sense of impact indicated either group of respondents. There are any number of reasons this may

have occurred. One possible explanation is that the influence of the Institute was simply too diffuse to identify with any degree of confidence; another is that the questions asked in the survey were just not the right ones, or were incorrectly worded to elicit strong responses. Another is that the changes desired have, in fact, only occurred to a moderate extent, and that the Institute was only moderately responsible for those changes, just as the surveys indicate.

As seen when examining the Institute's impact on individual silviculturists, it is important to examine the variation that surrounds these overall means, as well as the means themselves. The variation that individual respondents contributed to each individual question comprising the impact is presented in Appendices F and G; there are simply too many to present here. However, Table 23 summarizes the variation that individual respondents contributed to the overall mean. Two important trends can be noticed: 1) a significant number of respondents either marked "undecided" or failed to respond to the questions regarding the Institute's responsibility for the changes that have occurred in silviculture--indicating that the questions were difficult to answer, and 2) there is greater diversity in the responses to this set of questions than to others in the survey--that is, more respondents marked "1's" and "2's" than for other impacts in the surveys.

Variation can also be contributed to the overall impact mean by the means of the individual questions comprising the impact. This variation is summarized in Table 24. Again, two trends are noticeable: 1) there is significant variation among the means, for both "extent" and "responsibility," and 2) if relative rankings are examined, rather than absolute values, it is remarkable how similarly supervisors and participants responded to this set of questions, in spite of its apparent difficulty.

Table 24. Individual means for seven questions regarding the impact of the Institute on silviculture in general.

<u>Question</u> ¹	<u>Extent of Change</u> ²		<u>Responsibility for Change</u> ³	
	<u>Participant</u>	<u>Supervisor</u>	<u>Participant</u>	<u>Supervisor</u>
1	3.37 ⁴	3.71	3.41	3.45
2	2.62	2.75	2.40	2.70
3	3.05	3.23	3.37	3.30
4	2.69	2.71	2.73	2.72
5	3.13	3.51	3.20	3.37
6	3.32	3.64	2.79	2.93
7	<u>3.12</u>	<u>3.48</u>	<u>2.94</u>	<u>2.99</u>
Mean	3.04	3.32	2.98	3.07

¹ Question numbers refer to list of questions presented in the body of the text (see page 119).

² Extent to which item in question has changed over a 10-year period.

³ Degree to which the Institute is responsible for any changes noticed.

⁴ All means based on a 5-point scale.

1=no change, or SI not responsible for change.

3=moderate change, or SI mod. responsible for change.

5=great change, or SI very responsible for change.

It is difficult to summarize this particular section of the two surveys because of the diversity of responses. Although roughly 70 per cent of Institute graduates and their supervisors described the Institute's impact in the seven areas investigated as moderate or above, roughly 30 per cent perceived relatively little impact from the Institute. In addition, roughly 15 per cent of both groups either answered "undecided" for a majority of the questions, or simply left them blank, indicating that they were difficult to answer. From this one might conclude that some of the Institute's impact may have been masked by the difficulty of developing a set of questions that truly addressed the impacts desired by the program leaders, or because so many factor besides the Institute have contributed to any changes that were noticed. It should also be pointed out that the impacts sought in this set of questions do not stem directly from the instructional program of the Institute, but from the effect that its graduates are hoped to have on their organizations and their profession when they return to work. As a result, responsibility for the accomplishment of these achievements falls largely outside the control of the Institute itself.

IMPACTS OF THE SILVICULTURE INSTITUTE: IN THEIR OWN WORDS

Although mail surveys have a number of advantages over phone or face-to-face interviews (Dillman 1978), they lack the potential spontaneity of more personal techniques. In most cases they cause respondents to focus on specific items that the designers of the survey want them to focus on, and direct their responses into predetermined categories. In short, although mail surveys may collect data efficiently, they sometimes fail to discover issues or concerns that are important to respondents because of their rigid nature. In contrast, phone or face-to-face interviewers have the opportunity to probe, and to ask leading or follow-up questions that can elicit more complex responses (Dillman 1978).

One potential way of overcoming these limitations in mail surveys is through the use of open-ended questions. However, this technique is seldom used because of difficulties in getting people to respond coherently, and in analyzing responses when they are obtained (Dillman 1978). In spite of these potential difficulties, each of the two surveys used in this study included a section entitled "In Your Own Words," in which respondents were asked seven open-ended questions regarding impacts of the Silviculture Institute.

Despite the fact that the fixed-response sections of both surveys took a long time for respondents to complete, the response to the open-ended questions was

overwhelming. For example, of the 86 supervisors who responded to the survey, 65 per cent answered four or more of the questions, an additional 21 per cent answered between one and three questions, and only 14 per cent chose not to respond to any. Of the 215 participants who responded to the survey, 61 per cent answered four or more of the open-ended questions, an additional 33 per cent answered from one to three questions, and only 6 per cent chose not to respond to any. Many respondents completely filled both of the pages within the survey that were designed for written comments; some even typed their responses. Responses were almost always thoughtful; some were eloquent. Clearly, these people had a deep and abiding interest in the success of the Institute, and wanted their opinions heard.

Although analyzing open-ended responses to so many questions was quite a challenge, summarizing and presenting them in a meaningful fashion was even more difficult. The remainder of this section lists each question separately, along with the most common or important ideas gathered from both sets of responses. Please keep in mind the non-quantitative nature of the data; some items were mentioned by only a small number of supervisors or participants but were included because of the insight they provide into the Institute. More detailed listings are presented in Appendices I and J,

but even these are only paraphrased summaries of the hundreds of pages of original comments gathered from the surveys.

In your opinion, what are the most important impacts of the Silviculture Institute?

Although supervisors mentioned almost every impact described in earlier sections of the survey, and a few that were not mentioned, they mentioned improvements in the technical skills of silviculturists far more than anything else. Also high on their list were: 1) an increase in the credibility and status of silviculturists, 2) a broader, more inter-disciplinary perspective by silviculturists, 3) increased confidence and improved decision-making in silviculturists, and 4) the development of an effective network of silviculturists who can, and do, help each other solve problems.

Like their supervisors, participants listed almost every impact described in the survey, plus a few extras. However, networking--meeting and exchanging ideas with fellow silviculturists from around the region--was most often mentioned as the most significant impact. Fairly close behind were: 1) improved technical forestry skills and knowledge, 2) exposure to new ideas and concepts, 3) a broadened silvicultural perspective, 4) increased confidence, 5) improved decision-making and

problem solving skills, 6) improved analytical abilities and the ability to defend ideas, 7) exposure to research scientists and research literature, and 8) improved credibility for silviculturists.

With the possible exception of the emphasis placed by participants on the importance of networking, there were no surprises here. The major impacts identified in the beginning of the study seem to be the ones mentioned most often by both supervisors and participants.

Can you think of other impacts the Institute has had--on individuals, on organizations, or on the profession--that haven't been described in previous sections of this survey?

Although no single item dominated the supervisors' list, a number of important impacts were raised. The following are restatements of some examples they offered (they are not direct quotes unless so indicated): 1) it has broadened the perspective our entire organization about silviculture and the contribution it can make, 2) it has raised the knowledge base of our entire organization, 3) it has helped individuals meet personal goals that would not otherwise have been possible, and has revitalized a number of careers, 4) it has strengthened the partnership between the universities and forestry organizations, 5) it has helped establish higher standards for professionalism throughout our

organization, and 6) it has improved the ability of our organization to respond to public concerns. Altogether, this is a powerful list.

Although the items listed by participants were similar to those developed by their supervisors, participants mentioned two items more than any others: improved public support for silvicultural decisions, and increased credibility of silviculture within their own organizations.

Again, there were no real surprises in this section, with the possible exception of improved public support for silvicultural decisions mentioned by participants; this has commonly been mentioned as an idealized impact of the Institute, but no one seemed convinced that it was really likely to happen. As in the first question in this section, supervisors and participants agreed reasonably well on "other" impacts that have resulted from the Institute.

Can you quantify any of the beneficial impacts that have occurred--either in terms of dollars saved, acres affected, or people influenced?

By far the most common response from supervisors was that impacts from the Institute have been "significant, but very difficult to quantify." Several indicated that they had saved a great deal of money by not managing acres that should not be managed, by

carefully prioritizing which acres they should treat, and by reducing mistakes that in the past have required re-treatment. One estimated saving "millions of dollars" on improved reforestation practices alone, although not all the savings could be attributed to the Institute.

Another estimated saving \$300,000 over six years by relying on natural regeneration rather than planting and spraying. Another estimated a "30 per cent increase in tree growth due to better prescriptions and better brush control." Clearly, supervisors seem convinced that they have experienced significant economic returns from the Institute, even if they can not always quantify them.

Although a significant number of participants (15) also characterized the impact of the Institute as being "significant, but difficult to quantify," quite a few attached actual numbers to this sentiment. Six put the amount of money they have saved between \$80,000 and \$280,000 per year, mostly related to improvements in regeneration and slash burning. Several others estimated saving "thousands of dollars per year." Several others did not estimate dollar values, but were sure that they had paid back the cost of their participation many times over. Many described specific examples of how and where they saved money, but did not assign dollar values to the savings. Others pointed to savings as diverse as lowering the cost of contract inspections because of

improved communications, and bringing more acres into the timber management base because of creative silviculture. Only one described the monetary return from the Institute as low, and this occurred because poor management blocked implementation of good ideas that could have saved money or improved results.

Clearly, Institute graduates and their supervisors perceive significant economic returns from participation in the Silviculture Institute. Most seem to be in the areas of reforestation, slash control, and vegetation control; and most, but not all, seem to arise from actions not taken that have traditionally been viewed as "good" forestry practices.

Have you noticed any negative side-effects from the Institute?

The two most common responses of supervisors were "no," and "some Institute graduates are too arrogant about their new skills and knowledge." Included among the other comments were the following (responses have been paraphrased): 1) there is often a stigma attached to very qualified people who have not completed the Institute, 2) it takes time away from the traditional duties performed by silviculturists, 3) some graduates define themselves too narrowly as silviculturists and limit their career opportunities, 4) there is a tremendous negative impact on those who fail

certification, 5) there is a tendency by Institute graduates to view too many problems as having technical or silvicultural solutions, and 6) there is a building resentment among some technicians who are very capable but are ineligible to attend the Institute.

Again, the items listed by participants were similar to those of their supervisors, with the exception that participants pointed to strain on family life, and work build-up in the home office while attending the Institute, as by far the most serious negative impacts of the Institute. Several also mentioned: 1) the tremendous time and energy required for certification, 2) a building frustration among technicians who are not permitted to attend the Institute, 3) false hopes created for promotion among those who complete the Institute, 4) a degree of arrogance among some Institute graduates, and 5) that completion of the Institute is sometimes substituted for experience in promotions of women and minorities.

This section of the survey identified a number of adverse impacts that have resulted from the Institute. However, the magnitude of these impacts is uncertain because of the non-quantitative nature of the data. Although all are potentially important, they need to be investigated in more detail before assuming they are serious problems that must be corrected.

If the impact of the Institute has been less than its full potential, what factors have been important in limiting it?

From supervisors, the most common responses were that too many decisions within their organizations are still being driven by timber-related considerations, and that organizational inertia presents a significant barrier to implementing changes in current practices. Others suggested the following (paraphrased): 1) that the high cost and time commitment associated with attending the Institute prevent sending enough people to it, 2) that research and continuing education are well-funded, but intensive practices that they know will work are under-funded, 3) that many instructors in the Institute lack a realistic perspective of on-the-ground forestry, 4) that District Rangers should be more involved in planning and implementing the Institute, 5) that too many Institute graduates have been promoted out of silviculture too soon after completing the Institute, 6) that Institute graduates have a good biological perspective but not enough management perspective, and 7) that more non-foresters should be included in the Institute, both as participants and as instructors.

Although participants mentioned all the items listed by supervisors, and many more, organizational inertia--the resistance of supervisors and peers to change--was mentioned four times as often as any other

factor. Also high on the list were: 1) that too many silvicultural decisions are not being made by silviculturists, 2) that the "new" silviculture creates additional pressure on silviculturists who are already fully-occupied with existing responsibilities, 3) that continually shrinking budgets make it difficult to implement new ideas, and 4) that too many decisions are politically motivated rather than based on good silviculture.

It is clear from these responses that Institute graduates and their supervisors view organizational inertia as a crucial factor limiting the impact of the Institute. Regardless of whether this inertia is the result of laws, organizational policies, or simply the resistance of individuals to change, it must be reduced if the Institute is to reach its full potential.

Please describe any topics that should be added, deleted, or receive a different emphasis than they currently receive.

The list of items that supervisors would like to see added to the Institute is a long one. Among many other things, they would like to see more on silviculture for non-timber objectives, more on long-term productivity and forest fragmentation, more on conflict resolution, and more on working with the media and the general public. Perhaps the most intriguing suggestion is that

exposure to the management philosophies of other cultures, such as that of Native Americans, be added. Statistics was the only topic suggested for reduction or elimination, and it was only mentioned by two supervisors.

The participants' list of additions includes everything imaginable. The items listed most often include: 1) more on silviculture for other resources, 2) more on east-side silviculture, 3) more on computer programs and models that are useful in forestry, 4) more on current issues in forestry, and 5) more on communication skills, conflict resolution, and working with the public. Statistics was the only item that a significant number of participants would like to see either de-emphasized or made more practical, although a number of other topics were listed by individuals.

For the most part, suggestions for additions focused on more of what is already being taught in the Institute; the exception to this is the desire for more instruction in the areas of communication skills, conflict resolution, and working with the media and the public. The challenge associated with these good ideas is, of course, to find room within a curriculum that is already too crowded. Perhaps the best guidance was offered by a participant who encouraged program leaders to "focus on the quality of instruction, not the quantity of instruction."

The single area that respondents expressed significant dissatisfaction with is that of statistics and experimental design. This will not surprise program leaders, who have struggled to improve this segment of instruction since the inception of the Institute. Although many participants suggested that it be eliminated, many others suggested that it merely needs to be made more practical. It should also be noted that one participant noted saving \$100,000 in a single year by using statistical procedures to help evaluate tree seedlings prior to planting; if this information were shared with other participants and supervisors perhaps there would be more support for statistics.

Do you have other comments about the Institute, or the certification process in general?

Most supervisors who chose to comment within this section reiterated their strong support for the Institute. Others offered suggestions for improvement, such as: 1) "include a few outstanding technicians in each class," 2) "open the Institute to non-foresters," and 3) "silviculture is spreading itself too thin, it should concentrate on growing trees." The single negative comment suggested that the Institute is too long and costs too much money.

Although relatively few supervisors chose to comment specifically on the certification process, those

that did suggested the following improvements (paraphrased): 1) include District Rangers in the process, 2) make it more operational, and 3) establish various levels of certification based on experience. In addition, a few suggested that the entire process is too complex and time-consuming, that the success rate is too low, and that the process has limited the professional growth of some candidates in other areas by causing them to be "pigeon-holed" as silvicultural specialists.

As did their supervisors, most participants who chose to comment on the Institute expressed strong support for it. In addition, at least one or two participants made the following suggestions: 1) that the Institute open itself to non-silviculturists, 2) that it de-emphasize tests and grades, 3) that it increase the diversity of its instructors by looking to private industry, forestry organizations, and other universities, 4) that it increase the number of participants from outside the USDA Forest Service, and 5) that it consider granting a Masters degree for completing all six modules.

Participants had far more to say about the certification process than did their supervisors, and most of it was critical. A strong sentiment was expressed that the entire certification process is too complex (too time-consuming and too energy-intensive), too arbitrary (too dependent on the certification panel

rather than the quality of the candidate), and too academic (not representative of real-life silviculture). There was also a feeling that the entire process should be more supportive and less judgmental, that candidates need to receive more support from their work units during their try for certification, and that the Regional Office needs to develop (or communicate) more clear objectives on the purpose and process of certification, including guidelines or models for the prescription. Again, it must be kept in mind that this information is qualitative in nature, not quantitative. As a result, it is difficult to tell the full extent of dissatisfaction with the certification process, but it does appear to be significant enough to warrant serious thought. There were also two comments indicating that the recertification process is too complex, and that it lacks any clear incentives.

