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ABSTRACT

Perceptions and values of Oregon professional foresters on components of forestry education were evaluated. Three objectives guided the study: (1) the importance foresters place on incorporating forestry education in school curriculum; (2) foresters' opinions about agency involvement in schools; and (3) the value foresters place on forestry instruction in secondary school curriculum. A survey instrument was developed to collect information relative to the three objectives on: forest education perceptions, forest education solutions, high school instructional units, and demographic information. The study population was composed of 600 full members of the Oregon Society of American Foresters; 400 usable responses were analyzed. Five major findings pertained to study objectives: (1) forestry education should be infused into school curricula; (2) there was no adequate forestry education on environmental issues; (3) foresters should promote forestry education; (4) the timber industry's involvement in forestry education is poor; and (5) priority should be given in addressing forest ecology/forest management. (Twenty references and three appendices are included: the survey instrument, respondent demographics, and findings tables.) (NLA)

Professional Forester Perceptions of the Value of Forestry Education in High Schools*

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TABLE OF CONTENTS

INTRODUCTION

Conceptually, "forestry education" in high schools has been implemented in one form or another for several decades. There has been, however, no consistency in how it has been administered. If it existed at all in any particular school district, it was disseminated in one of three forms: general biological, ecological, or natural science instruction about various components of the forest taught in the science and/or social studies curricula; brief unit(s) of instruction concerning forestry skills and/or forestry as an applied science taught as part of the high school agricultural education program; or detailed instruction concerning all of the above taught in a vocational forestry/natural resources program.

Of the three approaches to providing forestry education described above, most educators would agree that the vocational forestry/natural resources program would be the best choice for promoting forestry education, both as a science and as a set of industrial skills. The problem, however, lies in the fact that very few such programs exist in Oregon's high schools, and those programs which do exist are elective in nature, thereby exposing only a limited number of students to forestry instruction in any given school.

Two key questions emerge: First, should forestry education be integrated into Oregon's overall public instruction, and more specifically, into that of the secondary education component? Secondly, if forestry education should be integrated into Oregon secondary instruction, what educational units should constitute the curriculum?

These two questions have increased in significance with increased activity on the part of environmental extremist organizations during the 1980s. They have brought to the forefront of public awareness a list of alleged charges against the timber industry. Further exacerbating the impact of "public awareness," some of these charges have been leveled c ·ially in the form of lawsuits aired in U.S. federal co . These actions have in turn set off a chain reaction of events which, in effect, have begun to take the authority for making land use decisions away from university trained foresters and have given that authority to court systems, politicians, and/or the general public. It is the opinion of the researchers that if timber production is to have a future in the State of Oregon, forestry education efforts may need to occur on a state-wide level, and be implemented and monitored through both vocational and non-vocational curricula.

Historically, education about forestry has taken place in one of three secondary classroom environments: science, agricultural education, and forestry/forest products. Each of these disciplines possesses their own inherent strengths and weaknesses as mediums for instruction about forests and forestry.

The biological, physical, and social sciences have traditionally taught instructional units which directly pertain to education about forest components and issues. The advantage to having these programs teaching about the forests is that every Oregon child must attend said courses. The disadvantage is that most of these teachers have rarely received any formal education in the science and practice of forestry. Unfortunately, this has often led to teachers who either have avoided teaching anything about forest practices, or have done so without adequate knowledge to teach the subject.

For decades, high school agricultural education (known in Oregon as agricultural science and technology) has included instructional units on forestry as a regular part of its standard curriculum, and in many states this is still true. By contrast, approximately twenty years ago, the (formerly named) Oregon Board of Education (OBE) implemented the development of "occupational clusters" for use in organizing vocational and career education programs (OBE, 1972). Forest products was identified as one of the original clusters, and from that time on, it was recognized as a separate entity from high school agricultural education. The emphasis placed upon forestry instruction by Oregon agriculture programs has steadily declined as the years passed, and in some schools there is no emphasis placed on it at all. Recently, however, there has been a renewed interest on the part of some Oregon agricultural science and technology instructors to reinstate instruction about forests and forestry back into their overall curriculum.

Forest products programs are certainly the most effective programs for teaching about forestry, given their profession specific nature. These programs are broad based in their subject matter, progressive in their approach, and tend to be very technologically attuned. One of the greatest advantages of this educational medium is that these programs must be taught by people who possess a state-regulated number of hours of forestry work experience. The main disadvantage inherent to these programs is that they will expose only a small percentage of Oregon students to the science and practice of forestry. At one time there were nearly 50 secondary schools teaching forestry in Oregon (M. Multanen, personal

communication, July 9, 1991). Today, however, there are only 18 high school programs providing such instruction (Monje, 1991).

The 1980s were, for the most part, tough years economically for the Northwest timber industry, and student enrollment in forest products programs steadily declined in the industry's wake. While over 131,000 students in grades 9 through 12 attended Oregon secondary schools during the 1988-89 academic school year (Oregon Department of Education [ODE], 1989), only about 520 of those students were enrolled in forest products cluster programs (D. Sligar, personal communication, January 15, 1991). However, if Oregon high school graduates are viewed as the decision makers for natural resource issues in the future, this is exposing but a fraction of Oregon's future decision makers to issues important to forest management policy in Oregon.

Given that the general public has been accepting, without question, most charges which have been leveled by environmental extremist factions against the forestry profession, and given that this unquestioning acceptance of preservationist information, on the part of the public, has been most likely due to the lack of educating the public about the science of forestry; the researcher believes that Oregon Public Schools may be called upon to address this very issue. If such action were ever to be taken, it would be absolutely necessary to possess a clear understanding of the aforementioned key questions: Should forestry education be integrated into Oregon's overall public instruction; and more specifically, into that of the secondary education component? And, if forestry education should be integrated into Oregon secondary instruction, what educational units should constitute the curriculum?

The purpose of this study was to answer the above questions by evaluating the perceptions and values of Oregon professional foresters on various components of forestry education. In an effort to secure these answers, the researcher established the following as the objectives for this study:

1. To determine the importance that professional foresters place on incorporating the concept of forestry education in the Oregon public school curriculum.

2. To assess the opinions of professional foresters about involvement on the part of their respective agencies in the Oregon public school system.

3. To determine the value professional foresters place on selected units of forestry instruction in the secondary school curriculum.

REVIEW OF LITERATURE

Related Research:

According to Mr. Howard Brock, former forest products specialist, Oregon Department of Education, Oregon was the only state in the United States (to his knowledge) to establish forestry/forest products as a secondary vocational entity. He wrote:

> From information gathered at the outset, Oregon is the only state, to my knowledge, that had a recognized statewide Forestry/Forest Products Cluster. Other states had Forestry programs outside of Vocational Agriculture. However, they were special programs not on equal footing with Vocational Agriculture, T & I, Business, etc., clusters. (H. Brock, personal communication, May 17, 1991)

Oregon is somewhat unique in its educational support toward formal secondary forestry instruction, yet very little educational research has been conducted in the arena of forestry education. Three pieces of work, however, have been conducted in Oregon and are worthy of discussion. All three studies dealt specifically with curriculum content for the aforementioned forestry/forest products cluster. Two of the studies were sponsored by the Oregon Department of Education, and the third was a Master's thesis by Mr. Roger Schoenborn.