Taken together, the quantity and quality of responses to these seven questions demonstrate a tremendous concern for the Institute on the part of former participants and their supervisors. The thoughtfulness, clarity, and details contained in them suggest nothing but respect for the Institute and hope for its future success. From them, it is clear that the Institute is having significant impacts on graduates of the program, on the organizations for which they work,

and on the practice of silviculture in general, and that there are significant economic returns associated with the program. It is also clear that resistance to change within forestry organizations is the single most important factor limiting additional impact from the Institute. Finally, although this study is not about the USDA Forest Service's silvicultural certification process, it is clear that there is significant dissatisfaction with that process; many feel that it has grown out-of-control. Although there is not enough information in this study to gauge the true extent of that sentiment among silviculturists and their supervisors, or to suggest how to correct the problems that seem to exist, there is enough information to suggest that the current process should be carefully, and openly, reviewed.

CHANGES IN KNOWLEDGE VERSUS THE IMPACT OF THOSE CHANGES

The principal question of this study was, "To what extent has the Silviculture Institute changed the practice of silviculture in the Pacific Northwest?" Although this would seem to be the ultimate question regarding the Institute, much of the responsibility for that impact lies with the participants themselves and with the organizations for which they work, well beyond control of the Institute staff. Because of this, leaders of the Institute were also interested in the question,

"To what extent has the Institute changed the abilities of those who have attended?," a subtle but significant difference from the primary question being asked.

This section briefly explores the extent to which the Institute changed the knowledge of its participants, without regard for the impact of those changes on their actions in the workplace. Note that this set of questions was asked only of participants, not of their supervisors, since supervisors can not actually see changes in knowledge that take place within Institute participants, but only the impact of those changes on their actions.

There is, of course, a very direct way of measuring changes in knowledge that result from an educational program such as the Institute--testing participants before they enter and after they complete the program in question (a process called pre- and post-testing). Unfortunately, this has never been done in the Institute, so perceptions of change were relied on as measures of teaching effectiveness rather than more direct measures.

In Section I of their survey (see Appendix B), participants were asked how they would have assessed their abilities prior to attending the Institute in the following eight areas:

1. their ability to make ecologically sound decisions,
2. their ability to make economically sound decisions,
3. their ability to make decisions that are practical from the standpoints of engineering and logistics,

4. their ability to make stand-level decisions that fit into a larger management context,
5. their ability to investigate and solve difficult silvicultural problems,
6. their ability to make structured, well-documented decisions,
7. their ability to understand broad ecological issues, and
8. their ability to present and defend their silvicultural decisions to others.

Note that these judgments were retrospective in nature; participants were asked to speculate about how they would have responded anywhere from one to ten years in the past.

Results of the self-assessments of silviculturists are presented in Table 25. Regardless of whether means or the distribution of responses are examined, one is likely to conclude that silviculturists did not rate their abilities highly prior to the Institute. On average, 23 per cent of those responding rated their abilities above moderate, while 39 per cent rated their abilities below moderate. Differences between the individual abilities were relatively small, although the ability to solve difficult silvicultural problems, and the ability to make economically sound decisions were rated somewhat lower than the others.

Table 25. A self-assessment of silvicultural abilities in eight areas prior to attending the Institute.

Ability: ¹	n	mean ²	Responses (%)				
			5	4	3	2	1
Ecological decisions	213	3.09	6	21	55	16	13
Economic decisions	212	2.47	3	11	35	31	20
Practical decisions	211	3.23	8	29	43	13	5
Context of decisions	209	2.90	4	20	45	25	6
Problem-solving	213	2.37	4	10	25	40	21
Structured decisions	213	3.08	5	29	41	22	4
Understanding issues	213	2.63	5	15	31	38	15
Defend decisions	211	2.54	3	10	40	32	15

¹ Refer to text (p. 141) for complete descriptions of abilities.

² Means based on a 5-point scale in which 1=low, 3=moderate, and 5=high.

In Section II of their survey (see Appendix B) participants were asked 34 questions about the extent to which the Institute improved their knowledge or ability in those same eight areas. More questions were asked in Section II than in Section I to probe more deeply into specific aspects of the Institute's teaching effectiveness. In most cases, responses to several questions from Section II were combined and compared with responses to single questions from Section I.

It is important to note that responses to questions in Section II should be evaluated by themselves; because each one indicates how much the Institute improved the knowledge or ability of participants in a particular area, the responses can not be added to or subtracted from questions in Section I to determine a "net gain."

Means are provided from Section I only as a relative index of where participants started prior to the Institute.

A summary of participants' responses to each set of questions is presented in Table 26; their responses to individual questions are presented in Appendix F. A listing of which questions from Section II of the Participant Survey comprise each ability grouping is presented in Appendix K.

Table 26. The extent to which attending the Institute improved the abilities of silviculturists in eight areas.

Ability: ¹	Q ²	n ³	mean ⁴	Responses (%)				
				5	4	3	2	1
Ecological decisions	7	211	3.52	15	39	32	13	2
Economic decisions	6	209	3.52	18	35	30	13	3
Practical decisions	2	210	2.82	6	20	33	31	9
Context of decisions	2	211	2.93	10	21	33	27	9
Problem-solving	9	211	3.24	11	29	36	19	5
Structured decisions	2	211	3.41	15	33	31	17	5
Understanding issues	5	210	3.38	14	36	31	17	3
Defend decisions	1	213	3.76	25	37	29	6	2

¹ Refer to text (p. 140-141) for complete descriptions of abilities.

² Number of questions comprising each ability grouping.

³ Average number of respondents for entire set of questions comprising ability group.

⁴ Means based on a 5-point scale in which 1=no improvement, 3=moderate improvement, and 5=great improvement.

As would be expected from earlier sections of this study, Table 26 indicates that the Institute has had a significant effect on the abilities of silviculturists in each of the eight areas explored. On average, 78 per

cent of those who responded to the survey described its impact in these eight areas as moderate or above; roughly half (46%) described its impact as greater than moderate. Clearly, the Institute has improved the abilities of a vast majority of those who have participated in it. On the other hand, almost a quarter (22%) of those who attended the Institute experienced relatively little improvement in their abilities. This suggests that there is ample room for improvement in the Institute's teaching program.

Looking at the individual abilities in Table 26 indicates that the most significant gains occurred in the ability of silviculturists to present and defend their silvicultural decisions to others, and in their ability to make ecologically and economically sound decisions. Gains in their abilities to defend their decisions and to make economically sound decisions are especially noteworthy because participants entered the Institute with relatively low skills in these two areas (Table 25). The smallest gains (but gains none-the-less) were made in their ability to make decisions that are sound from the standpoint of engineering and timing, and that fit into a larger management context. This is easy to understand given the relatively small amount of instructional time spent on these two areas during the Institute. It should also be noted that participants rated their ability to

make practical decisions from the standpoint of engineering and timing the highest of all their abilities upon entering the Institute (Table 25).

Taken together, this information suggests that significant gains in knowledge have occurred in each of the major areas covered within the Institute, but that the largest gains were made in the abilities of participants to present and defend their ideas to others, and to make economically and ecologically sound decisions. The smallest gains (but gains none-the-less) were made in their abilities to fit stand-level decisions into the larger management picture, and in their abilities to make decisions that are practical from an engineering and logistical standpoint.

It would be easy to grant too much significance to the observations just made, however. Rather than being used to pass judgment on particular segments of the Institute, they should be used as departure points for further discussions among the Institute's staff. They should raise questions in the minds of program leaders about whether the perceptions of participants agree with their own, and whether they understand the factors that might cause participants to respond the way they did. Perhaps the greatest value of this section is merely to point to areas where participants appear to be making the smallest strides, and raise the question of whether these

sections should be strengthened, or abandoned in favor of other content areas where gains might be greater.

Again, these measures of knowledge gains are indirect; they are based on perceptions and recollections of events that may have occurred years in the past. If Institute leaders desire more accurate measures, a program of pre- and post-testing should be established.

SUMMARY OF RESULTS

The goal of this study was to determine the extent to which the Silviculture Institute has influenced the practice of silviculture in the Pacific Northwest. To help make this determination, two mail surveys were developed and administered: one for those who completed the Institute during its first ten years, and one for people who supervise silviculturists within the USDA Forest Service (District Rangers) and the Bureau of Land Management (Area Managers), the two principal organizations which send participants to the Institute. Each survey included sets of open-ended and close-ended questions. Two types of impacts were sought: 1) those identified by leaders of the Institute as being highly desirable, and 2) those that were unanticipated, or unintended, by program leaders. Impacts may have been experienced by individuals who have completed the Institute, by the organizations for which they work, or on the practice of silviculture, in general. In drawing

conclusions and inferences from the study, data from the two surveys were combined with observations I made as a participant-observer during Institute VII.

The response to both surveys was very high: 82 per cent to the Supervisor Survey and 88 per cent to the Participant Survey. Because the surveys were sent to all participants who completed the entire Institute, and to all District Rangers and Area Managers in the Northwest, average responses were true population parameters, rather than statistics derived from random samples. Because of the high response rate, those who responded were assumed to be representative of the larger populations of which they are part.

Impacts on Individuals

To explore impacts on the thoughts and actions of individuals who have completed the Institute, 39 identical questions were asked of supervisors and Institute graduates. Their responses were analyzed according to six major impacts identified by program leaders at the start of the study (listed below).

The Institute hopes to produce silviculturists who:

1. make more-defensible silvicultural decisions,
2. have broader silvicultural perspectives,
3. are better problem solvers,
4. practice more innovative silviculture,
5. exhibit more confidence in their silvicultural decisions, and
6. are more influential within their profession.

The perceptions of Institute graduates and their supervisors about the Institute's impact in these six areas were surprisingly similar. In general, both groups indicated that the Institute has had significant impact on the thoughts and actions of silviculturists who have completed the Institute. Over three-fourths of both groups described the Institute's impact as moderate or greater; roughly half described it as being greater than moderate. Although there were minor differences between the perceptions of supervisors and participants, each of the major impacts seems to have occurred at a significant level and to a significant portion of Institute graduates.

Each set of respondents was also split into smaller groups to explore differences in perceptions of impact within specific segments of the larger populations. A single question regarding the overall success of the Institute in accomplishing its educational mission was used as an index of impact. Although a number of differences were found, most were minor, and their implications for the Institute are small. None-the-less, they should help Institute leaders understand how various sub-groups view the impact of the Institute.

The following observations summarize how sub-groups of Institute graduates viewed its impact.

1. Participants who attended the Institute during its initial, middle, and most recent periods rated the success of the Institute (and, by implication, its impact) almost identically.
2. Participants from the USDA Forest Service viewed the Institute as being slightly more successful than their counterparts in the BLM, but slightly less successful than their counterparts in private industry and other governmental agencies.
3. Participants promoted within the silvicultural ranks viewed the Institute as being slightly more successful than those promoted outside of silviculture, those not promoted at all, and those who made lateral transfers.
4. Participants with fewer than 10 years of total forestry experience, and fewer than 10 years of forestry experience in the Pacific Northwest, viewed the Institute as being slightly more successful than did those with more than 10 years of experience in either area.
5. Participants who received a high level of support from supervisors and colleagues both during and following their participation in the Institute viewed the Institute as being more successful than those who received less support.

6. Participants who attended the Institute primarily for self-improvement viewed it as being slightly more successful than those who attended out of a sense of obligation, but the difference was very small.

7. Participants from the USDA Forest Service who were already certified when they completed the survey viewed the Institute as being slightly more successful than those who had not yet attempted certification, those who had tried to become certified but had failed, and those who worked for organizations that do not certify silviculturists. Each of these groups viewed the Institute as being more successful than those few USDA Forest Service people who had decided not to even attempt certification.

A number of other factors examined in this study were found not to influence the perceptions of participants about the success of the Institute. These are described earlier in this report.

A quick review of results from the Supervisor Survey leads to the following observations.

1. BLM supervisors viewed the Institute as being a good deal more successful than their counterparts in the USDA Forest Service.

2. Supervisors with more experience (i.e. those who had supervised more silviculturists and more Institute

graduates) viewed the Institute as being significantly more successful than those with less experience.

3. Supervisors who have been silviculturists themselves viewed the Institute as being slightly more successful than those who have not been silviculturists.

4. Supervisors who have personally participated in the Silviculture Institute viewed it as being slightly more successful than those who have participated in some other regional silvicultural program. However, those who have not participated in any regional silvicultural program (the vast majority of respondents) viewed the Institute as being most successful of all.

Impacts on Silviculture

To explore impacts of the Institute on silviculture in a more general sense, seven two-part questions were asked of supervisors and participants. The first part asked the extent to which a certain impact had occurred within the 10 years prior to this study, while the second part asked the extent to which the Silviculture Institute could be considered responsible for that change.

In brief, these questions asked about the regard for silvicultural decisions both within and outside the respondents' organizations, the desire of other resource specialists to start programs like the Institute, the

extent to which silviculturists have been promoted into managerial positions outside of silviculture, the extent to which forestry organizations have committed to silviculture that is creative, integrative, and long-term, and, finally, the extent to which there is better communication between silviculturists and other resource specialists within their organizations.

Again, the responses of supervisors and participants were similar to one another, and generally indicated a significant impact, although somewhat less than the impact on individual silviculturists.

In Their Own Words

To permit participants and supervisors to offer their thoughts about the Institute in a less-structured format, seven open-ended questions were asked in each of the two surveys. The response to these questions was overwhelming; of those responding to the survey, 86 per cent of the supervisors and 94 per cent of the participants answered at least one of the open-ended questions; roughly 65 per cent answered at least four.

The first question asked respondents which of the various impacts of the Institute they thought were most important. Others asked respondents: to describe unanticipated impacts from the Institute (positive or negative), to quantify impacts they had observed, to identify factors that had been important in limiting the

impact of the Institute, and to describe how they would like to see the content of the Institute modified.

Finally, they were asked for general comments about the Institute and about the silvicultural certification process used by the USDA Forest Service in Region 6.

Although it was difficult to summarize the hundreds of pages of written comments, and even more difficult to categorize and quantify them, they provided many insights into the Institute, and many suggestions on how to improve it.

When asked which impacts from the Institute have been most important, supervisors mentioned gains in technical skills more than anything else. Participants, on the other hand, most often mentioned the network of silviculturists that has developed as a result of the Institute; many also mentioned gains in technical knowledge, broadened perspectives, and improvements in decision-making, problem solving, and confidence as important impacts.

When asked about unanticipated impacts from the Institute, supervisors tended to point to positive impacts within their own organizations, such as broadened perspectives, an improved knowledge base, higher standards of performance, and so forth. On the negative side, most answered that they had not observed any negative impacts; the second-most common response was that some Institute graduates have become arrogant about

their knowledge. When participants were asked about unanticipated positive impacts, they pointed to improved public support for silviculture, and increased credibility for silviculture, far more than anything else. On the negative side, they mentioned stress on their families, and work build-up at the office while they were attending the Institute, far more than anything else; a fair number also mentioned the increased pressure associated with trying to merge "new" silvicultural responsibilities with traditional ones. Many other negative side-effects were mentioned by individuals, or by small groups, but none were as common as those just listed.

When asked to quantify any of the Institute's impacts, most supervisors responded that the benefits were "significant, but difficult to quantify." Although most did not attach dollar figures to their judgments, one estimated the savings in the "millions" on his district alone, and another put it at over \$300,000 in six years. Participants, on the other hand, were good at quantifying impacts from the Institute. Half-a-dozen calculated savings ranging between \$80,000 and \$280,000 per year, primarily resulting from not doing things that they have done in the past in the name of good forestry. Many others described specific changes in practices without attaching cost savings to them. Clearly, both groups

have seen significant economic returns from the Institute.

To the extent that the Institute has failed to reach its full potential, respondents were asked to identify factors that have limited it. Both supervisors and participants identified organizational inertia--resistance to change--as one of the most important factors limiting the impact of the Institute.

Silvicultural decisions made by non-silviculturists, and for non-silvicultural reasons (such as political, economic, or administrative), also ranked high on both lists.

Finally, many comments were made about the Silviculture Institute, in general, and the USDA Forest Service's certification process, in particular. Comments about the Institute were generally supportive, and many suggestions were made for how it could be made even more effective. Although difficult to summarize, they tended to center around increasing its diversity--in terms of content, instructors, participants, and view points. Comments about the silvicultural certification process used in Region 6 of the USDA Forest Service, on the other hand, were largely critical. Of those who offered their opinions, most conveyed the idea that the process is too complex, too intensive, and too academic. However, many also offered suggestions for changes that would help

remedy these problems, inferring that they would support the process in a less-intense, more practical form.

Again, some of the comments listed above were mentioned by numerous respondents, while others were mentioned by only one or two. They are all presented here to stimulate thinking on the part of Institute leaders and the individuals and organizations that participate in the Institute.

Knowledge vs. Impact

Although the primary goal of this study was to assess the impact of the Silviculture Institute on the practice of silviculture in the Pacific Northwest, participants were asked a series of questions intended to help Institute leaders assess the effectiveness of their teaching. They were asked the extent to which the Institute improved their ability to: 1) make ecologically sound decisions, 2) make economically sound decisions, 3) make silvicultural decisions that are practical from an engineering and logistical standpoint, 4) make stand-level decisions that fit into a larger management context, 5) investigate and solve difficult silvicultural problems, 6) make decisions in a structured, well-documented way, 7) understand broad ecological issues, and 8) defend their silvicultural decisions to others.

Roughly 80 per cent of those responding to this set of questions described the Institute's impact on their

abilities in these eight areas as moderate or above; almost half described it as being greater than moderate. The greatest gains were made in their ability to present and defend their silvicultural decisions to others, and in their ability to make ecologically and economically sound decisions. The smallest gains were made in their ability to make silvicultural decisions that are practical from an engineering and logistical standpoint, and in their ability to make stand-level decisions that fit into a larger management context such as the entire forest, the organization, or the region.

A Final Thought Regarding the Results of this Study

Despite my best effort to identify all potential impacts from the Silviculture Institute, despite the thoughtful feedback of those who helped review the study plan and the two survey instruments used in this study, and despite the concern and thoughtfulness of the participants and supervisors who responded to those surveys, this study is likely to have underestimated the impact of the Silviculture Institute on the practice of forestry in the Pacific Northwest.

The reason for this underestimation is simple: some of the Institute's most important impacts are so subtle, and so long-term, that they are impossible to trace back to their origins. For example: one of the most fundamental hopes of the Institute staff is to affect how

participants think about forestry issues and problems-- how they approach new or difficult situations, how they define and react to constraints, how they propose and evaluate alternatives, and how they make final decisions. Although some of the behaviors associated with these thought process have physical manifestations, others lie buried far beneath the surface, undetectable even to the person doing the thinking. These are the types of impacts that are likely to be undetected by this study, in spite of their occurrence and their importance.

IMPLICATIONS AND RECOMMENDATIONS

"To create a willingness to change in the learner, workshop planners and facilitators must examine and understand both the work environment and the targeted competencies..."

-Robert D. Fox 1984-

The underlying purpose for this study was to provide leaders of the Silviculture Institute with information to help them improve the effectiveness of the Institute. This section discusses implications of some of the study's major findings, drawing on information collected from the two surveys used in the study, and also upon observations I made as a participant-observer during Silviculture Institute VII.

Before discussing implications, it is worth restating that this study focused on impacts that have resulted from the Silviculture Institute. It was not an evaluation of the educational program itself, but of the program's success in changing the practice of silviculture in the Pacific Northwest. The difference is subtle, but important. The responsibility for impact is not the Institute's alone--it is shared by those who plan and monitor the Institute, those who teach in it, those who participate as students, and those who shape the work environment in which Institute graduates are expected to apply what they have learned. Each is a vital link in designing and conducting a successful continuing

education program; each is responsible for its successes and its shortcomings.

With this caveat in mind, please consider the following implications and recommendations.

1. The quantitative data collected from the two surveys used in this study indicated that the six major individual impacts identified by program leaders as being most important to the Institute have all occurred at a significant level and to a significant portion of the Institute's graduates (roughly three-fourths). Of this result, Institute leaders may be justifiably proud. On the other hand, the study indicated that roughly one-fourth of the Institute's graduates have experienced a relatively small degree of impact. This raises the question of sufficiency--how much impact is enough--a question that can only be answered by Institute leaders and the organizations who participate in the Institute.

Assuming that moderate success is not sufficient, there are a number of specific actions that Institute leaders and the organizations that send participants to the Institute should take to improve its impact, fully realizing that some reasons for less-than-full impact lie well beyond their control.

1A. There are two closely-related steps that Institute leaders could take to dramatically increase the impact of the Institute. Both are

intended to improve the effectiveness of the teaching program itself.

First, they should identify specific silvicultural practices that can be improved through the Institute's instructional program. Then they should analyze those practices to find whether the shortcomings they see result from lack of knowledge, lack of motivation, or organizational constraints. If the causes for poor performance are motivational or organizational, then no amount of instruction will help solve them. Well-established and well-documented procedures, such as performance analysis and task analysis (Mager 1988), already exist for helping complete such tasks. Silviculturists and their supervisors should be heavily involved in this process--to improve its credibility, its accuracy, and its likelihood of success.

Second, when instruction does seem like it will help solve a particular problem, Institute leaders must be sure to distinguish between teaching and presenting information in the classroom. Robert Mager (1968) summed this difference up nicely when he said, "If telling were the same as teaching, we'd all be so smart we could hardly stand it." In continuing education programs like the Institute, where so many sacrifices are made to attend, the emphasis must be

on teaching rather than on presenting information. Again, well-established and well-documented procedures do exist for improving the effectiveness of educational programs. Although there are many good sources of information about these procedures, one would be hard-pressed to find a more useful one than Making Instruction Work (Mager 1988).

Clearly there is no end to what "should" be taught during the Institute; when asked how they would improve the content of the Institute, participants and supervisors both offered long lists of additional topics without deleting any. However, time and human constraints limit what can be taught in a fixed period of time, or perhaps more correctly, what can be learned in a fixed period of time. Trying to convey too much information in a given time period creates information overload, and is likely to decrease learning rather than increase it (Cross 1977). In continuing education programs such as the Institute, where the intention is to change certain behaviors of those who attend, emphasis needs to be placed on what participants learn, rather than on what they hear about.

Thinking in terms of long-term impacts will help program leaders narrow the topics that are included in the Institute. Although not every lesson needs to have a practical use, most should. When

time is limited, and costs are high, emphasis should be placed on those things that are likely to influence what participants actually do when they return to the work-place.

1B. Of the limiting factors beyond control of Institute's teaching staff, organizational inertia, or resistance to change, was the one most commonly identified by both participants and their supervisors in this study. Organizations that send participants to the Institute spend too much money to permit inertia to limit the impact that those participants have once they return to work. Those who supervise Institute graduates must carefully examine their own organizations and strive to remove barriers that limit the ability of their employees to implement new ideas. In some cases, moral support may be all that is needed, but it appears that a significant number of Institute graduates also feel severely constrained by the pressure associated with "getting the cut out" or "getting the job done on a daily basis." Whether this pressure is real, or illusory, it must be dealt with if the Institute is to achieve its potential impact.

2. This study indicated that while some of the major impacts achieved as a result of the Institute stem directly from the content taught, others occur simply

because the Institute has brought capable people together in a challenging environment. Realizing this should challenge program leaders to create situations in which participants share their own ideas and experiences with their colleagues from around the region, and with the Institute's teaching staff. Also, participants must be given time to assimilate new ideas, and to test those ideas against their personal experience if learning is to be translated into practice (Cross 1977).

3. The open-ended sections of the two surveys used in this study clearly indicated that organizations that send participants to the Institute experience significant economic returns from that participation. However, until this study was conducted, no one was sure that these gains were quantifiable. Selected examples of economic returns should be verified, developed more fully, and shared with forest supervisors from throughout the Pacific Northwest, in both public and private organizations. This may be the only way for the Institute to increase participation from organizations outside the USDA Forest Service and BLM, a goal which both supervisors and participants seem to support. In addition, it is likely to increase instructional effectiveness by helping convince participants of the applicability of what they are learning.

4. The open-ended sections of the two surveys used in this study also suggest that benefits of the Institute extend well beyond those experienced by individuals who have attended the program. Supervisors and participants both described numerous broad-scale benefits of the Institute, such as broadening the perspective of their entire organizations, raising standards for professionalism throughout their organizations, strengthening the bond between universities and their organizations, and improving the relationships between their organizations and the general public. Clearly, returns from the Institute are not all individual, nor are they all economic.

5. Institute graduates who participated in this study indicated that there are high personal costs associated with attending the Institute. During the year in which participants actually attended the Institute, they experienced significant stress, both within their families and at the office as work piled-up during their 12-week absences. Following the Institute, they experienced additional stress from attempting to balance the demands of the "new" silviculture with traditional responsibilities, and, for those in the USDA Forest Service, from the additional pressure associated with the certification process. From the perspective of Institute graduates, it is clear that many supervisors have either

failed to recognize, or have greatly undervalued, the extent of this stress and the effect it has had on Institute graduates. It would seem that organizations must come to grips with this important reality before they "burn-out" the people in whom they have invested so heavily.

6. The open-ended sections of the surveys used in this study uncovered significant dissatisfaction with the silvicultural certification process currently used by Region 6 of the USDA Forest Service. The extent, and the severity, of this dissatisfaction are difficult to gauge from this study, but it clearly merits discussion within the Region. The majority of problems seem to lie not with the concept of certification, but with details of implementation; others may simply stem from poor communication between those running the program and those applying for certification, both with respect to the objectives of certification and specific procedures involved in the process.

7. Finally, participants in this study indicated strong support for the Silviculture Institute. When asked to rate the success of the Institute, approximately half of both groups rated it "very successful" while the other half rated it "moderately successful;" very few characterized it as "not successful." Perhaps the greatest indication of support came from the significant

amount of effort and thought that respondents put into their written responses to the open-ended questions on the surveys. Clearly they would not have gone to such great lengths if they did not support the Institute and hope to see it be even more effective in the future.

This support suggests that Institute leaders continue to work to improve their program, that they involve stakeholders in these improvement efforts, and that they inform all stakeholders of their efforts to incorporate their feedback into the program.

REFLECTIONS

"The best part of every man's education is that which he gives to himself."

-Sir Walter Scott-

Assessing the Impact of Educational Programs

Assessing the impact of educational programs is, at best, a difficult task. However, my experience in this study suggests that the principal difficulty lies not in the assessing, but in determining what to assess.

As a university faculty member who has participated in numerous curriculum meetings, as an instructional designer who has worked with numerous faculty on their own classes, and now as an "evaluator" of a well-respected continuing education program, I am continually amazed by the great amount of thought instructors give to what they would like to present to their audiences compared with the small amount of thought they give to what their audiences really need to know, or how what they learn will affect something they actually do in the future.

When educators learn to think beyond the classroom--to think in terms of outcomes rather than inputs--their teaching will become much more effective, and impacts will be much easier to assess.

Conducting Continuing Education Programs

In the process of conducting this study, I had the privilege of actually attending the Silviculture Institute, not as an evaluator, but as a "regular" participant--attending lectures, taking tests, making presentations, and standing around in the rain and snow on field trips.

From that vantage point I became convinced that the single most important thing that continuing educators can do is walk a mile in the shoes of their audience. Only then will they know what makes sense and what does not, what it is like to sit passively for eight hours a day while someone lectures to you, whether examinations and grades stimulate learning or get in its way, and what it is like for someone who has been practicing their profession for ten years to get advice from an "expert" with relatively little "real-world" experience.

I was the first person from either Oregon State University or the University of Washington to attend the entire Institute. In fact, relatively few program leaders have even attended an entire two-week module, including the module leaders responsible for running their own modules. Most tend to "drop by" for a few minutes during breaks or when someone else is teaching. However, "dropping by" is dramatically different from attending the entire module; the perceptions one receives in a short time span are often not representative of the

big picture. There is no substitute for being there--for seeing with your own eyes how, or even whether, the various pieces fit together. I highly recommend it to anyone engaged in the continuing education of adults.

Secondly, I came to have great respect for the people who attend the Institute. As a group, they are bright, dedicated, and have a world of expertise to offer each other and the teaching staff within the Institute. Adult learners are not empty vessels into which knowledge can be poured; they need time to assimilate new ideas, to test those ideas against their own experiences, and to "work through" the ideas with colleagues whose opinions they respect. I am convinced that they must play an active role in their own learning process, and that this will increase what they truly learn, and what they apply when they return to work.

Conducting Mail Surveys

I learned three important lessons from this study about developing mail surveys: 1) quality is crucial, 2) quality takes time and effort, and 3) the time and effort must come from the person responsible for the survey.

There are no shortcuts. There are no substitutes. No one will think about the survey process as carefully as the person responsible for conducting it.

If I Were To Do This Again

Except for the fact that it took too long from conception to completion, I think this has been a reasonably good process. We (the program leaders and I) learned a great deal about the Institute, not only from the surveys that were conducted, but from the process used to develop the surveys. At the beginning of this study, it did not appear that any of the major stakeholders in the Institute--the program leaders, the participants, or those who supervise silviculturists--had ever given much thought to impacts of the Institute beyond the classroom. It seemed well accepted, at least for those in the USDA Forest Service, that the Institute is a fact of life, and that as long as the instruction within the Institute is "good," then it also must be effective. I think, and hope, that my efforts have caused at least some of these stakeholders to think beyond the classroom--to think in terms of impacts that should occur when participants return to their jobs.

Perhaps the one thing that I would do differently if I were doing another study of this type would be to expect a bit less in the way of guidance from the stakeholders. Their input was certainly valuable throughout the study, and their role in the testing/review phase was crucial, but in several instances I expected them to think about, and care about, the study as much as I did. Clearly this was not the

case; in some situations they had neither the inclination nor the background to provide the information that I was seeking. Again, stakeholder involvement is crucial to the success of any assessment, but there are limits to the information that they can provide--and the boundary between too much and just the right amount of input is very narrow, and probably ever-shifting.

POSTSCRIPT

"Education, then, is done on purpose. It is not a "happening" where teachers and learners come together and let the chips fall where they may. The responsibility for purposeful change is enormous."

"If we are to evaluate education, then we have to know what was intended and compare that with what actually happened. Evaluation relates intended ends to actual ends..."

-Kaufman and Thomas 1980-

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APPENDICES

APPENDIX A

Indicators of Major Impact

INDICATORS OF IMPACT

This list describes the seven major impacts identified in this study and a set of characteristics, or indicators, that help define those impacts. The indicators were generated through brainstorming sessions with roughly 11 program leaders of the Institute, 25 participants in the program, and 5 district-level supervisors in the USDA Forest Service and the BLM. The major impacts were derived by the study leader from the list of indicators, and were subsequently "verified" by a subset of program leaders.

Impact 1: Silviculturists who make more defensible silvicultural decisions.

Decisions that are more defensible have the following characteristics:

1. ecologically sound
 - a. should consider impacts on resources both above and below ground
 - b. should consider both long-term and short-term consequences
 - c. should evaluate a range of alternatives, including "no action"
 - d. recommended actions must be biologically feasible and prudent
 - e. must evaluate effects of proposed action on physical environment
 - f. must evaluate effects of proposed action on non-timber resources
 - g. must evaluate effects of proposed action on timber resource
2. economically sound
 - a. all analyses must include an economic component
 - b. should understand economic assumptions underlying the analysis
 - c. should choose appropriate economic indicators (e.g. SEV, IRR, PNW)
 - d. should use chosen indicators appropriately (perform correct calculations)
 - e. should always include a sensitivity analysis (what happens if economic assumptions don't hold)
 - f. should present a range of alternatives that address potential changes in the operating environment
 - g. should be able to justify what they do and why do it
3. operationally sound
 - a. must fit management direction of the forest or organization
 - b. must be feasible from a technical, or engineering, standpoint
 - c. must be feasible from a logistical standpoint
4. fit well into a larger management context
5. use systematic, well-documented decision-making process
 - a. others should be able to follow the logic behind individual decisions
 - b. assumptions, alternatives, and decision criteria should be clearly specified
 - c. decisions should be based on pre-specified criteria that match given objectives

Impact 2: Silviculturists who have broader silvicultural perspective.