While the first Oregon high school vocational forestry cluster program officially started in 1970 (H. Brock, personal communication, May 17, 1991), the first curriculum guide was not released until 1972 (Oregon Board of Education [OBE], 1972). Mr. Monty Multanen, former associate superintendent of Vocational-Technical Education, Oregon Department of Education, gave the following account of how the first curriculum study was conducted:

> As with all cluster programs we used an industrial advisory council representing key occupations within the cluster area. Key occupations were those that represented the common knowledge and skills of jobs within the industry and those that employed the majority of people. The committee identified the key occupations and then did a task analysis of each one. The curriculum was based upon the common skills and knowledge plus some other entry level requirements. High schools and community college

> instructors also participated in the curriculum design process. (M. Multanen, personal communication, July 9, 1991)

Worthen and Sanders (1987) suggested that stakeholders in any evaluation process should be strongly encouraged to participate in that process. By all outward appearances, the OBE seemed to have encouraged compliance with that principle on this project.

> Industry and education have worked together over the past few years to develop this guide. Representatives of the forest products industry, special consultants, and teachers have participated in analysis studies, workshops, and committee sessions during various phases of its development. (OBE, 1972, p. iii)

The Curriculum Guide for Forest Products, which was issued in July of 1972, was produced by the aforementioned advisory council. This document was an objectives-oriented curriculum guide which coupled behavioral objectives with both required knowledge and suggested learning activities. The curriculum was designed in such a way so as to train students for employment in one of nine broad occupational groups which were compiled from a list of 37 identified careers addressed in the Dictionary of Occupational Titles (OBE, 1972).

In 1985, the Oregon Department of Education (ODE) published a forecasting report for the forestry/forest products vocational cluster entitled, Subject Matter Update-1986-87: Forestry/Forest Products (Oregon Department of Education [ODE], 1985). The ODE, in conjunction with Oregon State University, assembled a technical committee made up of 15 individuals who were recognized as having "outstanding records of achievement and significant prior working experience" (ODE, 1985, p. 1) in various facets of the forest industry. It should be noted that three of the members were functioning in public education capacities. This committee then became the primary source of information for the ODE forecasting report. The report listed industry trends and trade practices, forestry employment trends, equipment recommendations for secondary forestry programs, and curriculum recommendations for secondary forestry programs.

The curriculum recommendations were listed in chart-form, and required the 15 committee members to rate the relative importance of 30 units of forestry instruction on a scale from 0 to 5, with 0 indicating obsolescence of the subject matter

and 5 indicating the highest level of importance. Seven units scored 5, fourteen units scored 4, nine units scored 3, and none of the units scored less than 3. Units of instruction which scored 5 were: timber cruising, harvesting systems, falling and bucking, fire prevention, first aid and safety, mathematics, and use and maintenance of power tools.

While this study quantified the level of importance that the technical committee placed on 30 chosen units of instruction, the fact remains that this was the perception of only 15 individuals. The results may or may not have represented the perceptions of the thousands of other forestry related professionals working in the State of Oregon.

In addition to the findings already stated, this 1985 technical committee also made some recommendations with regard to the overall subject matter. First, not only should vocational forestry be incorporating science, math, and communication skills into its instructional process, but the academic disciplines should be integrating forestry education into their areas of instruction as well. Second, vocational forestry instructors should make greater use of industry media (e.g., trade journals, audio-visual materials, field trips, and the like) in their programs, as well as make greater use of industry personnel as lecturers and discussion leaders. Third, forest products programs should be encouraging students to assume responsibilities in leadership, organizational structure, and customer relations. Fourth, forest products programs should stress preventive industrial safety measures. Fifth, programs should provide "real life" work experiences on technical projects. Furthermore, the committee suggested that three additional areas of instruction be added to the state recommended curriculum: advanced computer applications, Oregon Forest Practices Act laws and policies, and organizational behavior.

The third study deserving recognition in adding to the body of knowledge in secondary forestry education is an Oregon State University Master's thesis written by Mr. Roger Ellis Schoenborn in 1976, entitled, Forestry Competencies Needed by High School Graduates as Rated by Employers, Secondary and Post-Secondary Instructors. In his study, Schoenborn sought to meet four objectives. First, to identify forestry competencies needed by high school forestry program graduates. Second, to rate specific forestry competencies according to four classifications of importance. Third, to place the rated competencies in rank order according to their total sample mean. Fourth, to rate and rank 26 units of forestry instruction.

Surveyed were 30 "key" Oregon forest employers, all (23) post-secondary forestry instructors in Oregon, all (13) post-secondary forestry instructors in Washington, all (18) Oregon secondary forestry instructors in agriculture, and all (29) Oregon secondary forest products instructors. In seeking to answer his fourth objective, Schoenborn asked his respondents to rate 26 units of forestry instruction on a scale of 1 to 5, with each number representing the following in order of ascension: NO OPINION, NOT NECESSARY, NICE TO KNOW, NECESSARY, and ESSENTIAL. He noted that of the 26 units; eight were rated as NICE TO KNOW, seventeen were rated as NECESSARY, and one was rated as ESSENTIAL. The top seven units in ranked order according to the entire sample were as follows: first aid and safety, chain saw operation and maintenance, tree growth, hand tools, mapping and compass, fire fighting and suppression, and basic surveying. The top seven units in ranked order according to forest employers were as follows: first aid and safety, mapping and compass, log scaling, tree growth, occupational opportunities, chain saw operation and maintenance, and tree planting.

It is noteworthy that the only units of forestry instruction which were rated in the top seven between the 1985 15-member ODE technical committee and the 1976 30-respondent forest employer sample are first aid and safety and chain saw (power tool) operation and maintenance.

The sample for each of the forestry instructor groups was the respective population of the same. Thus, there was no need for inferential statistics. However, the 30 Oregon "key" forest employers were obviously but a fraction of all forestry related employers available at the time. The researcher assumed then that there was no intent on Schoenborn's part to infer his sample statistics from this group back to the larger population.

Schoenborn's study was the first to identify some firm conclusions with regard to vocational forestry education curriculum. First, he determined that there were specific units of instruction which were necessary, and some which were simply "nice to know." Second, forestry employers rated their scores closer to the overall means than did any other individual sample group. Third, post-secondary instructors tended to rate the value of secondary competencies lower than the overall mean. Fourth, first aid and safety training should be given priority in secondary instruction. Additionally, Schoenborn made several recommendations. Among others, he suggested that the ODE should consider re-evaluating it's suggested forest products core curriculum

guide, and that forestry competencies should be reviewed and updated every 5 years.

Concerning the third conclusion mentioned above, he made the following observation in the "findings" chapter of his thesis:

> Many comments and additional competencies were included in letters received by the investigator. Post-secondary community college forestry instructors consistently indicated that forestry competencies were not needed by high school graduates, but rather "good study habits, good basic math, good reading and writing, communication, and self-motivation skills" were needed first. (Schoenborn, 1976, p. 37)

He did not elaborate any further.

Schoenborn's work was the first comprehensive quantitative study on what units of forestry instruction should be included in a secondary vocational forest products curriculum. Given that vocational forestry education was formally introduced at the secondary level in 1970, and that Schoenborn began his study in 1974, it must be presumed that he assumed that forestry education should be integrated in Oregon secondary instruction. There is no doubt that his work should be considered a benchmark study in the area of forestry education curriculum, at least on the vocational level.

Related Literature:

In reviewing the related literature with regard to subjects germane to forestry education, the researcher has embarked upon three key topics: 1) the connection between forestry education and its agricultural educational parentage, 2) the history of secondary forestry education in Oregon, and 3) what rationale exists, from a research perspective, in sanctioning, and moreover necessitating, this study.

Some portions of this literature review may appear to border on naturalistic inquiry. This is both by necessity and design. In the case of addressing the history of secondary forestry education in Oregon, there is little to nothing documenting its development except for those people who made it happen. In order to piece together all of the major factors which affect the context of this study, a naturalistic approach was necessary in acquiring this particular piece of the contextual puzzle. Worthen and Sanders (1987, p. 139)

suggested that, "Naturalistic inquiry casts the evaluator in the role of a learner, and those being studied in the role of informants who 'teach' the evaluator." Mr. Howard Brock, Mr. Monty Multanen, and Mr. Don Sligar operated in this latter role in allowing the investigator to research this vague contextual component.

The notion that forestry is a profession which falls under the larger science of agriculture is probably not a foreign concept to anyone other than those who reside in the Pacific Northwest. Ferrioli, Petersen, and Wilson (1990) have shown that value-added manufacturing revenues in Oregon are nearly three times higher for the forest products industry than they are for Oregon's second leading industry--agriculture. When such is the case, it is very easy then, on a regional level, to begin to think that forestry is a completely different science from that of agriculture. However, on a national level, when the Transfer Act of 1905 was signed into law, the administration of the nation's forest reserves was transferred from the Secretary of the Interior to the Secretary of Agriculture (Dana & Fairfax, 1980).

It was only natural then for the vocational agriculture programs which developed after the passing of the Smith-Hughes Act of 1917 to immediately incorporate forestry into their curricula. To this day, writers of agricultural education books and material automatically consider instruction about forestry as part of their overall mission (McClay, 1978; Newcomb, McCracken, & Warmbrod, 1986; and Phipps & Osborne, 1988). Forestry has also been recognized as a valid curriculum component in agricultural education program evaluation instruments such as, but not limited to, Standards for Quality Vocational Programs in Agricultural/Agribusiness Education and the National Study of School Evaluation.

Newcomb, McCracken, and Warmbrod (1986, p.11) quoted the National Science Foundation's Committee on Agricultural Education as having defined the agricultural sector as including "...use, conservation, development and management of air, land and water resources...." While the word "forestry" was not included in their definition, those components which were listed are certainly indigenous to forestry education as well. Furthermore, the above authors stated that there were seven major classifications of subject matter which should be addressed in an agriculture program. Agricultural resources and forestry were two of the seven which were listed. Concerning these, the authors stated:

> **Agricultural Resources.** Includes subject matter concerned with the principles and processes involved

> in the conservation and improvement of natural resources such as air, forests, soil, water, fish, plants, and wildlife for economic and recreational purposes.
>
> **Forestry.** Includes subject matter concerned with the use, management, and protection of forest lands. Specific subject areas include logging, wood utilization and forest protection. (Newcomb, McCracken, & Warmbrod, 1986, p. 12)

Phipps and Osborne (1988) also suggested that the same subject matter areas should be addressed in an agricultural education program, but they combined agricultural resources and forestry into one subject area.

Schoenborn (1976) provided the history of the first known attempt to infuse forestry education into the context of the Oregon public high school. He reported that then State Forester N. S. Rogers in 1943 worked with the principal of Salem High School to develop an experimental forestry course. Schoenborn reported that five foresters from the State Forestry Department in conjunction with some Salem High School faculty members wrote a seven-chapter curriculum which covered 28 units of instruction. Schoenborn quoted Rogers from the preface of a State Forestry Bulletin (No. 8) entitled, General Forestry: A course for Oregon High Schools:

> Although Oregon's forests are its greatest single resource and more than 1/3 of the people receive their livelihood from the manufacture of forest products, the public schools of the state teach little or nothing about forestry and forest industries. (Schoenborn, 1976, p. 13)

With the aforementioned exception, up until 1970, forestry education in Oregon was, for the most part, handled through agricultural education programs in local community school districts. A series of events which occurred during the 1960s, however, began to alter this traditional approach to secondary forestry education.

In 1962, the federal Manpower Act was passed. The very next year saw the passage of Public Law 88-210, the Vocational Education Act of 1963 (Phipps & Osborne, 1988). Among other things, the latter provided funding to implement training programs for non-employed and under-employed persons. These funds initially started 1-year (or less) forestry aide and other forestry-type programs in the newly formed community college districts, which later in the decade spawned 2-year

associate degree programs in forestry technology at the community college level (H. Brock, personal communication, May 17, 1991). The year 1966 became a pivotal year. According to Brock (personal communication, May 17, 1991), 1966 saw the first forestry technology graduates of the 2-year community college programs, and according to Multanen (personal communication, July 9, 1991), it saw the first move toward high school vocational forestry programs. Multanen noted:

> In 1966 the Vocational Education Division, Oregon Department of Education, established new guidelines for occupational cluster programs. To be a recognized cluster an industry needed to have a statewide employment base of 10,000. Forest Products was one of the original 11 clusters. (M. Multanen, personal communication, July 9, 1991)

Multanen further stated that once Howard Brock was hired by the ODE as the state forest products specialist, he was to work with members of the forest industry, secondary schools, and community colleges to develop forestry education curriculum and start new forest products programs. Brock performed his assignment, and at one point in time, Oregon had nearly 50 state-approved high school programs (M. Multanen, personal communication, July 9, 1991).

While the original curriculum placed a great deal of emphasis on the milling/processing component of forestry education (OBE, 1972), the forest products instructors tended to place far more emphasis on the woods-based technical skills. Don Sligar, forest products specialist, Division of Vocational-Technical Education, Oregon Department of Education, noted the following:

> Due to costs, opportunities, etc., the mill related side never materialized, but logging and technical training grew in the forestry cluster. (D. Sligar, personal communication, January 15, 1991)

Multanen (personal communication, July 9, 1991) believed that most teachers had limited experience in the milling/processing arena, and consequently tended not to place a great deal of emphasis on it.