Silviculturists with broad perspectives do the following:

1. consider the impact of their decisions on all resources, timber and non-timber
2. consider both long-term and short-term impacts of their decisions
3. consider the impacts of their decisions both above and below the ground
4. consider stand-level decisions in a forest-wide context
5. understand the management techniques and philosophies of other forest organizations and agencies

Impact 3: Silviculturists who are better problem solvers.

Silviculturists who are good problem solvers do the following:

1. systematically analyze problem situations
 - a. propose and evaluate wide array of alternatives
2. collect information from a wide variety of sources
 - a. use scientific literature
 - b. use quantitative tools such as models and computers
 - c. conduct operational experiments to solve unique problems
3. use a network of colleagues to help solve problems
 - a. other silviculturists
 - b. other resource specialists
 - c. "experts" such as university faculty

Impact 4: Silviculturists who are innovative or creative.

Silviculturists who are innovative have the following characteristics:

1. feel less constrained by "standard operating procedures"
2. tend to be "early adopters" of new techniques and tools
3. are less reliant on "conventional wisdom"
4. initiate pilot studies and tests to help answer questions and test their own ideas

Impact 5: Silviculturists who are more confident in their decisions.

Silviculturists who are more confident are:

1. more willing to listen to alternative points of view
2. are willing to explain their decisions to others without being defensive

Impact 6: Silviculturists who are more influential, both within and their organizations and within the profession.

Silviculturists who are more influential are more likely to:

1. influence the outcomes of working groups and i.d. teams
2. become mentors to young foresters
3. be active in their professional organizations
4. be promoted, especially into managerial positions
5. have better working relationships with other resource specialists
6. have better working relationships with groups outside of forestry

Impact 7: Silviculture and silviculturists will be held in higher esteem, both within and outside the forestry profession.

We will know this is happening when:

1. there is a higher regard for silvicultural decisions within forestry organizations
2. there is a higher regard for silvicultural decisions outside of forestry organizations
3. there is a desire by other resource specialists to have educational programs similar to SI
4. there is an increase in the number of silviculturists promoted into managerial positions outside of silviculture
5. forestry organizations make a true commitment to creative silviculture
6. forestry organizations increase their commitment to integrative, long-term forestry practices
7. there is better communication between silviculturists and other resource specialists

APPENDIX B

Participant Survey and Cover Letter

(Reduced in size to meet thesis requirements)

Forestry Media Center


 Peavy Hall 248
 Corvallis, Oregon 97331-5702

(503) 754-4702

March 24, 1989

Dear Silviculture Institute Graduate:

The Silviculture Institute is currently in its eleventh year of operation. Although program leaders commonly seek participants' opinions about instructional effectiveness during the Institute itself, they haven't done much follow-up once participants have returned to their jobs. As a result, we really aren't sure how much difference the Institute has made to the practice of forestry in the Pacific Northwest. As a graduate of the Institute, you've been selected to help us get a better idea about impacts the Institute has had, to you individually and to silviculture in general.

Ed Jensen, a graduate of SI VII and a Ph.D. candidate at Oregon State University, has developed the enclosed survey as part of his graduate program; a similar survey is being sent to people who typically supervise silviculturists. The intent of this study is to determine the extent to which certain outcomes have occurred, and how various factors influence those outcomes. This is truly a pioneering effort in the evaluation of continuing education, and we're pleased to be a part of it.

We ask that you complete the enclosed questionnaire promptly and return it in the enclosed pre-paid envelope. Although it may look imposing, pilot tests indicate that it should take less than an hour to complete.

Please be assured that your responses are completely anonymous. An identification number at the top of the survey will allow your name to be removed from the mailing list once your survey has been returned (thereby avoiding follow-up reminders to return your survey), but your name will never be associated with your responses, or placed on any computerized record.

Results of this study will be used primarily by leaders of the Institute to improve the effectiveness of the program in the future. If you'd like a summary of the study, please return the enclosed postcard.

Thank you for your thoughtful participation in this survey process. Your prompt reply will save much time and effort in follow-up mailings. If you have questions about the survey process, please contact Ed Jensen at (503) 754-4702.

Sincerely,

 James F. Torrence
 Regional Forester
 Region 6, USDA

 Carl H. Stoltenberg
 Dean, College of Forestry
 Oregon State University

 H. N. Chappell
 SI Coordinator
 University of Washington

THE SILVICULTURE INSTITUTE:
AN ASSESSMENT OF IMPACT

A SURVEY OF SI GRADUATES

Conducted by:

COLLEGE OF FORESTRY
OREGON STATE UNIVERSITY

In cooperation with:

College of Forest Resources
University of Washington

USDA Forest Service
Region 6



PURPOSE OF THIS STUDY:

To determine impacts that have occurred as a result of the Silviculture Institute, and to help us understand factors that influence those impacts. Our ultimate purpose is to improve the effectiveness of the Institute in accomplishing the objectives that have been set for it, and to determine the usefulness of those objectives to graduates of the program and to the organizations for which they work. Questions in the survey are based on extensive input from program leaders, instructors, and participants in SI; results will be shared with them as well.

YOUR ROLE IN THIS STUDY:

This study focuses on impacts that have occurred as a result of the Silviculture Institute, rather than on events that took place during the instructional process itself. As one who supervises graduates of the Institute, you're in a unique position to describe impacts that have occurred to the graduates themselves, and to the organizations for which they work. We hope that you'll respond with openness and candor.

IMPORTANCE OF CANDOR:

All of the impacts that we're looking for in this study represent highly desirable characteristics for those involved in silviculture and the organizations for which they work. Therefore, your natural inclination might be to rate each factor highly, regardless of how much the Institute has actually influenced that factor. Please resist this temptation. Think carefully about how the Institute has actually influenced the item in question. A lower rating will not reflect negatively on silviculturists in general, or upon your organization, but will help highlight areas in which the Institute must improve in the future. Your candid opinions are crucial to the success of this study and will be held in the strictest confidence.

KEY DEFINITIONS:

For the purpose of this survey, the term silviculturist does not refer only to those with that specific job title, but instead to the broad spectrum of professional foresters who perform silvicultural tasks (such as reforestation, stand improvement practices, plantation management, etc.).

In the same vein, silvicultural decisions may be made by a variety of professional foresters, not just those officially designated as "silviculturists."

IMPORTANCE OF A PROMPT RESPONSE:

Survey research indicates that response rates decrease dramatically with each day respondents wait to return questionnaires. Your opinions are crucial to this study and to the continued improvement of the Institute--insure that they're heard by taking time from your busy schedule to complete this questionnaire as soon as possible.



Thank you for your thoughtful input,

Ed Jensen

Edward C. Jensen
Survey Coordinator

SECTION II: ACQUISITION OF SKILLS AND KNOWLEDGE

This section seeks to determine how much the Institute has improved your **ability** to accomplish certain tasks, make certain types of decisions, or deal with certain types of issues. Please note that the **emphasis** is on how well the Institute has prepared you to do certain things, not the extent to which you actually do them. Questions about application will come in a later section.

INSTRUCTIONS: In this section you'll be asked to evaluate how **attending the Institute** has influenced a particular set of skills, abilities, or attitudes that you possess. For each question read the introductory clause followed by one of the numbered statements immediately below. Then circle the number in the response column that best describes how the Institute has influenced your ability or understanding in that particular area. Note that some questions may be similar to others; this is part of the survey design.

Response Categories:

5 = GREATLY

3 = MODERATELY

1 = NOT AT ALL

U = UNCERTAIN, UNABLE TO JUDGE, DOES NOT APPLY

SITE-SPECIFIC SILVICULTURAL DECISIONS

How much has the Silviculture Institute improved your ability to:

1. make ecologically sound decisions at the stand level?
2. evaluate ecological variables that influence silvicultural decisions?
3. evaluate potential impacts of silvicultural decisions on the timber resource of specific sites?
4. evaluate potential impacts of silvicultural decisions on the non-timber resources of specific sites?
5. evaluate potential impacts of silvicultural decisions on a site's future productivity?
6. evaluate potential impacts of individual silvicultural decisions on a site's ecological diversity?
7. evaluate potential impacts of individual silvicultural decisions on a site's ability to store and filter water?
8. make economically sound silvicultural decisions or recommendations?
9. identify and understand key assumptions underlying economic analyses of stand-level silvicultural practices?
10. select and calculate appropriate economic indicators (such as SEV, IRR, PNW) to help evaluate your own silvicultural alternatives?
11. describe how and why to assign economic costs and benefits to stand-level silvicultural decisions?

[illegible]

ANALYTICAL SKILLS

How much has the Silviculture Institute improved your ability to:

25. analyze problem situations--distinguish between symptoms and problems, identify constraints, etc.?
26. identify a range of alternatives varied enough to satisfy most client groups?
27. use scientific literature to help you answer questions?
28. use quantitative tools and techniques, such as computers, hand-held calculators, and models, to help you analyze information and evaluate alternatives?
29. design and conduct pilot studies, or small-scale experiments, to help you collect information and evaluate alternatives?
30. discuss information needs, or evaluate silvicultural alternatives, with non-timber resource specialists?
31. discuss information needs with quantitative specialists, such as modelers or statisticians?
32. discuss information needs, or evaluate silvicultural alternatives, with economic specialists?
33. establish clear decision criteria and evaluate alternatives against those criteria?
34. present and defend your silvicultural recommendations to others?

(circle best response)

IMPROVEMENT AFTER SI					
GREATLY		MODERATELY		NOT AT ALL	UNCERTAIN
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U



SECTION III: IMPACT OF SKILLS AND KNOWLEDGE

IMPACT ON INDIVIDUALS

In addition to improving your ability to accomplish certain tasks, leaders of the Institute hope that the knowledge, skills, and attitudes you're exposed to during the program will significantly alter the way you actually approach and complete tasks once you're back on-the-job. In short, we're interested in knowing how the Institute has influenced what you actually do with what you've learned.

INSTRUCTIONS: Questions in this section ask how your actions have **actually changed** as a result of your participation in the Silviculture Institute. The distinction between what you **can do** in theory and what you **really do** in practice is an important one; please think carefully about it. As in earlier sections, read the introductory clause at the top of the left-hand column, followed by each of the numbered statements directly below it; then circle the appropriate number in the response column.

Response categories:

- 5 = To a GREAT extent
3 = To a MODERATE extent
1 = NOT AT ALL
U = UNCERTAIN, DOES NOT APPLY, NOT PART OF MY JOB

To what extent has your participation in the Silviculture Institute actually resulted in:

1. a better job of manipulating forest vegetation to achieve specific timber objectives?
2. a better job of manipulating forest vegetation to achieve specific non-timber objectives?
3. fewer negative side effects to the ecosystem?
4. a better job of assigning economic costs and benefits to your silvicultural decisions?
5. a better job of presenting and defending your silvicultural decisions to foresters and other resource specialists?
6. a better job of presenting and defending your silvicultural decisions to non-foresters and members of the public?
7. silvicultural decisions that have stronger ecological foundations?
8. silvicultural decisions that have stronger economic foundations?
9. silvicultural decisions that are more practical from an engineering standpoint (harvesting system, road-building, etc.)?
10. silvicultural decisions that exhibit better timing between different operations?

[illegible]

(circle best response)

To what extent has your participation in the Silviculture Institute actually resulted in:

11. silvicultural decisions that fit better into the broad management picture of the forest, region, or organization?
12. silvicultural decisions that are easier to defend based on their technical forestry merit?
13. silvicultural decisions that are easier to defend because of the decision-making process used to develop them?
14. silvicultural decisions that are based on the evaluation of a wider array of feasible alternatives (biological, economic, social, etc)?
15. a greater desire on your part to practice innovative silviculture--that is, to experiment with traditional practices or try-out new ones?
16. silvicultural decisions that rely less on "standard operating procedures" or "conventional wisdom" and more on your own judgement?
17. a greater willingness to try new silvicultural tools and techniques as soon as they become available?
18. an improvement in your ability to identify specific types of information needed to make good, defensible silvicultural decisions?
19. silvicultural decisions that are based on a more logical, step-wise decision-making process?

IMPACT OF SI						
GREAT		MODERATE		NOT AT ALL		UNCERTAIN
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U

As a result of your participation in the Silviculture Institute, to what extent are you actually:

20. more likely to establish test plots or pilot studies to answer specific silvicultural questions?
21. more likely to review the scientific literature when confronted with difficult silviculture problems?
22. more likely to call on fellow silviculturists from around the region for assistance when confronted with difficult silvicultural problems?
23. more likely to call on "outside experts", like university faculty or regional specialists, when confronted with difficult silvicultural problems?
24. more likely to use computers and models to help you make decisions?

5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U
5	4	3	2	1		U

(circle best response)

As a result of your participation in the Silviculture Institute, to what extent are you actually:

25. more willing to express your views and defend your silvicultural decisions in front of others?
26. more willing to listen to the views of other resource specialists, even when they conflict with yours?
27. more willing to listen to the views of non-specialists, such as the general public, even when they conflict with yours?
28. less "defensive" when explaining your actions to those who might not agree with you?
29. a more influential member of working groups and interdisciplinary teams?
30. more interested in serving as a "mentor" to young foresters?
31. more active in professional organizations?
32. more promotable--especially for decision-making and managerial positions outside of silviculture?

[illegible]

To what extent have your silvicultural decisions actually been influenced by:

33. your improved understanding of the relationships between forest vegetation and other living forest resources (wildlife, fish, etc.)?
34. your improved understanding of the relationships between forest vegetation and forces that attack it (insects, diseases, fire, etc.) ?
35. your improved understanding of below-ground resources (soil, micro-organisms, etc.)?
36. your improved understanding of the way forests store and filter water?
37. your improved understanding about the importance of long-term productivity?
38. your improved understanding about the long-term impacts of forest fragmentation?
39. your improved understanding about the importance of diversity to the long-term health of the forest?

[illegible]

SECTION IV: IN YOUR OWN WORDS

In attempting to quantify your responses to earlier questions, we may have limited your ability to describe impacts of the Silviculture Institute that are particularly important to you. Here's your chance to rectify that shortcoming. Please respond to the following questions with any amount of detail that you'd like to provide, using additional pages as needed.

1. In your opinion, what are the most important impacts of the Silviculture Institute?
2. Can you think of any impacts the Silviculture Institute has had--on individuals, on organizations, or on the profession--that haven't been described in the previous sections of this survey?
3. Can you quantify any of the beneficial impacts that have occurred -- either in terms of dollars saved, acres affected, or people influenced?

4. Have you noticed any negative side-effects of the Institute? If so, please describe.
5. If the impact of the Institute has been less than its full potential, what factors have been important in limiting it?
6. Please describe any topics that should be added, deleted, or receive a different emphasis than they currently receive in the Institute.
7. Do you have other comments about the Institute, or the certification process in general?

SECTION V: BACKGROUND INFORMATION

This section will help us understand what's happened to graduates of the Institute, and why some have experienced certain impacts while others haven't. Each possible response has a number immediately to its left; please circle one number for each question.