In addressing the fact that part of forestry education had been pulled completely away from agricultural education, which had traditionally taught the subject, Multanen noted:

> Since we were promoting programs from an industry base, we felt that certain communities ought to have

> full time programs. In other words, they did not get enough instruction time in agri-forestry programs. In addition, the agri-forestry programs were almost exclusively limited to growing and management. The forestry programs were also designed to emphasize harvesting and wood products jobs. We left it up to the districts to decide what combination of programs was best. (M. Multanen, personal communication, July 9, 1991)

Sligar added:

> The emergence of forestry seems to have been a response to the wood products segment of the industry. Ag/ Forestry was to cover only the pre-production side of Forestry related occupations while Forestry/Forest Products was to primarily focus on the mill/logging side. ...It appears that the FP industry wanted more of an identity than they were getting from the traditional agriculture program and they were a large enough industry to warrant more identity in occupational training. (D. Sligar, personal communication, January 15, 1991)

Data provided by Don Sligar with his correspondence indicates that state-wide secondary forest products enrollment through the 1980s tended to increase or decrease in accordance with whether the timber industry was doing well or was doing poorly. In regard to the fact that one of the most highly respected secondary forest products programs in Oregon was facing termination due to the lack of adequate student enrollment, Monje wrote the following after an interview with Don Sligar:

> Enrollment and interest in forestry probably has been affected by the difficulty that area mills are having because of their dependence on the dwindling supply of old-growth Douglas fir, said Don Sligar.... (Monje, 1991, p. 4M)

As to whether the timber industry is doing well or is doing poorly is, for the most part, a question of economic prosperity. Economic prosperity is, among other things, hinged upon timber availability and affordability. It follows then, that the actions of individual people who collectively form as preservationist groups organized for the purpose of regulating forests to the point of not allowing any commercial use, directly affect timber availability, affordability, and ultimately whether or not a timber industry even exists. If the actions of average citizens affect all of the above, then the key questions of this study appear to be very valid, and

in need of an answer. Linda Coss, educational service manager for the Canadian organization, Council of Forest Industries, suggested that:

> The more people know about the forest industry, the better equipped they are to make the difficult decisions about how it should work. Education is the key. (Coss, 1990, p. 3)

DESIGN AND METHODOLOGY

Design:

This study was descriptive in its methodology. Borg and Gall (1989) stated that descriptive research, in a broad sense, has been responsible for targeting efforts which have led to major scientific discoveries. From a research perspective, they suggested that it has significantly increased the body of knowledge about what happens within schools. Furthermore, they (Borg & Gall, 1989, p. 5) noted that, "Some descriptive research is intended to produce statistical information about aspects of education that interest policymakers and educators." This latter point is germane to the intent of this study. The merits of applying descriptive methodology to this study were clearly identified by Ary, Cheser-Jacobs, and Razavieh (1990) who noted that:

> Descriptive research studies are designed to obtain information concerning the current status of phenomena. They are directed toward determining the nature of a situation as it exists at the time of the study. ...The aim is to describe "what exists" with respect to variables or conditions in a situation. (p. 381)

The review of literature indicated that very little research of any kind had been conducted in the area of secondary and vocational forestry education. Furthermore, it appeared that only one piece of comprehensive research had ever been implemented in Oregon--Schoenborn (1976). Thus, the use of descriptive methodology in this study is valid. Dr. W. Wade Miller, associate professor of Agricultural Education at Iowa State University, noted in one of his graduate research methods lectures (AGEDS 620) that research which clearly defin s "what is" is necessary before any research can be implemented in seeking to ask "why" (W. Miller, personal communication, Fall 1990).

Population Identification and Sample Selection:

The population of interest in this study was composed of "full members" of the Oregon Society of American Foresters (OSAF). The researcher believed that a cross-sectional survey of this population would most accurately reflect the perceptions of professional foresters as a whole, in that full membership was reserved for only 1) those who possessed a 4-year degree in forestry or a closely related applied

environmental science, and 2) for those who were currently working in or were retired from a career in forestry. The leadership of the OSAF was approached about the need for conducting this study, and they demonstrated their interest and support by graciously approving the release of their 1991 mailing list to serve as the sampling frame. From this list, it was determined that 1,347 members were classified as members, retired members, fellows, or retired fellows. These "full members" constituted the population for the study.

Initially, the sample size was estimated to be 320 by using the NEA Model (Krejcie & Morgan, 1970). Later, however, a refined determination was made by interpolating from the data of Table C-12 in the statistics book, Applied Statistics for the Behavioral Sciences (Hinkle, Wiersma, & Jurs, 1988). Hinkle, Wiersma, and Jurs (1988) suggested that four factors must be considered when determining an appropriate sample size. These were:

1. The level of significance (alpha).
2. The power of the test (1 - Beta).
3. The population error variance.
4. The effect size.

The aforementioned table suggested that a sample size of 400 would be more than adequate to represent the population given 11 demographic groups, an alpha of .05, a test power of .80, and an effect size of 1. Based upon the 1,347 member population, 600 OSAF members were randomly selected. The first 400 members constituted the primary study sample, and the second 200 members made up the alternate list.

Instrumentation:

Based on the study's first key question, "Should forestry education be integrated into Oregon's overall public instruction, and more specifically into that of the secondary education component?" the researcher developed a series of criterion questions. Approximately half of the questions were targeted toward forestry education perceptions, and the other half were targeted toward forestry education solutions.

In an effort to address the second key question of the study, "If forestry education should be integrated into Oregon secondary instruction, what educational units should constitute the curriculum?" the researcher listed 54 potential curriculum units for respondents to react to. Most of the units of instruction were taken from several of the best forest products curricula being used in Oregon, in addition to

including other units reflecting subjects which probably few Oregon programs were currently addressing. A set of demographic questions were placed on the back of the questionnaire.

The content validity of the instrument was tested by eight individuals. Mr. Robert Hostetter of the OSAF state office; Mr. Clark Seely, the 1991 OSAF state president; and Dr. Steven Jungst, ISU Forestry Department chair, all examined the instrument from a professional forester's perspective. Dr. Alan Kahler, professor of Agricultural Education and Studies (AGEDS), Dr. Wade Miller, associate professor of AGEDS, Dr. Richard Carter, professor of AGEDS, and Dr. Anton Netusil, professor of Research and Evaluation, examined the instrument from the perspective of educational research. Mr. Donald Sligar, forest products specialist from the ODE, examined the questionnaire from a forestry education perspective. These individuals examined the survey instrument and suggested a variety of changes, approaches, and improvements.

In its final form, the questionnaire contained four parts. The first part was entitled "Forest Education Perceptions," and it posed eight questions which sought to address objective number one of this study:

> To determine the importance that professional foresters place on incorporating the concept of forestry education in the Oregon public school curriculum.

The second part of the survey was entitled "Forest Education Solutions," and it possessed ten questions which were designed to address the second objective of this study:

> To assess the opinions of professional foresters about involvement on the part of their respective agencies in the Oregon public school system.