1. In what year did you complete the Silviculture Institute?

1 SI I (1978-79)	6 SI VI (1983-84)
2 SI II (1979-80)	7 SI VII (1984-85)
3 SI III (1980-81)	8 SI VIII (1985-86)
4 SI IV (1981-82)	9 SI IX (1986-87)
5 SI V (1982-83)	10 SI X (1987-88)

2. At the time you participated in the Institute, who was your employer?
 - 1 USFS
 - 2 BLM
 - 3 OTHER FEDERAL AGENCY (specify) _____
 - 4 OTHER (specify) _____

3. Are you still employed by that same organization?
 - 1 YES
 - 2 NO Who is your current employer? _____

4. Which one of the following categories best describes your job at the time you attended the Institute?
 - 1 SILVICULTURIST (or a forester with significant silvicultural responsibilities, such as regeneration, stand management, sale prep., etc.)
 - 2 NON-TIMBER RESOURCE SPECIALIST (wildlife, watershed, recreation, etc.)
 - 3 GENERAL FORESTER (with broad duties well beyond silviculture)
 - 4 OTHER (specify) _____

5. Which one of the following statements best describes what has happened to your career since completing the Institute:
 - 1 RETAINED THE SAME POSITION THAT YOU OCCUPIED DURING THE INSTITUTE (even if you have transferred locations)
 - 2 BEEN PROMOTED WITHIN THE SILVICULTURAL RANKS (specify) _____
 - 3 BEEN PROMOTED INTO A NON-SILVICULTURAL POSITION (specify) _____
 - 4 MADE A LATERAL TRANSFER (new duties but same level) (specify) _____

6. Prior to the Institute, about how many years of full-time work experience did you have in forestry?
 - 1 FEWER THAN 5 YEARS
 - 2 FIVE TO TEN YEARS
 - 3 MORE THAN 10 YEARS

7. Prior to the Institute, about how many years of forestry experience did you have in the Pacific Northwest?
 - 1 FEWER THAN 5 YEARS
 - 2 FIVE TO TEN YEARS
 - 3 MORE THAN 10 YEARS

8. Prior to attending the Institute, what had been your highest educational degree?
 - 1 BACHELOR'S DEGREE (major) _____
 - 2 MASTER'S DEGREE (major) _____
 - 3 OTHER (major and type) _____

9. How would you rate the degree of support you received from your immediate supervisor during your participation in the Institute?
 - 1 HIGH
 - 2 MODERATE
 - 3 LOW

10. How would you rate the receptiveness of your supervisors to new ideas that you've shared with them since completing the Institute?
- 1 HIGH
 - 2 MODERATE
 - 3 LOW
11. How would you rate your peers' receptiveness to new ideas that you've shared with them since completing the Institute?
- 1 HIGH
 - 2 MODERATE
 - 3 LOW
12. Which one of the following statements best represents your motivation for attending the Silviculture Institute?
- 1 TO IMPROVE YOUR ABILITY TO PRACTICE SILVICULTURE
 - 2 AS A NECESSARY STEP FOR PROFESSIONAL ADVANCEMENT
 - 3 AS A MEANS TO BREAK AWAY FROM YOUR NORMAL ROUTINE
 - 4 TO EXPLORE THE FEASIBILITY OF AN ADVANCED DEGREE
 - 5 IT WAS REQUIRED BY YOUR EMPLOYER
 - 6 OTHER (Describe) _____
13. Prior to attending the Institute, how would you have characterized your ability to manipulate forest vegetation to meet specific timber production objectives?
- 1 HIGH
 - 2 MODERATE
 - 3 LOW
 - 4 UNCERTAIN
14. Prior to attending the Institute, how would you have characterized your ability to manipulate forest vegetation to meet non-timber objectives?
- 1 HIGH
 - 2 MODERATE
 - 3 LOW
 - 4 UNCERTAIN
15. At the time you attended the Institute, how would you have characterized your primary orientation in forestry?
- 1 PRIMARILY ORIENTED TOWARD TIMBER PRODUCTION
 - 2 PRIMARILY ORIENTED TOWARD NON-TIMBER RESOURCES
 - 3 WELL BALANCED BETWEEN TIMBER AND NON-TIMBER RESOURCES
16. In your opinion, how well has the Institute defined an educational program that's important to you and your organization?
- 1 VERY WELL
 - 2 MODERATELY WELL
 - 3 NOT WELL AT ALL
 - 4 UNCERTAIN
17. In your opinion, how successful has the Institute been in implementing the program that it's defined?
- 1 VERY SUCCESSFUL
 - 2 MODERATELY SUCCESSFUL
 - 3 NOT AT ALL SUCCESSFUL
 - 4 UNCERTAIN
18. Have you become a certified silviculturist since completing the Institute?
- 1 YES, I HAVE BECOME CERTIFIED.
 - 2 NO, BUT I INTEND TO BECOME CERTIFIED.
 - 3 NO, AND I DO NOT INTEND TO BECOME CERTIFIED.
 - 4 NO, CERTIFICATION IS NOT OFFERED BY MY ORGANIZATION.
 - 5 OTHER (specify) _____

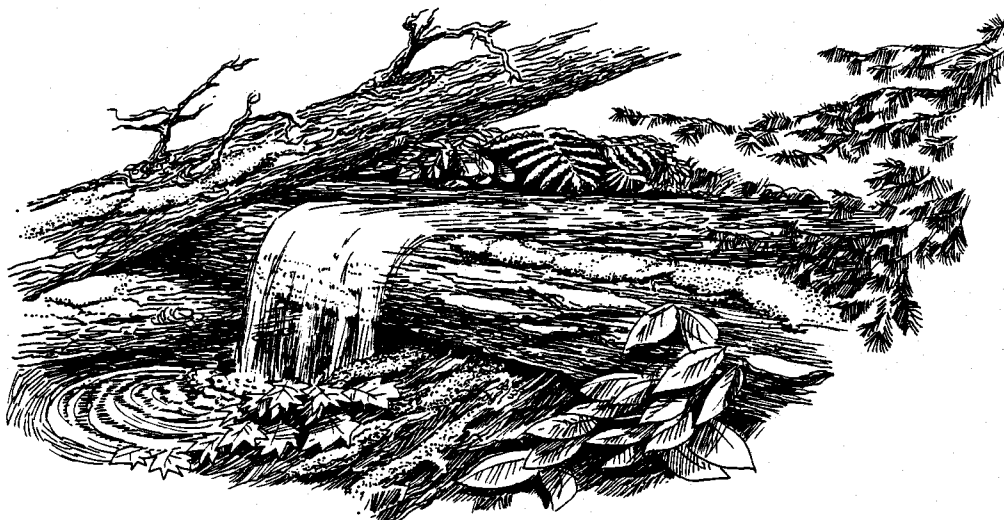
WOULD YOU LIKE TO KNOW THE RESULTS OF THIS SURVEY?

If you're interested in receiving a summary of the results of this study, return the postcard enclosed with this questionnaire. (Please be patient; results are not likely to be ready until the Spring of 1989).

RETURNING THE SURVEY:

Enclosed with this survey is a pre-addressed, pre-paid envelope. Simply insert the survey into the envelope and drop it in the mail. If the pre-addressed envelope is misplaced, return the survey to:

Silviculture Institute Survey
College of Forestry
Oregon State University
Corvallis, OR 97331-5702



THANK YOU FOR YOUR TIME AND THOUGHTFUL REPLIES

APPENDIX C

Three Follow-up Letters: Appeal for Response

(Reduced in size to meet thesis requirements)

First Reminder: Generic postcard sent to everyone who received a survey. Mailed one week after the survey.

Second Reminder: Personalized letter sent only to individuals who had not returned a survey. Mailed three weeks after the survey.

Third Reminder: Personalized letter sent only to individuals who had not returned a survey. Mailed two months after the first survey.

FIRST REMINDER

April 3, 1989

Last week a questionnaire was mailed to you seeking your opinion about impacts of the Silviculture Institute.

If you have already completed and returned it, please accept my sincere thanks. If not, please do so today. Because of the relatively small number of people involved in this study, each and every opinion is important to developing an accurate picture of the Institute's impact.

If you did not receive the questionnaire, or if it was misplaced, please call me right now, collect (503-754-4702) and I will get another in the mail to you immediately. Thank you.

Sincerely,

Edward C. Jensen
SI Survey Coordinator

SECOND REMINDER

Forestry Media Center

Peavy Hall 248
Corvallis, Oregon 97331-5702

(503) 754-4702

April 19, 1989

(personalized inside address)

About three weeks ago I mailed you a questionnaire seeking your opinion about impacts that have occurred as a result of the Silviculture Institute. Although I've heard from many of your colleagues, I've not yet received your completed questionnaire.

The intent of my study is to determine how effective the Silviculture Institute has been in bringing about change, both in people who have completed the Institute and in silvicultural practices in the Pacific Northwest. To my knowledge this effort is unique, not only in forestry, but in the field of continuing education, as well.

I'm writing to you again because of the importance of each questionnaire to the successful completion of my study. Because the number of graduates from the Institute is small, the opinions of each and every one of you are important in developing a comprehensive picture of the Institute's effectiveness.

If you've already returned the questionnaire, please accept my thanks. If not, please fill it out and mail it today. In the event that your questionnaire has been misplaced, I've enclosed a replacement.

Thank you for your cooperation. Your input will help ensure that the Silviculture Institute continues to meet the educational needs of those who practice silviculture in the Pacific Northwest. If you have any questions, please don't hesitate to call me at (503) 754-4702.

Sincerely,

A handwritten signature in cursive script that reads "Ed Jensen".

Edward C. Jensen
SI Survey Coordinator

THIRD REMINDER

Forestry Media Center

Peavy Hall 248
Corvallis, Oregon 97331-5702

(503) 754-4702

June 1, 1989

(personalized inside address)

Dear :

Two months ago I sent you a questionnaire concerning impacts that have occurred as a result of the Silviculture Institute. Although I've heard from many of your colleagues, I've still not received your response.

The large number of questionnaires that have already been returned, and the interest that's been expressed in hearing about the results of my study, are very encouraging. However, the accuracy of my assessment depends on you, and others who have not yet responded. This is especially true since survey research indicates that those who fail to respond to questionnaires often hold different views from those who respond early.

This is the first survey of its kind in forestry education, and among the first for any type of continuing education program. Your response is important to the improvement of the Silviculture Institute, but also to the concept of involving participants and their supervisors in evaluating the effectiveness of such programs.

Therefore, I'm sending you one final questionnaire, and again asking for your help. If you'd like your views represented in this study, please return the questionnaire by June 30, 1989.

If you'd like a summary of results from this study, simply return the postcard enclosed with this letter.

Your contribution to the success of this study will be greatly appreciated, and will help ensure that the Silviculture Institute continues to improve in the future.

Sincerely,

A handwritten signature in cursive script, appearing to read "Ed Jensen".

Edward C. Jensen
SI Survey Coordinator

APPENDIX D

Supervisor Survey and Cover Letter

(Reduced in size to meet thesis requirements)

Forestry Media Center


 Peavy Hall 248
 Corvallis, Oregon 97331-5702

(503) 754-4702

March 24, 1989

Dear District Ranger or Area Manager:

The Silviculture Institute is currently in its eleventh year of operation. Although program leaders commonly seek participants' opinions about instructional effectiveness during the Institute itself, they haven't done much follow-up once participants have returned to their jobs. As a result, we really aren't sure how much difference the Institute has made to the practice of forestry in the Pacific Northwest. As one who supervises graduates of the Institute, you've been selected to help us get a better idea about impacts the Institute has had, to individuals and to silviculture in general.

Ed Jensen, a graduate of SI VII and a Ph.D. candidate at Oregon State University, has developed the enclosed survey as part of his graduate program; a similar survey is being sent to graduates of the Institute. The intent of this study is to determine the extent to which certain outcomes have occurred, and how various factors influence those outcomes. This is truly a pioneering effort in the evaluation of continuing education, and we're pleased to be a part of it.

We ask that you complete the enclosed questionnaire promptly and return it in the enclosed pre-paid envelope. Although it may look imposing, pilot tests indicate that it should take less than 30 minutes to complete.

Please be assured that your responses are completely anonymous. An identification number at the top of the survey will allow your name to be removed from the mailing list once your survey has been returned (thereby avoiding follow-up reminders to return your survey), but your name will never be associated with your responses, or placed on any computerized record.

Results of the survey will be used primarily by leaders of the Institute to improve the effectiveness of the program in the future. If you'd like a summary of the study, please return the enclosed postcard.

Thank you for your thoughtful participation in this survey process. Your prompt reply will save much time and effort in follow-up mailings. If you have questions about the survey process, please contact Ed Jensen at (503) 754-4702.

Sincerely,

 James F. Torrence
 Regional Forester
 Region 6, USFS

 Carl H. Stoltenberg
 Dean, College of Forestry
 Oregon State University

 H. N. Chappell
 SI Coordinator
 University of Washington

THE SILVICULTURE INSTITUTE:
AN ASSESSMENT OF IMPACT

*A SURVEY OF DISTRICT RANGERS
and
AREA MANAGERS*

Conducted by:

COLLEGE OF FORESTRY
OREGON STATE UNIVERSITY

In cooperation with:

College of Forest Resources
University of Washington

USDA Forest Service
Region 6



PURPOSE OF THIS STUDY:

To determine impacts that have occurred as a result of the Silviculture Institute, and to help us understand factors that influence those impacts. Our ultimate purpose is to **improve the effectiveness of the Institute** in accomplishing the objectives that have been set for it, and to determine the usefulness of those objectives to graduates of the program and to the organizations for which they work. Questions in the survey are based on extensive input from program leaders, instructors, and participants in SI; results will be shared with them as well.

YOUR ROLE IN THIS STUDY:

This study focuses on impacts that have occurred as a **result of the Silviculture Institute**, rather than on events that took place during the instructional process itself. As one who supervises graduates of the Institute, you're in a unique position to describe impacts that have occurred to the graduates themselves, and to the organizations for which they work. We hope that you'll respond with openness and candor.

IMPORTANCE OF CANDOR:

All of the impacts that we're looking for in this study represent highly desirable characteristics for those involved in silviculture and the organizations for which they work. Therefore, your natural inclination might be to rate each factor highly, regardless of how much the Institute has actually influenced that factor. Please resist this temptation. Think carefully about how the Institute has actually influenced the item in question. A lower rating will not reflect negatively on silviculturists in general, or upon your organization, but will help highlight areas in which the Institute must improve in the future. Your candid opinions are crucial to the success of this study and will be held in the strictest confidence.

KEY DEFINITIONS:

For the purpose of this survey, the term silviculturist does not refer only to those with that specific job title, but instead to the broad spectrum of professional foresters who perform silvicultural tasks (such as reforestation, stand improvement practices, plantation management, etc.).

In the same vein, silvicultural decisions may be made by a variety of professional foresters, not just those officially designated as "silviculturists."

IMPORTANCE OF A PROMPT RESPONSE:

Survey research indicates that response rates decrease dramatically with each day respondents wait to return questionnaires. **Your opinions are crucial to this study and to the continued improvement of the Institute--insure that they're heard by taking time from your busy schedule to complete this questionnaire as soon as possible.**



Thank you for your thoughtful input,

Ed Jensen

Edward C. Jensen
Survey Coordinator

SECTION I: IMPACT OF THE SILVICULTURE INSTITUTE ON INDIVIDUALS

This section seeks to determine the extent to which the Silviculture Institute has influenced those who have attended it. In making your judgments, please try to compare the same individuals before and after they attended the Institute, rather than comparing people who have attended the Institute with those who haven't.

INSTRUCTIONS: Form a complete question by reading the introductory clause at the top of the column of questions on the left side of the page (*To what extent has the Silviculture Institute resulted in:*) followed by one of the numbered statements immediately below it. Respond to each question by circling the number in the right-hand column that best represents your response.

Response Categories:

- 5 = To a GREAT extent
3 = To a MODERATE extent
1 = NOT AT ALL
U = UNCERTAIN, DOES NOT APPLY, UNABLE TO JUDGE

Note: More than one question may be asked about a single attribute; this is part of the survey's design. Please respond to each question independently; there's no need to "match" previous answers.

(circle best response)

To what extent has the Silviculture Institute resulted in:

1. silviculturists who do a better job of manipulating forest vegetation to achieve specific timber objectives?
2. silviculturists who do a better job of manipulating forest vegetation to achieve specific non-timber objectives?
3. silvicultural decisions which have resulted in fewer negative side effects to the ecosystem?
4. silviculturists who are better at assigning economic costs and benefits to their recommendations?
5. silviculturists who are better at presenting and defending their recommendations to foresters and other resource specialists?
6. silviculturists who are better at presenting and defending their recommendations to non-foresters and members of the public?
7. silvicultural recommendations that have stronger ecological foundations?
8. silvicultural recommendations that have stronger economic foundations?
9. silvicultural recommendations that are more practical from an engineering standpoint (harvesting systems, road-building, etc.)?

[illegible]

(circle best response)

To what extent has the Silviculture Institute resulted in:

22. silviculturists who, when confronted with difficult problems, are more likely to call upon fellow silviculturists from throughout the region for assistance?
23. silviculturists who, when confronted with difficult problems, are more likely to call on "outside experts," like university faculty or regional specialists, for assistance?
24. silviculturists who are more likely to use computers and models to help them solve problems and make decisions?
25. silviculturists who are more willing to express their views and defend their silvicultural decisions in front of others?
26. silviculturists who are more willing to listen to the views of other resource specialists, even when they conflict with their own?
27. silviculturists who are more willing to listen to the views of the general public, even when they conflict with their own?
28. silviculturists who are less "defensive" when explaining their actions to those who might not agree with them?

EXTENT OF IMPACT					
GREAT		MODERATE		NOT AT ALL	UNCERTAIN
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U

To what extent has the Silviculture Institute resulted in:

29. silviculturists who are more influential members of working groups and interdisciplinary teams?
30. silviculturists who are more interested in serving as "mentors" to young foresters?
31. silviculturists who are more active in professional organizations?
32. silviculturists who are more promotable, especially into decision-making or managerial positions outside of silviculture?
33. silviculturists who understand the relationships that exist between forest vegetation and other living forest resources (wildlife, fish, etc.), and manage the forest accordingly?

5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U

(circle best response)

To what extent has the Silviculture Institute resulted in:

34. silviculturists who understand the relationships that exist between forest vegetation and forces that attack it (insects, diseases, fire, etc.), and manage the forest accordingly?
35. silviculturists who understand below-ground resources (soil, micro-organisms, etc.), and manage the forest accordingly?
36. silviculturists who understand how forests store and filter water, and manage the forest accordingly?
37. silviculturists who understand the importance of long-term productivity, and manage the forest accordingly?
38. silviculturists who understand the long-term impacts of forest fragmentation, and manage the forest accordingly?
39. silviculturists who understand the importance of diversity to the long-term health of the forest, and manage the forest accordingly?

EXTENT OF IMPACT					
GREAT		MODERATE		NOT AT ALL	UNCERTAIN
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U
5	4	3	2	1	U



4. Have you noticed any negative side-effects of the Institute? If so, please describe.
5. If the impact of the Institute has been less than its full potential, what factors have been important in limiting it?
6. Please describe any topics that should be added, deleted, or receive a different emphasis than they currently receive in the Institute.
7. Do you have other comments about the Institute, or the certification process in general?

SECTION IV: BACKGROUND INFORMATION

This section will help us understand more about you and the perspective from which you've answered the preceding questions. Each possible response has a number immediately to its left; please circle one number for each question.

1. By what agency or organization are you employed?
 - 1 USFS
 - 2 BLM
 - 3 OTHER (specify) _____
2. What is your position title?
 - 1 DISTRICT RANGER
 - 2 AREA MANAGER
 - 3 OTHER (specify) _____
3. At any time prior to your current position, have you been a silviculturist, or one whose primary responsibilities were silvicultural in nature?
 - 1 YES
 - 2 NO
4. Are you a graduate of the Silviculture Institute, CEFES, or a similar regional program?
 - 1 SILVICULTURE INSTITUTE
 - 2 CEFES
 - 3 ANOTHER REGIONAL PROGRAM (specify) _____
 - 4 NOT A GRADUATE OF ANY OF THESE PROGRAMS
5. Counting both current and previous positions, approximately how long have you been supervising silviculturists and other professional foresters with significant silvicultural responsibilities?
 - 1 FEWER THAN 5 YEARS
 - 2 FIVE TO TEN YEARS
 - 3 MORE THAN 10 YEARS
6. Please give rough estimates for each of the following:
 - ____ ABOUT HOW MANY SILVICULTURISTS (and other foresters with major silvicultural responsibilities) HAVE YOU SUPERVISED DURING YOUR CAREER?
 - ____ ABOUT HOW MANY OF THESE HAVE COMPLETED THE SILVICULTURE INSTITUTE?
 - ____ ABOUT HOW MANY HAVE COMPLETED OTHER REGIONAL PROGRAMS, SUCH AS "CEFES"?
 - ____ ABOUT HOW MANY INDIVIDUALS HAVE YOU SUPERVISED BOTH BEFORE AND AFTER THEY ATTENDED THE SILVICULTURE INSTITUTE?
7. In your opinion, how well has the Silviculture Institute defined an educational mission that's important to your organization?
 - 1 VERY WELL
 - 2 MODERATELY WELL
 - 3 NOT VERY WELL
8. In your opinion, how successful has the Silviculture Institute been in accomplishing the educational mission that it's identified?
 - 1 VERY SUCCESSFUL
 - 2 MODERATELY SUCCESSFUL
 - 3 NOT VERY SUCCESSFUL

WOULD YOU LIKE TO KNOW THE RESULTS OF THIS SURVEY?

If you're interested in receiving a summary of the results of this study, return the postcard enclosed with this questionnaire. (Please be patient; results are not likely to be ready until the Spring of 1989).

RETURNING THE SURVEY:

Enclosed with the survey is a pre-addressed, pre-paid return envelope. Simply insert the survey into the envelope and drop it in the mail. If the pre-addressed envelope is misplaced, return the survey to:

Silviculture Institute Survey
College of Forestry
Oregon State University
Corvallis, OR 97331-5702



THANK YOU FOR YOUR TIME AND THOUGHTFUL REPLIES

APPENDIX E

**Survey Questions Used To Assess
Major Individual Impacts**

SURVEY QUESTIONS USED TO ASSESS MAJOR IMPACTS

Questions from Section I of the Supervisor Survey and Section III of the Participant Survey were combined in the following way to assess the six major impacts identified in this study:

Impact 1: The Institute hopes to produce silviculturists who make more defensible silvicultural decisions.

Questions 1, 2, 3, 4, 7, 8, 9, 10, 12, 13, 19

Impact 2: The Institute hope to produce silviculturists who have a broader silvicultural perspective.

Questions: 11, 33, 34, 35, 36, 37, 38, 39

Impact 3: The Institute hopes to produce silviculturists who are better problem solvers.

Questions: 14, 18, 19, 20, 21, 22, 23, 24

Impact 4: The Institute hopes to produce silviculturists who practice more innovative silviculture.

Questions: 15, 16, 17

Impact 5: The Institute hopes to produce silviculturists who exhibit more confidence in their decisions.

Questions: 5, 6, 25, 26, 27, 28

Impact 6: The Institute hopes to produce silviculturists who are more influential within their organizations and forestry profession.

Questions: 29, 30, 31, 32

APPENDIX F

Participant Survey: Summary of Responses

PARTICIPANT SURVEY
Summary of Responses for Individual Questions

Note: See Appendix B for actual survey.

SECTION I: BEFORE ATTENDING THE INSTITUTE

<u>Question</u>	<u>n</u>	<u>Mean</u>	<u>Distribution of Responses (% of n)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
1	213	3.09	6	21	55	16	3
2	212	2.47	3	11	35	31	20
3	208	3.23	9	29	43	13	5
4	209	2.90	4	19	45	25	6
5	213	2.37	4	10	25	40	21
6	213	3.08	5	29	41	22	4
7	213	3.11	9	26	38	21	7
8	213	3.38	15	35	27	18	5
9	213	2.63	5	15	32	38	11
10	211	2.54	3	10	40	32	15
11	213	2.87	7	18	38	30	7

SECTION II: ACQUISITION OF SKILLS AND KNOWLEDGE

<u>Question</u>	<u>n</u>	<u>Mean</u>	<u>Distribution of Responses (% of n)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
1	210	3.70	14	49	29	6	1
2	210	3.78	18	46	32	4	0
3	212	3.67	20	38	33	9	0
4	211	3.52	13	42	29	15	1
5	212	3.68	21	39	29	10	1
6	211	3.41	12	35	37	15	1
7	210	2.86	4	23	36	28	9
8	211	3.67	21	40	26	10	2
9	211	3.67	20	40	28	9	2
10	210	3.67	24	37	24	12	3
11	210	3.48	16	35	32	13	4
12	210	3.41	18	29	31	16	5
13	199	3.24	9	33	36	18	5
14	211	2.57	4	16	29	34	16
15	209	3.06	8	24	38	26	3
16	211	3.01	7	24	37	26	6
17	210	3.41	16	31	31	19	2
18	212	3.42	14	36	31	16	3
19	210	3.39	14	35	29	17	4
20	208	3.44	12	39	33	13	3
21	210	2.93	5	25	35	30	5
22	212	3.51	17	35	33	13	2
23	212	3.63	23	35	26	14	2
24	210	2.84	11	17	30	30	12
25	212	3.31	10	29	43	15	2
26	214	3.29	10	32	36	19	3
27	212	3.38	17	29	34	16	5
28	213	3.39	18	29	33	15	6
29	212	2.84	5	22	34	29	10
30	214	3.24	11	29	39	15	6
31	203	3.08	7	26	40	24	4
32	204	3.35	14	30	36	18	2
33	213	3.32	11	35	33	18	4
34	213	3.76	25	37	30	6	2

SECTION III: IMPACT OF SKILLS AND KNOWLEDGE

A: Impact on Individuals

<u>Question</u>	<u>n</u>	<u>Mean</u>	<u>Distribution of Responses (% of n)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
1	210	3.32	11	33	39	12	5
2	208	3.24	13	31	31	18	8
3	201	3.28	11	33	34	15	6
4	208	3.24	11	29	38	15	6
5	212	3.64	21	38	28	9	4
6	200	3.53	20	33	31	10	5
7	210	3.60	21	35	30	11	3
8	210	3.34	12	36	31	16	5
9	203	2.48	3	13	31	35	18
10	204	2.78	3	22	36	29	10
11	204	3.11	7	31	34	23	5
12	210	3.53	18	35	32	12	3
13	208	3.22	15	26	32	17	9
14	209	3.21	9	33	34	15	8
15	210	3.75	33	30	21	11	5
16	211	3.56	23	35	23	12	6
17	212	3.56	24	31	29	10	6
18	209	3.66	19	39	33	8	1
19	210	3.36	15	30	37	14	5
20	207	2.78	8	17	33	27	15
21	211	3.42	17	36	27	13	7
22	210	3.60	22	35	28	11	4
23	209	3.52	21	31	32	13	3
24	210	3.39	19	31	28	18	5
25	210	3.67	23	38	25	11	3
26	211	3.48	16	37	31	12	4
27	204	3.15	11	29	34	17	9
28	208	3.16	10	29	37	17	8
29	210	3.52	19	36	29	12	4
30	207	3.10	17	20	30	20	12
31	208	1.92	2	8	17	26	47
32	194	2.65	10	19	24	18	28
33	210	3.42	11	45	24	16	4
34	210	3.41	14	36	32	14	4
35	211	3.46	16	35	33	14	3
36	211	2.85	4	21	39	27	9
37	211	3.57	22	33	27	15	3
38	201	2.82	10	20	30	28	13
39	210	3.40	17	33	29	15	6

SECTION III: IMPACT OF SKILLS AND KNOWLEDGE

B: Impact on Silviculture

<u>Question</u>	<u>n</u>	<u>Mean</u>	<u>Distribution of Responses (% of n)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
(Extent)							
40-A	207	3.37	17	35	25	13	10
41-A	196	2.62	5	16	36	21	21
42-A	184	3.05	11	25	34	14	15
43-A	191	2.69	8	17	30	25	20
44-A	210	3.13	11	32	26	21	11
45-A	204	3.32	9	36	39	10	6
46-A	208	3.16	9	32	30	20	9
(Responsibility)							
40-B	188	3.41	24	26	29	10	11
41-B	163	2.40	5	13	28	21	32
42-B	165	3.37	25	27	25	7	16
43-B	164	2.73	10	21	29	12	28
44-B	189	3.20	13	33	29	11	14
45-B	186	2.79	5	23	35	20	17
46-B	185	2.94	8	25	36	13	17

SECTION V: BACKGROUND INFORMATION ON SI GRADUATES

Note: Some questions and response categories have been shortened for this display. Complete questions and response categories may be found in Appendix B.

1. In what year did you complete the Institute?

<u>Institute</u>	<u># surveys returned</u>	<u>% of total</u>
SI I (1978-79)	28	13
SI II (1979-80)	19	9
SI III (1980-81)	17	8
SI IV (1981-82)	15	7
SI V (1982-83)	24	11
SI VI (1983-84)	22	10
SI VII (1984-85)	25	12
SI VIII (1985-86)	20	9
SI IX (1986-87)	20	9
SI X (1987-88)	25	12
Total	215	100

2. At the time you participated in SI, who was your employer?

<u>Employer</u>	<u>Number</u>	<u>% of total</u>
USFS	160	74
BLM	33	15
Other federal agency	5	2
<u>Other</u>	<u>17</u>	<u>8</u>
Total	215	100

3. Are you still employed by that same organization?

<u>Response</u>	<u>Number</u>	<u>% total</u>
Yes	206	96
<u>No</u>	<u>8</u>	<u>4</u>
Total	214	100

4. Which of the following best describes your job at the time you attended the Institute?

<u>Category</u>	<u>Number</u>	<u>% of total</u>
Silviculturist	170	79
Non-timber resource spec.	2	1
General forester	29	14
<u>Other</u>	<u>13</u>	<u>6</u>
Total	214	100

5. Which of the following statements best describes what has happened to your career since completing the Institute?

<u>Category</u>	<u>Number</u>	<u>% of total</u>
Retained same position	89	42
Been promoted within silviculture	46	22
Been promoted outside of silviculture	31	15
Made a lateral transfer	41	19
<u>Other</u>	<u>6</u>	<u>3</u>
Total	213	100

6. Prior to the Institute, about how many years of full-time work experience did you have in forestry?

<u>Number of years</u>	<u>Number</u>	<u>% of total</u>
Fewer than 5	20	9
Five to ten	103	48
<u>More than 10</u>	<u>90</u>	<u>42</u>
Total	213	100

7. Prior to the Institute, about how many years of forestry experience did you have in the Pacific Northwest?

<u>Number of years</u>	<u>Number</u>	<u>% of total</u>
Fewer than 5	46	22
Five to ten	83	39
More than 10	84	39
Total	213	100

8. Prior to attending the Institute, what had been your highest educational degree?

<u>Degree</u>	<u>Number</u>	<u>% of total</u>
Bachelor's	189	88
Master's	23	11
Other	2	1
Total	214	100

9. How would you rate the level of support received from your immediate supervisor during your participation in the Institute?

<u>Rating</u>	<u>Number</u>	<u>% of total</u>
High	121	57
Moderate	53	25
Low	39	18
Other	1	-
Total	214	100

10. How would you rate the receptiveness of your supervisors to new ideas that you've shared with them since completing the Institute?

<u>Rating</u>	<u>Number</u>	<u>% of total</u>
High	99	46
Moderate	83	39
Low	28	13
Other	4	2
Total	214	100

11. How would you rate receptiveness of your peers to new ideas that you've shared with them since completing the Institute?

<u>Rating</u>	<u>Number</u>	<u>% of total</u>
High	102	48
Moderate	101	47
Low	8	4
<u>Other</u>	<u>3</u>	<u>1</u>
Total	214	100

12. Which of the following best represents your motivation for attending the Institute?

<u>Reason</u>	<u>Number</u>	<u>%</u>
Improve ability to practice silviculture	156	73
Necessary step for professional advancement	31	15
To break away from normal routine	5	2
To explore feasibility for advanced degree	5	2
Required by employer	8	4
<u>Other</u>	<u>9</u>	<u>4</u>
Total	214	100

13. Prior to the Institute, how would you have characterized your ability to manipulate forestry vegetation to meet timber objectives?