The third part of the instrument was entitled "High School Instructional Units," and it sought to answer objective number three by having the respondents rate the importance of 54 potential units of forestry instruction for three different categories of high school students. These categories included "all high school students," "high school college-bound forestry students," and "high school forestry job-oriented students." Objective number three stated:

To determine the value professional foresters place on selected units of forestry instruction in the secondary school curriculum.

The fourth part of the instrument was entitled "Demographic Information," and as the name indicates, it asked the respondent for 11 pieces of personal information. A copy of the final questionnaire is included in Appendix A.

With the exception of the demographic questions, all other questions required the respondent to indicate their position by rating each item on a modified 1 to 9 Likert-type scale. This scale was chosen for three reasons. First, it allowed the respondent the most convenience in answering. Second, this scale allowed for the most efficient and economical data entry. Third, the 1 to 9 response allowed for an interval scale with a wide enough range to facilitate an adequate distribution of responses in developing realistic means.

Finally, each randomly selected individual was assigned a code number between 1 and 600. This code number was machine stamped on to the questionnaire that was sent to that specific individual. At no time were any of the respondents asked to identify themselves in any way, thereby protecting their anonymity.

A post hoc reliability was run on the instrument after the data were collected. The 18 questions in parts one and two were examined together as a scale and received a Cronbach alpha rating of .7456. The 54 curriculum units were run together as a separate scale, and received a Cronbach alpha rating of .9542. Given the fact that the researcher expected that there may be a wide variance in the respondents' ratings of the first 18 questions, the Cronbach alpha of .7456 was considered adequate.

Data Collection:

After the survey instrument was initiated, validated, and refined into its final form, a letter of transmittal was written to accompany it. The letter bore the signatures of Mr. Clark Seely, the 1991 OSAF state president, Mr. Don Sligar, the forest products specialist for the Oregon Department of Education, and the researcher. The letter was off-set printed with a thermal resistant ink so that the finished letter stock could be run through a laser printer. Prior to this, the names and addresses of all 600 individuals randomly selected to participate in the study had been entered

into a WordPerfect 5.1 mail-merge file. When the letter stock was run through the laser printer, each letter was personalized with the participant's name and address, as well as his/her specific identification code for purposes of the study.

The researcher used a procedure for data collection based upon that which was suggested by Ary, Cheser-Jacobs, and Razavieh (1990), which included an initial mailing of the survey packet, a postcard follow-up, and then a second follow-up consisting of another survey packet. The returns were then coded as to whether they occurred in the time range of the first, second, or third mailing.

On March 22, 1991, 600 survey packets were mailed to study participants, each containing a questionnaire, a self-addressed stamped envelope, and a personalized letter of transmittal. The initial mailing drew 361 returns constituting a 60.17% return rate.

On April 12, 1991, postcards were mailed to the nonrespondents as the first follow-up to the initial mailing. A 2-week period was allowed for additional responses to be returned. There were 43 returns received during this period. These added another 7.2% to the overall response rate which then stood at 67.37%, posing a total of 404 returns.

On April 26, 1991, second follow-up packets were mailed out which consisted of a questionnaire, a self-addressed stamped envelope, and a new form letter of transmittal which greeted the participant as, "Dear Oregon Forestry Professional." May 17, 1991, was chosen as the "cut-off" day for usable returns. The third mailing drew an additional 83 returns, adding another 13.8% to the overall response rate. On the official "cut-off" date for the study, a total of 487 returns, constituting an 81.17% response rate, had been received by the researcher.

An additional 13 returns came in after the "cut-off" date, making the overall return rate 83.33%. A total of 500 of the 600 randomly selected participants returned questionnaires. It should be noted that three survey packets were mailed back as "Return to Sender."

Upon completing the data collection phase of the study, all of the returned questionnaires were collated chronologically via the natural order of their respective identification codes. The total set of returns were then divided into two groups; a primary stack comprised of survey numbers 1 to 400, and a secondary stack comprised of survey

numbers 401 to 600. Between these two stacks there were 113 omissions due to late responses and non-responses.

The final sample of 400 surveys was compiled by examining the first ordered survey in the primary group and determining whether or not it was "usable." Useability was defined by the researcher as whether the respondent completed the questionnaire in earnest. If more than a couple of questions were not rated in the first 18 items, or if more than two curriculum units were not rated in any one of the five factor classifications, then the questionnaire was not considered to be usable. It was then set aside, and the first ordered survey from the secondary group was examined for useability. If it met the criteria for useability, it was transferred into the primary sample and reassigned the identification number of that ordered position. If the first ordered survey in the secondary group was considered not to be usable, then it was set aside, and the next ordered survey was examined. This process was continued until a sample of 400 usable surveys numbered consecutively between 1 and 400 was established. Substitutions from the secondary group to the primary group were made only if 1) a questionnaire in the primary group failed to meet the useability criteria, or 2) if an ordered chronological number was missing due to no response on the part of the selected participant. How a participant responded to any part of the questionnaire was not a part of the "useability" determination process, nor was the identity of the respondent ever referenced or used as a selection criterion. As has been stated, any given participant's identification code was assigned totally at random by a computer, and the sample selections were based strictly on the chronological ordering of the identification codes.

Given that 500 questionnaires were returned to the researcher out of 600 targeted participants, the following provides an accounting of the 400 survey sample selection procedure. Four hundred surveys made up the sample. Thirty-two surveys were deemed unusable in the selection process. Thirty-nine surveys in the secondary group were left over after the selection process. Sixteen surveys were returned by persons who chose not to participate. Thirteen surveys were returned too late to be considered for selection. Additionally, three surveys were mailed back to the researcher as "Return to Sender."

Data Analysis:

Once the sample was established, each questionnaire was inspected and coded by the researcher. Appropriate codes were

assigned for the entry of demographic information, and a code was written in for any missing data which were identified. The surveys were key-punched into the ISU mainframe (a Hitachi Data Systems HDS-AS/9180) by the Data Entry Department in Durham Center. This took place in the early part of June of 1991. All computer manipulation of these data was conducted through the use of the statistical analysis package SPSS.

As has been stated previously in the Instrumentation subsection of this chapter, the questionnaire was initially separated into two scales, and a reliability test was run on both. The Cronbach alpha for the first part was satisfactory (.7456), and the Cronbach alpha for the second part was very favorable (.9542).

The next issue dealt with was that of respondents vs. nonrespondents. Miller and Smith (1983, p. 45) noted that, "Data gathered from self-selected respondents may not represent the opinions of the entire sample or population." They suggested that "double-dipping" the sample by contacting 10 to 20% of the nonrespondents by telephone, and then using the questionnaire as an interview schedule, would provide the best means to evaluated respondents and nonrespondents. The two groups could then be compared to determine if, where, and how many statistically significant differences existed. If few differences occurred, and the sample was correctly drawn from a representative frame, then the researcher could infer the results to the larger population (Miller & Smith, 1983). The problem in this study lies in the fact that the frame was a mailing list, and thus there was no provision for providing telephone numbers. In that the researcher desired to infer the results of this study back to the population of foresters belonging to the OSAF, he employed the procedure that Miller and Smith suggested as the next best alternative. They (Miller & Smith, 1983) noted that:

> Research has shown that late respondents are often similar to nonrespondents.[4] [Superscript 4 referred the reader to four studies on which Miller and Smith based their position.] Thus, one way to estimate the nature of the replies of nonrespondents is through late respondents. ...These two groups can be compared statistically to determine differences between the groups. With late respondents assumed typical of nonrespondents, if no differences are found, then respondents are generalized to the sample. (p. 48)

The researcher implemented this suggested technique by comparing the mean scores given by the early respondents (N

varying around 304) with those scores given by the late respondents (N varying around 56) through the use of t-tests. All 180 questions on the survey were compared with only seven questions showing a statistically significant difference given an alpha of less than or equal to 0.05. Given that nine statistically significant differences could have occurred by chance with this alpha level, the researcher determined that there was no difference between early respondents and late respondents. It appeared safe to assume, then, that the nonrespondents were not different from the respondents.

The first objective of this study was satisfied by individually analyzing questionnaire items 1 to 4, 8 and 18, in light of various demographic considerations through the use of ONE-WAY ANOVAs, and where appropriate, t-tests.

The second objective of this study was satisfied by individually analyzing questionnaire items 9 to 13 and 15 to 17 in light of various demographic considerations through the use of ONE-WAY ANOVAs, and where appropriate, t-tests.

The third objective of this study was satisfied using two analytical approaches. First, COMPUTE statements were used to calculate a factor classification mean on all five factors for each of the three student audience applications. These means were then analyzed in light of various demographic considerations through the use of ONE-WAY ANOVAs, and where appropriate, t-tests. Secondly, individual means were calculated on all 54 of the forestry instructional units (questionnaire items 19 to 72) as rated by the respondents for each of the three student audience applications. These means were then listed in ranked order according to their decreasing mean values.

FINDINGS

The findings are summarized in six sections. These sections are organized under the following headings: 1) Respondent Background Information, 2) Objective One, 3) Objective Two, 4) Objective Three, 5) Respondent Characteristics and Their Effect on the Findings, and 6) Major Findings.

Respondent Background Information:

A description of the respondents is provided in Figures 1-4 in Appendix B. Of the 400 subjects sampled, 46.9% practiced as forest managers, and 20.2% described themselves as being retired. Forty percent reported themselves to work in government forestry, while 34% and 5% reported themselves to be industry foresters and university foresters (respectively). The greater majority of the respondents (90.7%) were male. Their number of years of work experience ranged between one and 58 years, with the mean being 24.05 years. The mean number of years of education was 17.25 years, with 267 respondents (66.9%) possessing a bachelor's degree, and the remaining possessing a master's (24%) or doctorate (9%). Approximately 73% of the sample held a bachelor's degree in forest management, and 52.6% of the sample had acquired their bachelor's degree in Oregon, Washington, or California. Respondents were bimodal with regard to the population of the community in which they resided. Approximately 43% of the sample came from cities of 20,000 people or less, while 29.3% of the sample came from communities with populations which exceeded 90,000 people.

Objective One:

The first objective of this study was to determine the importance that professional foresters placed on incorporating the concept of forestry education in the Oregon public school curriculum. The respondents believed strongly (6.66 on a Likert-type scale of 1 to 9) that forestry education should be infused into Oregon's public school curricula (Table 1 of Appendix C). At the same time, the respondents believed that Oregon's public school system was not adequately (3.13) educating students about environmental issues and how the practice of forestry relates to those issues. The respondents were very consistent in their responses to the questions that affected this particular objective.

Objective Two:

The second objective of this study was to assess the opinions of professional foresters about involvement of their respective agencies in the Oregon public school system. In Table 2 it was observed that respondents believed strongly (6.52) that professional foresters/timber industry must increase their involvement in promoting forestry education in the public school system. Respondents believed that this increased involvement must occur both in their local community (6.92), as well as across the state (7.14). Respondents believed that their industry should be investing more money in educational materials (6.45), as well as in developing more educational partnerships (7.34). However, when it came to committing their own firm/agency in providing cooperative work experiences for students or in providing internship opportunities for teachers, they rated these items much lower (5.93 and 5.33, respectively). The variation in responses for these two items was notably greater than for the other items in Table 2. Finally, respondents indicated that the record of involvement of the timber industry in forestry education either at the local level (3.82), or on a state-wide scale (3.64), was rather mediocre to poor.

Objective Three:

The third objective of this study was to determine the value professional foresters placed on selected units of forestry instruction to be implemented at the secondary level. As noted in Chapter III, the third portion of the survey instrument was designed to accomplish this third objective. Fifty-four units of instruction were divided among five instructional areas: forest ecology, forest management, forest engineering, forest harvesting, and milling, manufacturing, and services. An overall mean was computed for all five areas by averaging the sum of the unit means under each area. This was done for each of three curricula that were being examined: all high school students, college-bound forestry students, and forestry job-oriented students.

As an instructional area, forest ecology was ranked the highest as to being necessary for all high school students (Table 3). However, its rating was only moderate (4.73) in nature. Forest ecology was also rated as being of "much" importance (6.18) for high school students who wished to pursue college forestry programs. Respondents believed that each of the other four areas were of "some" importance as well. It was believed by members of the sample that forestry job-oriented students needed "much" training in the areas of

forest ecology (6.36), forest management (6.12), forest engineering (5.96), and forest harvesting (5.97). While the respondents believed that instructional units under the area of milling, manufacturing, and services were of "some" importance, this area was ranked the lowest of the five.

Tabling the ranked order of all instructional units, regardless of their instructional area, was used as a second method of analysis in satisfying objective three. Means and standard deviations for all units studied are presented in Tables 7 to 9 (Appendix C). In Table 4, it was observed that only three instructional units were rated as being of "much" value in a curriculum for all high school students: current environmental issues, first aid and CPR training, and stewardship of natural resources. One of these three was from the forest ecology instructional area. It was interesting to note that seven of the eight instructional units which were rated by respondents as to being of "some" value were also from the forest ecology instructional area.

With regard to college-bound forestry students, it was observed that one unit of instruction, current environmental issues, was rated as being of "very much" value in the curriculum (Table 5). Additionally, 11 other units of instruction were rated by the respondents as being of "much" value in the curriculum. Six of these 11 were again from the forest ecology instructional area.

It was observed in Table 6 that first aid and CPR training was the only instructional unit to be rated as being of "very much" value in the job-oriented curriculum. However, 29 units of instruction were rated as being of "much" value. These included nine of the 11 units under forest ecology, six of the 11 units under forest management, seven of the 11 units under forest engineering, six of the 12 units under forest harvesting, and one of the nine units under milling, manufacturing, and services. It is clear from this table that while forest ecology once again proved to be very important to this overall curriculum, it was not exclusively so, as was the case in the other two curricula.