<u>Rating</u>	<u>Number</u>	<u>% of total</u>
High	47	22
Moderate	144	67
Low	22	10
<u>Other</u>	<u>1</u>	<u>-</u>
Total	214	100

14. Prior to the Institute, how would you have characterized your ability to manipulate forestry objectives to meet non-timber objectives?

<u>Rating</u>	<u>Number</u>	<u>% of total</u>
High	27	13
Moderate	111	52
Low	72	34
<u>Other</u>	<u>4</u>	<u>2</u>
Total	214	100

15. At the time you attended the Institute, how would you have characterized your primary orientation in forestry?

<u>Response</u>	<u>Number</u>	<u>% of total</u>
Primarily timber production	119	56
Primarily non-timber resources	4	2
Well-balanced between the two	90	42
<u>Other</u>	<u>1</u>	<u>-</u>
Total	214	100

16. How well has the Institute defined an educational program that's important to you and your organization?

<u>Response</u>	<u>Number</u>	<u>% of total</u>
Very well	94	44
Moderately well	99	47
Not well at all	10	5
<u>Uncertain</u>	<u>9</u>	<u>4</u>
Total	211	100

17. How successful has the Institute been in implementing the program that it's defined?

<u>Response</u>	<u>Number</u>	<u>% of total</u>
Very successful	97	46
Moderately successful	102	48
Not at all successful	6	3
<u>Uncertain</u>	<u>8</u>	<u>4</u>
Total	213	100

18. Have you become certified since completing the Institute?

<u>Response</u>	<u>Number</u>	<u>%</u>
Yes	107	50
No, but I intend to	28	13
No, and I do not intend to be	11	5
No certification in my organization	53	25
<u>Other</u>	<u>15</u>	<u>7</u>
Total	213	100

19. Week from the date of mailing in which the survey was returned:

<u>Week</u>	<u>Number</u>	<u>% of total</u>
1	49	23
2	38	18
3	50	23
4	20	9
5	21	10
6	17	8
7	6	3
8	1	-
9	0	-
10	1	-
11	2	1
12	2	1
13	5	2
14	1	-
15	1	-
Total	214	100

APPENDIX G:**Supervisor Survey: Summary of Responses**

SUPERVISOR SURVEY
Summary of Responses for Individual Questions

Note: See Appendix D for complete survey.

SECTION I: IMPACT OF THE INSTITUTE ON INDIVIDUALS

<u>Question</u>	<u>n</u>	<u>Mean</u>	<u>Distribution of Responses (% of n)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
1	83	3.80	18	45	36	1	0
2	81	3.27	5	43	32	14	6
3	80	3.55	9	45	39	7	0
4	80	3.45	13	40	28	20	0
5	82	3.95	22	52	24	1	0
6	78	3.46	11	36	31	19	3
7	81	3.65	11	52	31	4	3
8	82	3.49	16	37	29	17	1
9	76	2.91	1	18	57	17	7
10	72	3.13	4	28	49	15	4
11	78	3.36	9	32	47	9	3
12	82	3.89	18	56	22	2	1
13	77	3.43	10	35	43	10	1
14	80	3.24	5	35	41	16	3
15	78	3.36	13	33	35	15	4
16	79	3.44	13	35	38	11	3
17	81	3.59	14	42	36	7	1
18	80	3.65	9	53	35	3	1
19	80	3.49	9	45	35	9	3
20	76	3.20	11	26	39	20	4
21	77	3.47	8	45	35	9	3
22	75	3.67	17	47	24	9	3
23	79	3.27	8	34	39	15	4
24	80	3.75	21	47	17	13	3
25	78	3.74	21	41	31	8	0
26	79	3.22	5	38	35	17	5
27	77	2.82	3	18	43	31	5
28	78	2.99	3	26	45	22	5
29	78	3.68	17	46	26	12	0
30	67	2.90	5	21	43	22	9
31	61	2.70	3	16	46	16	18
32	79	3.24	10	35	32	14	9
33	80	3.43	10	36	43	9	3
34	81	3.79	16	54	23	5	1
35	80	3.57	11	45	34	10	0
36	80	3.45	7	39	45	9	0
37	82	3.65	15	49	28	4	5
38	77	2.92	5	23	39	23	9
39	79	3.32	8	38	37	14	4

SECTION II: IMPACT OF THE INSTITUTE ON SILVICULTURE

<u>Question</u>	<u>n</u>	<u>Mean</u>	<u>Distribution of Responses (% of n)</u>				
			<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>
(Extent)							
41-A	84	3.71	20	44	26	6	4
42-A	81	2.75	5	14	43	28	10
43-A	79	3.23	17	27	29	19	9
44-A	82	2.71	6	11	46	21	16
45-A	83	3.51	13	39	36	10	2
46-A	84	3.64	15	45	30	7	2
47-A	84	3.48	19	29	35	17	1
(Responsibility)							
41-B	76	3.45	13	37	34	13	3
42-B	69	2.70	6	23	30	16	25
43-B	70	3.30	13	40	24	10	13
44-B	72	2.72	7	17	40	14	22
45-B	75	3.37	15	28	43	9	5
46-B	73	2.93	4	23	43	22	8
47-B	73	2.99	7	23	40	22	8

SECTION IV: BACKGROUND INFORMATION

NOTE: Some questions and response categories have been shortened for this display. See Appendix D for the complete statements.

1. By what agency are you employed?

<u>Category</u>	<u>Number</u>	<u>% Total</u>
USFS	68	79
BLM	17	20
Other	1	1
Total	86	100

2. What is your position title?

<u>Category</u>	<u>Number</u>	<u>% Total</u>
District Ranger	59	69
Area Manager	13	15
Other (mostly Acting Rangers)	14	16
Total	86	100

3. Prior to your current position, had you been a silviculturist, or a person whose primary duties were silvicultural in nature?

<u>Category</u>	<u>Number</u>	<u>% Total</u>
Yes	46	54
No	40	47
Total	86	100

4. Are you a graduate of SI, CEFES, or another regional silvicultural program?

<u>Category</u>	<u>Number</u>	<u>% Total</u>
SI	8	9
CEFES	8	9
Another program	10	12
None of the above	59	64
Total	85	100

5. Approximately how long have you been supervising silviculturists?

<u>Number of Years</u>	<u>Number</u>	<u>% Total</u>
Fewer than 5	18	21
Five to ten	35	41
More than 10	33	38
Total	86	100

6. Please estimate:

<u>Category</u>	<u>Range</u>	<u>Mean</u>	<u>Mode</u>
# silvic. supervised during career	1-30	7.2	4
# silvic. who have completed SI	0-8	2.8	2
# silvic. who have completed other regional programs	0-5	1.3	1
# SI grads supervised both before and after SI	0-10	1.8	1

7. How well has the Institute defined an educational mission that's important to your organization?

<u>Category</u>	<u>Number</u>	<u>% Total</u>
Very well	45	52
Moderately well	36	42
Not very well	5	6
Total	86	100

8. How successful has the Institute been in accomplishing the educational mission that it's identified?

<u>Category</u>	<u>Number</u>	<u>% Total</u>
Very successful	44	52
Moderately successful	35	41
Not very successful	6	7
Total	85	100

9. Week from original mailing in which the survey was returned:

<u>Week</u>	<u>Number Returned</u>	<u>% Total</u>
1	20	24
2	21	25
3	18	21
4	3	4
5	9	11
6	6	7
7	1	1
8	0	0
9	0	0
10	0	0
11	3	4
12	2	2
13	1	1
Total	86	100

APPENDIX H**Survey Reliability: Measures of Internal Consistency**

SURVEY RELIABILITY: Measures of Internal Consistency

The internal consistency of each of the two surveys used in this study was assessed by comparing each population's average response to two questions which asked their overall assessment of the Institute with their composite responses to the set of questions comprising the six major impacts identified in the study. To determine the internal consistency, I divided responses to the two overall questions into three categories (e.g. very successful, moderately successful, not successful), and then compared responses to the six major impact questions within these three categories.

For this display the two overall questions will be identified in the following manner:

Importance:

"In your opinion, how well has the Institute defined an educational program that's important to you and to your organization?"

Success:

"In your opinion, how successful has the Institute been in implementing the educational program that it's defined?"

For this display, the six major impacts will be identified in the following way:

Defensible: more defensible silvicultural decisions
 Perspectives: broader silvicultural perspectives
 Problem-Solving: better problem solvers
 Innovation: more innovative silviculturists
 Confidence: more confident silviculturists
 Influence: more influential silviculturists

For this display, responses of "very well" or "very successful" will be denoted as "high"; responses of "moderately well" or "moderately successful" will be denoted as "moderate"; others will be denoted as "low".

PARTICIPANT SURVEY

<u>IMPACT</u>	<u>IMPORTANCE</u>			<u>SUCCESS</u>		
	<u>High</u>	<u>Mod.</u>	<u>Low</u>	<u>High</u>	<u>Mod.</u>	<u>Low</u>
Defensible	3.52	3.04	2.57	3.60	2.96	2.42
Perspectives	3.49	3.12	2.64	3.51	3.07	2.87
Problem-Solving	3.57	3.24	2.76	3.61	3.19	2.67
Innovation	3.96	3.41	3.03	3.90	3.45	3.00
Confidence	3.74	3.17	2.99	3.79	3.17	2.94
Influence	3.02	2.63	2.47	3.07	2.65	1.92

SUPERVISOR SURVEY

<u>IMPACT</u>	<u>IMPORTANCE</u>			<u>SUCCESS</u>		
	<u>High</u>	<u>Mod.</u>	<u>Low</u>	<u>High</u>	<u>Mod.</u>	<u>Low</u>
Defensible	3.61	3.29	2.92	3.61	3.34	2.59
Perspectives	3.63	3.18	3.09	3.61	3.27	2.66
Problem-Solving	3.45	3.00	2.75	3.58	2.87	2.25
Innovation	3.54	3.44	2.93	3.69	3.28	2.53
Confidence	3.59	3.06	2.67	3.58	3.13	2.40
Influence	3.33	2.90	2.94	3.35	2.93	2.50

From these tables we see that those who rated the Institute highly on each of the two overall questions, also rated the occurrence of the six impacts most highly; those who rated the Institute as moderate on the two overall questions also rated the occurrence of the six impacts as moderate; and those who rated the Institute as low on the two overall questions also rated the occurrence of the six impacts lowest. Therefore, the two survey instruments demonstrate a high degree of internal consistency.

APPENDIX I

Participant Survey: In Their Own Words

PARTICIPANT SURVEY: Summary of Open-ended Questions

Note: This section summarizes the written responses of participants to seven open-ended questions on the Participant Survey. I have greatly summarized and paraphrased the comments in order to present them here. Numbers in parentheses indicate the number of participants who gave roughly the same response.

Question 1: In your opinion, what are the most significant impacts of the Institute

- It helped establish a network of silviculturists (46)
- It improved my basic forestry skills/knowledge/abilities
 - In general (36)
 - In the area of computers or models (12)
 - In the area of economic analyses (20)
 - In the area of biology/ecology (16)
- Exposure to new ideas and concepts or review of old ones (31)
- Its interdisciplinary nature has broadened my silvicultural perspective (28)
- It improved my confidence in myself and my silvicultural abilities (24)
- It improved my decision-making/problem-solving skills (20)
- It exposed me to researchers and scientific literature (18)
- It improved my analytical ability and made me better prepared to defend my ideas (19)
- It has improved the credibility of silviculturists (16)
- It increased my understanding of, or concern for, non-timber resources (12)
- It improved my understanding of long-term site productivity (9)
- It provided a good review of current silvicultural practices (6)
- It stimulated my curiosity/creativity (5)
- It has resulted in better prescriptions or land management practices (4)
- It helped me understand the limits of our knowledge (3)
- It has increased the role of silviculture in the planning process (2)
- It made me skeptical of models (2)
- It helped me prepare for certification (2)
- It improved my ability to communicate with others about silviculture (2)
- It has resulted in better communications between foresters and universities
- It has given me an increased sense of responsibility for the success or failure of individual projects
- It provided a good review of statistics and sampling
- It helped me understand that "facts" change over time
- It has improved the promotability of silviculturists
- It improved my presentation skills
- It has helped change how foresters react to public input
- It has increased the respect for silviculture by other resource specialists
- It has created an esprit de corps among silviculturists
- It has made the greatest improvement in the "average" forester
- It helped me realize the importance of managing for particular objectives

Question 2: Can you think of any impacts the Institute has had that haven't been described in other parts of this survey?

- Has improved public support for silvicultural decisions, or for our organization in general (6)
- Has increased the credibility of silviculture within our organization (6)
- Has caused our organization to think more carefully about what it does and why (3)
- Its impacts are minimal due to overemphasis on clearcutting
- SI has not influenced the BLM in any way - nothing gets in the way of maximizing timber harvest
- Has been an important way of moving women into management
- Prescriptions have become more site-specific and less generic
- Has improved the ability of silviculturists to communicate with others
- Enabled me to develop a simple D-f/hemlock model that improved our decision-making
- It's a great forum for training managers, administrators, etc.
- Has increased the level of trust that the organization places in the individual
- It motivated me to return to graduate school
- It has caused the BIA to consider certifying silviculturists
- It was used as a model for silvicultural program in B.C.
- As a consultant, I am sharing my knowledge with others across Canada, China and Malaysia.
- It has improved my sense of ethics
- It was an important factor in my promotion
- It has helped shift the perception of silviculturists as providers of timber volume to natural resource managers
- It helped prepare me for staff-level positions that came later
- It has created a silvicultural network that is very important
- It raised our organization's commitment to silviculture
- We spend more time than before analyzing whether a treatment is really needed

Question 3: Can you quantify any of the impacts that have resulted from SI?

The value is significant, but difficult to quantify (15)

Have experienced tremendous savings in reforestation alone (7)

I have saved roughly \$280,000 per year on reforestation costs alone

I saved over \$200,000 in one year alone by reducing site prep and reforestation costs

I have saved \$180,000 per year by not burning slash

I saved \$100,000 in a single year by prescribing natural regeneration.

I saved \$100,000 in a single year by having seedlings tested prior to planting

I have reduced slash burning costs by \$80,000 per year by burning fewer acres and burning more efficiently

I have improved planting survival by 10% through statistical analysis - at great savings

I have saved tens of thousands of dollars per year by moving to spring burning

I have stopped slash piling on 20,000 acres - at great savings

It has greatly improved our nursery stock, and therefore regeneration success

I have saved more each year than the cost of sending me to SI

I have not burned hundreds of acres - at great savings

I have dramatically reduced the acres treated - has saved much

Potentially - millions of dollars over the past 7 years

I have saved thousands of dollars and influenced thinking of many people

Our quality of work has improved; therefore great savings

Has reduced inspection costs for contracts because of better communications and cooperation

Has reduced court appeals

In general, it has saved the cost of sending every single participant

I am bringing 200-300 acres into the land base each year through creative silviculture

The monetary return has been low; not many practices have actually changed due to poor management

Question 4: Have you noticed any negative side-effects from the Institute?

- Tremendous strain on family life during SI (10)
- Work continues to pile up at home office during SI (10)
- Certification requires tremendous time and energy (4)
- Some capable technicians are becoming resentful that they don't have the opportunity to attend (4)
- Some SI grads arrogant of their knowledge (3)
- Frustration builds up in people who attend and they can't implement what they've learned due to organizational constraints (2)
- Has created a tendency to rely too much on models (2)
- SI is often substituted for experience in promotions - esp. with respect to Affirmative Action (2)
- Too much pressure to become certified following SI (2)
- Failure to be certified can be a career-crushing blow (2)
- Has created a tendency for others to want silviculturists to know everything (2)
- SI has helped create an advancement bottleneck at GS 9-11, and has created false hopes for promotion (2)
- Silviculture has such a low priority in Alaska that completion of SI is often used as a ticket out of the region
- Frustration builds when one region won't honor another's certification process
- I now realize how poor many stand models are
- Certification has become so important for advancement that many attend SI out of necessity, rather than a desire to attend
- SI III discouraged creativity
- SI grads are becoming too analytical for some other specialists
- SI grads too often type-cast as specialists, limiting their careers
- Some SI grads haven't improved their silvicultural skills at the "field level"--leaving some with negative impressions of SI
- Physical and mental exhaustion of results from SI and certification
- There is an increasing tendency for every discipline to develop a certification program
- Frustration can build when SI grads encounter resistance to change within their own organization
- Frustration in those who are required to attend against their will

Question 5: What factors have been important in limiting effectiveness of SI?