Major findings as they pertained to the stated objectives were as follows:

1. Respondents believed that forestry education should be infused into Oregon's public school curricula.

2. Respondents believed that Oregon's public school system was not adequately educating students about

environmental issues, and how the practice of forestry relates to those issues.

3. Respondents believed that professional foresters/ timber industry must increase their involvement in promoting forestry education in the public school system, and that this involvement must occur both in their local community as well as across the state.

4. Respondents indicated that the record of involvement of the timber industry in forestry education either at the local level or on a state-wide scale was poor.

5. Respondents indicated that priority should be given to units of instruction which address forest ecology or forest management. This was the case for all three student audiences examined: all high school students, college-bound forestry students, and job-oriented forestry students.

Respondent Characteristics and Their Effect on the Findings:

After having met the objectives of the study, the researcher believed that it would be valuable to examine the effects of five respondent characteristics on the findings of the study as said findings related to the aforementioned objectives. Respondent characteristics which were analyzed included: employment status, job classification, gender, years of work experience, and highest degree held. In analyses where more than two levels of the characteristic were examined, the results of two post hoc multiple mean comparison tests were considered. These were the Scheffé test and the Duncan test. In cases where a one-way analysis of variance statistic (F) proved to be statistically significant, the Scheffé multiple mean comparison test (alpha=.05) was always the first choice as far as a tool to determine where the differences occurred. If, however, the Scheffé test was unable (due to its rigorous nature) to distinguish between differing means, the Duncan multiple mean comparison test (alpha=.05) was employed.

The survey questions were tabled exactly as they appeared in the instrument. The content of the questions are presented as statements in this narrative, and are referred to as "items."

Major findings concerning various demographic considerations were as follows:

6. Retired foresters tended to rate the value of various curriculum areas higher than did working foresters when the curriculum was designed for students who planned to pursue forestry as a possible career.

7. Industry foresters consistently rated the importance of forestry education in Oregon public schools higher than did their government counterparts.

8. Industry foresters tended to rate most forestry education instructional areas higher than did university foresters, regardless of the intended student audience.

9. There was virtually no difference in the values and perceptions held by respondents based upon gender.

10. As the number of years of work experience held by foresters increased, the value that they placed on any given category of forestry instruction tended to decrease.

11. Doctoral degree holding foresters tended to rate the importance of forestry education in Oregon schools lower than did bachelor's degree holding foresters.

12. Doctoral degree holding foresters consistently rated the value of forestry curriculum lower than did bachelor's degree holding foresters, when the curriculum was applied to students pursuing possible careers in forestry.

DISCUSSION & SUMMARY

By virtue of the fact that the Oregon Department of Education sponsored two separate curriculum investigations into vocational forestry education (Curriculum Guide for Forest Products, 1972; Subject Matter Update 1986-87: Forestry/Forest Products, 1985), it seems reasonable that they saw some value in forestry education, at least at the vocational level. Respondents in this study seemed to believe rather strongly that forestry education should be occurring at most grade levels in the public school system; particularly at the secondary level. The technical committee involved in the Subject Matter Update 1986-87: Forestry/ Forest Products recommended that academic disciplines should be incorporating forestry education into their respective areas of instruction (ODE, 1985). Respondents also indicated that some type of forestry education curriculum should be required in all Oregon school districts, and that vocational forestry programs should be operating in the high school of communities where the timber industry is a significant employer.

Members of the sample believed that the Oregon public school system had not done an effective job in instructing Oregon's youth about the importance of the practice of forestry in the state. Respondents did not believe that current high school graduates had been informed well enough with regard to forestry practices so that they could make intelligent decisions about environmental issues that might come up as ballot measures in Oregon elections. While the ODE has historically supported the concept of vocational forestry education, it appears that there has not been much emphasis given to programs which would serve the general, nonvocational forestry student in the public high schools.

The technical committee involved in the aforementioned 1985 study suggested that forestry instructors should make greater use of industry media (e.g., trade journals, audio-visual materials, field trips, and the like) in their programs, as well as make greater use of industry personnel as lecturers and discussion leaders. This recommendation implies that this technical committee, made up of various forest industry personnel, must have believed that their industry would be amiable to participating in public education at some level. This study indicated that professional foresters still believe that they should be involved; in fact, more so than they have been in the past. As a group, the respondents believed that the timber industry must greatly improve its efforts in promoting forestry education both at the local level, as well as at the state level. They indicated that

elements of the forest industry should become involved in developing local educational partnerships, and should invest more money in the development of educational materials to be included in the public school curricula. In attempting to ascertain their degree of commitment on a personal level, the strength of their responses dropped. Respondents believed strongly that the timber industry has not been as involved in forestry education as it should have been, both at the local and state-wide levels.

The Curriculum Guide for Forest Products (OBE, 1972) provided the first glimpse of what vocational forestry education in Oregon might include in the way of content. This guide placed a great deal of its instructional emphasis on the milling/processing components of the forest industry. Schoenborn (1976) recommended that the ODE re-evaluate the vocational forestry core curriculum as it was revised and published again in 1974. Subject Matter Update 1986-1987: Forestry/Forest Products (ODE, 1985) significantly de-emphasized milling/processing, and suggested a curriculum which was more in line with the findings of Schoenborn.

Schoenborn (1976) noted that there was a need for vocational forestry programs to give priority to competencies which related to first aid and safety. Subject Matter Update 1986-1987: Forestry/Forest Products (ODE, 1985) suggested that curriculum should stress preventative industrial safety measures. Respondents involved in this research effort further corroborate the findings of these aforementioned studies relative to the value of first aid and occupational safety being necessary in a vocational forestry education curriculum. Respondents rated these units first and sixth respectively out of 54 selected units of instruction.

Subject Matter Update 1986-1987: Forestry/Forest Products (ODE, 1985) also suggested that instruction be included on forest practices laws. Respondents in this study indicated that this unit of instruction was important by ranking it ninth out of 54 units. Other top ranking units of instruction found in this study fell in line with many of those which ranked high in both Schoenborn's 1976 study, and those addressed in Subject Matter Update 1986-1987: Forestry/ Forest Products.

Where this study significantly differs from those already mentioned is in the area of environmental and/or ecological units of instruction. The researcher noted that respondents usually placed these curriculum units immediately below that of first aid. The emphasis on the inclusion of environmental and ecological educational units is probably driven by the

emerging awareness of society with regard to ecological problems, as well as the continuing old growth/spotted owl controversy which has been in the news since the mid to late 1980s. Among the 29 units of instruction which respondents indicated were of "much" value in a job-oriented forestry curriculum, 9 of the 11 units listed in the forest ecology category of the survey instrument were included therein. When examining rated units of instruction for all three curricula studied (all high school students, college-bound forestry students, and job-oriented forestry students), foresters consistently rated the curriculum categories forest ecology and forest management as being of the most relative value to the students.