Constraints Beyond Control of the Institute

- Organizational inertia - resistance to change within organization, management, or peers (21)
- Too many silvicultural decisions are not made by silviculturists (6)
- "New" silvicultural activities conflict with normal job pressures (6)
- Shrinking budgets work against implementing good ideas (4)
- Managers often don't have good perspective on the role that silviculture can play (3)
- In the USFS many activities are directed by policies and guidelines that are politically motivated, not dictated by good silvicultural practice (3)
- Need more release time from normal duties during SI (2)
(supervisors often don't realize time and energy needed)
- Inconsistent support from supervisors for new ideas (2)
- Timber still drives too many decisions (2)
- Creative silviculture is discouraged by management
- Management assumes a short-term view while good silviculture requires a long-term view
- BLM planning process doesn't value silviculture
- Too many SI grads spend too much time in the office
- Too many SI grads transfer out of silviculture too soon after completing SI
- Economic analyses don't carry enough weight in decision-making
- Organization does not reward competence
- USFS should consider certifying top technicians
- Young silviculturists need more mentoring at district level
- Failure to promote success of program to management
- Lack of upward mobility for SI grads
- Long-term contracts work against silvicultural input (Tongass)
- SI grads need significant peer support at District level
- Not enough silviculturists follow their prescriptions over time
- Affirmative Action procedures often work against those who have sacrificed a great deal to attend SI
- Agency limits participation in SI to those involved in reforestation
- SI grads need to be able to continue to update - education is not a one-time thing
- Too few people understand the importance of clear objectives in silviculture

Constraints Within Control of the Institute

- Too much emphasis on west-side forestry (8)
- Instructors need a more realistic perspective on the realities of day-to-day silviculture (7)
- Too much emphasis on problems of USFS (4)
- Too much is presented in too short a time (3)
- Some instructors and participants should be selected from outside of forestry (2)
- High cost has limited the number of people who can attend (2)
- Scope is too narrow - could be broadened to other natural resources (2)
- Scope is too broad - silviculture can't do everything (2)
- Some of what was learned has no practical application (2)
- Not enough time is spent on application of ideas (2)
- Too much emphasis on grades, at the expense of learning

Need better instruction with computer models

Intensity is not great enough to require total dedication on the part of participants

Some people attend too early in their careers

Poor teaching ability of some instructors

SI needs to become better known outside the USFS

Leaders of SI seem unresponsive to suggestions for change - same problems exist from year to year

Instructors should not be limited to OSU and UW faculty

SI needs to include management personnel if it hopes to really make a difference in what happens on the ground

Question 6: Please describe any topics that should be added, deleted, or receive a different emphasis than they currently receive in the Institute.

[Note: People responded based on their own experience with the Institute, which could be as much as 10 years out-of-date.]

Need more on the following:

- wood quality
- alternative silvicultural systems
- every-day prescriptions (rather than certification Rx)
- on implementing prescriptions, research results, etc.
- practical examples of everything (2)
- allowable cut modeling
- reforestation studies (e.g. FIR)
- high elevation silviculture
- eastside silviculture (8)
- forest planning process (2)
- global issues
- political process and how it affects policy
- decision-making
- the process of innovation/creativity
- stand density management
- computer programs and models useful in forestry (e.g. PROGNOSIS) (5)
- other resource management philosophies (such as Native American)
- more on engineering/logging systems (3)
- working with the public and the media (3)
- economics of non-timber resources
- growth and yield models/stand models (4)
- non-timber resource models
- communication/persuasion skills (5)
- people management skills/conflict resolution (2)
- regional budgeting
- geomorphology and soils
- insects and disease (3)
- lab activities on physiology
- stand level economics 1
- silviculture for other resources (11)
- future markets for timber products
- management systems/tools (e.g. GIS) (4)
- stand dynamics (as in Advanced Workshop) (2)
- current issues in forestry (esp. broad ecological issues) (5)
- how to clarify management objectives and how to deal with conflicting objectives
- analyzing strengths and weaknesses of models
- how to gain support for new ideas/deal with change (2)
- prescribed burning (2)
- integrated resource approach
- uneven aged management. (3)
- other regions/species (3)
- designing an experiment
- young growth management
- regeneration
- international forestry

Reduce or modify the following:

- statistics (17)
- economics (3)
- decision-making techniques
- experimental design (3)
- physiology
- models (4)
- herbicides
- items that are covered so briefly that students don't learn anything (e.g. snow hydrology)
- basic economics
- Module 6 problem (too long)

General:

- Should spend more time writing real-life prescriptions
- There is too much repetition in hydrology and statistics
- Should emphasize the quality of instruction, not quantity
- Sections on wildlife and logging are too basic

Question 7: Do you have other comments about the Institute, or about the silvicultural certification process in general?

About the Institute:

- Comments indicating strong support for SI (43)
- SI should be opened to non-silviculturists (2)
- SI should result in a Master's degree
- Too much emphasis on right and wrong answers
- Should get more students from private sector
- SI and certification process work well together
- SI is too expensive
- Classes are too large
- SI is too dominated by the USFS - not enough diversity
- Should be cut to 6 weeks
- Take-home exams are more like real work environment
- Should increase diversity of instructors (e.g. from industry, other institutions) (2)
- Testing is unnecessary; too much emphasis on grades (2)
- Work load is too demanding
- SI should publish a newsletter to keep people posted on new information, special educational events, etc.
- Advanced workshops are excellent

About certification:

- Entire process is overdone (14)
 - too complex
 - too time-consuming
 - should be decreased in importance
 - "is a damn nuisance"
- Success seems too arbitrary (8)
 - too dependent on panel rather than candidate
 - needs better defined (communicated) objectives
- Is too academic (9)
 - needs to be more operational
 - panel should visit sites
 - doesn't have much to do with real silviculture
 - should be based on a representative sample of real prescription
 - should monitor success of prescriptions over several years
- Entire process should be more supportive, less judgmental (3)
 - too many people fail
 - failure is extremely demoralizing - some will never recover
- Candidates should be given more work time to complete Rx (2)
- USFS should develop prescription guidelines for candidates to follow (2)
- Certification should be made available to qualified technicians
- Our district has found a local pre-certification panel to be quite helpful to candidates
- Candidates should be expected to demonstrate more creativity in their prescriptions, not just deal with harvest units
- Region 6 has best certification process of any region
- Region 6 should adopt certification process used by Region 5
- Review panels should be carefully screened for resistance to change
- Recertification: is too complicated
- Recertification: there is no incentive to be recertified

About Organizations Participating in SI:

USFS should be more selective in who they send; higher commitment would result in greater impact

USFS is sending some people before they're ready

USFS doesn't recognize true value of certified silviculturists; they should all be GS 11's

USFS needs more contact between the Regional Office and silviculturists

USFS techs who complete SI should be eligible for certification

BIA is developing a certification program that is likely to be less complex and more practical than USFS

Encourage other resources to follow lead of SI

Other organizations should adopt certification process (2)

APPENDIX J

Supervisor Survey: In Their Own Words

SUPERVISOR SURVEY: Summary of Open-ended Questions

Note: This section summarizes the written responses of supervisors to seven open-ended questions on the Supervisor Survey. I have greatly summarized and paraphrased the comments in order to present them here. Numbers in parentheses indicate the number of supervisors who gave roughly the same response.

Question 1: In your opinion, what are the most significant impacts of the Institute?

- Has improved the technical skills/knowledge/abilities of silviculturists (47).
 - Improved technical skills (41).
 - Improved ability to use computer systems/models (1).
 - Improved ability to perform economic analyses (2).
- Has developed a more consistent knowledge base among silviculturists (3).
- Has improved the credibility and status of silviculturists (15).
- Has given silviculturists a broader, more interdisciplinary perspective (15).
- Has improved the confidence of silviculturists (7).
- Has developed an effective network for the exchange of ideas among silviculturists (7).
- Has improved the decision-making skills of silviculturists (6).
- Has made silviculturists better able to present and defend their ideas (5).
- Has encouraged creative thinking in silviculturists (4).
- Has made silviculturists more effective team players (3).
- Has raised the standard of excellence expected from silviculturists (3).
- Has improved on-the-ground silviculture and timber sale planning (2).
- Has improved the ability of silviculturists to use the results of research and scientific literature (2).
- Has improved the thoroughness of planning at the project level (2).
- Has produced certified silviculturists as mandated.
- Has been especially helpful for those trained in another region.
- Has had the greatest impact on those with the greatest potential.
- Has raised the stature of silviculture within the organization.
- Has resulted in more open-minded silviculturists.

Question 2: Can you think of other impacts - on individuals organizations, or on the profession - that haven't been described previously?

- Has elevated the status and impact of silviculture in the planning process (2).
- Has helped individuals meet personal goals that might not have been obtainable otherwise (like continuing education) (2).
- Has broadened the organization's perspective of silviculture and the contribution it can make.
- Has raised technical knowledge base of entire organization.
- Has improved partnerships between universities and organizations.
- Has improved our ability to meet public laws.
- Has made our organization more concerned with economics of management.
- Has set higher standards of professionalism throughout our organization.
- Has developed within our organization a cadre of qualified decision-makers.
- Has increased public support for silviculture (somewhat).
- Has caused us to take a hard look at "standard practices" within our organization.
- Our silvicultural decisions are better accepted, both inside and outside the organization.
- Has improved our ability to respond to public concerns.
- Has revitalized the careers of a number of people.

Question 3: Can you quantify any of the beneficial impacts that have resulted from SI?

- Impacts have been significant, but they're difficult to quantify (14).
- Haven't realized any tangible benefits (3).
- We have saved millions of dollars on reforestation alone, although not all savings due directly to SI.
- We have saved \$300,000 over 6 years by relying on natural regeneration rather than spraying and burning.
- Tree growth has improved on 30% of our lands due to better Rx and better brush control.
- Difficult to quantify, but certainly hundreds of thousands of dollars have been saved each year as a result of improved forest practices and decreased legislation that may have otherwise occurred.
- We have experienced great savings in reforestation costs alone.
- Much has been saved by not managing acres that shouldn't be.
- Much has been saved because prescriptions are more realistic and cost effective.
- We have far fewer changes to prescriptions once they've begun.
- We've experienced much better prioritization for stands to be treated.
- Has reduced our need to do things twice.

Question 4: Have you noticed any negative side-effects of the Institute?

Some SI grads assume a new arrogance about their new-found skills and knowledge (9).

No (6)

It takes time away from traditional duties performed by silviculturists (3).

There is often a stigma attached to excellent people who have not been certified, especially technicians. (2)

Our organization tends to rely too much on SI grads, at the expense of others.

There is a tendency to rely too much on technical solutions to problems.

Many graduates define themselves too narrowly as silvicultural specialists when thinking of a career ladder.

Some graduates associate even more strongly with other silviculturists than before attending.

It has created too much emphasis on gaining extra yields from forest lands.

Certification prescriptions are counter-productive.

Some graduates are too quick to adopt methods learned in SI, without being critical.

Some graduates try to over-analyze situations where the answer is already known.

Creates additional stress on individual silviculturists, who are expected to do so many more things.

Too many decisions are viewed as being purely silvicultural.

There is a tremendous negative impact on those who fail certification.

It's easy to "type-cast" SI grads as specialists, unsuited for management.

There is some resentment by technicians, who are ineligible to attend.

Some grads try to do too much on their own - silviculturists should concentrate on trees and leave the other resources to other specialists.

Question 5: If the impact of SI has been less than its full potential, what factors have been important in limiting it?

Too much emphasis on timber production (6).

Organizational inertia - SI grads jump back into the same routine (4).

High cost of the program - can't send enough people (3).

Easy for young silviculturists to become over-burdened - need to find a way to relieve some pressure.

Although we fund training and research, we don't fund intensive management practices that allow us to use what we know.

Length of the program - can't free-up enough people to attend.

Too many silvicultural decisions are timber-driven.

Federal restrictions on the use of herbicides has prevented us from applying much of what we know.

SI needs to include instructors from outside of forestry.

Instructors in SI need to spend time on the districts to see what really happens.

Entrance requirements are too high.

More effort should be made to inform the public about the program.

Sometimes there is resistance to change by technicians who actually do the work.

Grads still have trouble managing for non-timber objectives.

District Rangers should be more heavily involved in planning SI - and certification.

SI has fostered specializations within our organization, both in silviculture and other areas - these groups tend to be cliquish rather than interdisciplinary.

Grads have a good biological perspective, but not enough management perspective.

Non-foresters should be included as participants.

Need more emphasis on integrated prescriptions.

Too many grads see silviculture as an end in itself, rather than as a means to an end.

Lack of time and money committed to action by management.

Sometimes the wrong people have been selected to go (e.g. performance problems).

SI grads should stay at GS-9 level longer after completion (not jump to GS 11)

Question 6: Describe any topics that should be added or deleted, or receive a different emphasis than currently received.

More emphasis on the following:

- silviculture for non-timber objectives (11)
- policy-making, litigation, court appeals, conflict resolution (6)
- timber management, less on other resources
- fire, insects and disease
- long-term productivity and forest fragmentation (5)
- working with the media and the public (4)
- eastside management (3)
- implementation of prescriptions (2)
- different land management philosophies (e.g. Native American) (2)
- meeting management and facilitation skills
- ecosystem management at the landscape level
- managing forests for social objectives
- inventories and data bases
- uneven-aged management
- the history of silvicultural systems (especially results)
- economics of non-timber resources

Less emphasis on the following:

- statistics (2)

Question 7: Do you have other comments about the Institute, or about the certification process?

Silviculture Institute:

I'm very supportive of the program (19).
Encourage SI grads to complete graduate school.
People who attend have a great sense of accomplishment.
SI should include some of the outstanding technicians.
Final project is excellent.
This evaluation is timely.
This evaluation is worthless. SI seems to be trying to take credit for too many things.
Option of sending people to individual modules is good.
SI should be open to non-foresters.
Silviculture is trying to do too much - should concentrate on growing trees.
SI costs too much time and money.
Decrease in workforce is cutting the need for SI grads.

Certification:

Certification prescription is too complex - should be more operational (3).
District Rangers should be more involved in certification.
I'm very supportive of certification process.
Success rate for certification is too low - either something is wrong with SI or the certification process.
There should be various levels of certification, based on experience.
Certification has limited the growth of some employees in other areas.
USFS should encourage participation in SI, but not require all prescriptions to be signed by certified silviculturists.

APPENDIX K

Questions Used to Assess Improvements in the Abilities of Participants

**SURVEY QUESTIONS USED TO ASSESS IMPROVEMENTS IN
ABILITIES OF PARTICIPANTS**

Questions from Section II of the Participant Survey were combined in the following way to assess how the Institute affected eight major abilities of participants.

1. Ability to make ecologically sound decisions:

Questions: 1, 2, 3, 4, 5, 6, and 7.

2. Ability to make economically sound decisions:

Questions: 8, 9, 10, 11, 12, and 13.

3. Ability to make practical silvicultural decisions
(from the standpoints of engineering and logistics):

Questions: 14 and 15.

4. Ability to make stand-level decisions that fit into
the larger management context of the forest,
organization, or region:

Questions: 16 and 24.

5. Ability to investigate and solve difficult
silvicultural problems:

Questions: 25, 26, 27, 28, 29, 30, 31, 32, and 33.

6. Ability to make structured, well-documented decisions:

Questions: 17 and 18.

7. Ability to understand broad ecological issues:

Questions: 19, 20, 21, 22 , and 23.

8. Ability to present and defend silvicultural
recommendations to others:

Question: 34.