Retired foresters tended to rate items concerning a state-wide forestry education curriculum different than one may have expected. A possible explanation for this phenomenon might be that retired foresters may not be as aware of what is happening in the profession on a day-to-day basis, or that they probably do not have school-age children.

Industry foresters consistently rated higher the importance of, and the emphasis on, forestry education in Oregon public schools than did their government colleagues. One explanation for this observation may be that industrial forestry, by its very definition, is in the business of managing forests for profit. Government foresters are not nearly so much compelled to manage forests for this reason. Again, the old growth/spotted owl controversy has placed the industry in a precarious economic position, and they may have come to a point in believing that public education will be of great long-term benefit. It was not surprising to see that industry foresters rated higher the need for more involvement on the part of their respective agencies with regard to promoting forestry education. However, industry foresters appeared to be less willing than government foresters to provide work experiences for either secondary forestry students or their instructors.

With regard to rating the various curriculum categories, statistically significant differences were most often noted between industry foresters and university foresters, with university foresters rating the value of the instructional units lower than their industry counterparts. Schoenborn (1976) noted a similar phenomena with Oregon and Washington community college instructors. These instructors indicated that forestry competencies were not needed by high school graduates, and that it was their job to provide interested students with the necessary skills.

The researcher noted during this study that gender made little to no difference in how respondents rated the various questionnaire items.

The number of years of work experience that the respondents possessed made little to no difference in how they rated the importance of, and emphasis on, forestry education in Oregon's public schools, nor did it make any difference relative to their opinions concerning the involvement of their respective agencies in public school educational programs. When it came to how the respondents rated the various curriculum categories, it was noted that as the number of years of work experience increased, the value given to the curriculum category by the respondents tended to decrease. This might be explained in that younger foresters are mingled with older foresters in almost every work environment. "Shop talk" about public education might very well center around the importance of forestry education, or the involvement of forestry agencies, but may not include discussions of what specific units should constitute various forestry education curricula. Foresters, regardless of years of work experience, might be homogenous relative to their opinions about the former, but possess very divergent opinions about the latter, because younger foresters had not been influenced by the opinions of older foresters, or visa versa. In other words, all respondents had their own perceptions with regard to the value of various curriculum units.

Doctoral degree holding foresters consistently rated items concerning the importance of, and emphasis on, forestry education in Oregon public schools lower than did bachelor's degree holding foresters. This relationship also existed in terms of the respondents' opinions concerning the involvement of their respective agencies in public school educational programs. Part of this relationship might be explained due to the fact that half of the doctoral degree holding foresters were also university foresters. Another possible explanation might be that, in general, doctoral degree holding foresters are further removed from the practitioner level than are the bachelor's degree holding foresters, and do not see the benefits that may be gained through greater public instruction about forestry. Concerning the three forestry curricula, doctoral degree holding foresters consistently rated the various instructional categories lower than did their bachelor's degree holding counterparts.

Brock (personal communication, May 17, 1991) noted that Oregon was the only state to his knowledge to have a state-wide forestry/forest products cluster. From all indications in this study, the continued existence of vocational forestry

programs in Oregon should be encouraged by the ODE, by all forestry firms and agencies, and by local communities.

Multanen (personal communication, July 9, 1991) noted that vocational forestry/forest products programs came into being because "agri-forestry programs were almost exclusively limited to growing and management" of trees and forests. It was believed that these programs did not adequately cover topics relative to engineering, harvesting, milling and processing, and the like. However, respondents in this study have clearly indicated that instructional units related to forest ecology and forest management should take precedence to those latter units mentioned above. When vocational forestry programs came into existence in the early 1970s, vocational agriculture programs began to drop forestry (in any kind of detail) from their curricula. Given the findings of this study, this trend is regrettable. While the evidence suggests that vocational forestry programs have a definite place in Oregon's public education system, vocational agriculture has no less of a place of value in terms of disseminating forestry knowledge, skills, and attitudes. The value of teaching about forestry through agriculture programs is further illustrated when one notes that there are far more agriculture programs operating in Oregon than there are forestry programs.

In terms of answering the rhetorical question of "What do I teach?" the following might prove to be a helpful guide. Based upon the findings of this study, it is the contention of the researcher that all Oregon school districts should be providing a basic level of instruction to all of their students with regard to forestry education. Forestry is one of the economic pillars of Oregon's economy. It is a travesty if an Oregon high school graduate cannot discuss and/or demonstrate some kind of basic knowledge concerning one of his/her state's economic mainstays. A basic curriculum for all high school students should emphasize units of instruction revolving around and supporting the study of forest ecology and forest management. Selected units of instruction might include the following:

- Current environmental issues
- Stewardship of natural resources
- Ecosystems and interactions
- Multiple-use forest management
- Oregon Forest Practices laws
- Natural forest succession
- Forest product markets
- Fire prevention

Some may argue that many of these units are being covered by high school biological science programs. If school districts depend solely upon their science departments for presenting these units of instruction, they may be failing to meet the intent of this recommendation. Many science teachers appear to be biocentric in their philosophy of natural resources, and fail to impress upon the students the importance of natural resources for humanity's existence. It is important that students receive balanced emphasis on these subjects from instructors who tend toward a more anthropocentric philosophical approach. In this case, it may be valuable for students to complete at least one one-semester course taught by either a forestry/forest products instructor or an agriculture instructor. Balance (biocentric vs. anthropocentric) in teaching these units is paramount.

Based upon the findings of this study, the researcher believes that the needs of college-bound students would best be met by enrolling them in either a vocational forestry program or the forestry/natural resources portion of an agricultural science and technology program. Respondents indicated that the instructional unit needs of college-bound students can be met in a forestry/forest products program. These programs are usually designed to meet the needs of both college-bound students and job-oriented students. This recommendation is then appropriate for job-oriented students as well. The following should be considered a minimum program of study:

- First aid & CPR training
- Environmental issues
- Natural resources stewardship
- Multiple-use practices
- Tree & shrub ID
- Occupational safety & health
- Topographic map reading
- Wildfire prevention
- Forest practices laws
- Chain saw operation
- Reforestation methods
- Ecosystems & interactions
- Natural forest succession
- Planimetric map reading
- Basic map making
- Timber cruising
- Wildfire control
- Forest tool ID
- Cable logging systems
- Tractor logging methods
- Fire ecology
- Thinning effects
- Watershed quality
- Forest land surveying
- Timber felling & bucking
- Slash burning
- Log scaling
- Equipment operation
- Vegetative control
- Computer applications

Upon completion of this study the researcher noted the following conclusions:

1. Professional foresters in Oregon do believe that forestry education is important, and should be infused into the public school curriculum.

2. Professional foresters do not believe that Oregon has done a sufficient job in instructing Oregon's youth about the importance of the practice of forestry, nor do they believe that Oregon public school graduates are well enough informed to vote intelligently on potential environmental legislation placed on public ballots.

3. Professional foresters do believe that they collectively must greatly improve their efforts in promoting forestry education, developing educational partnerships, and investing more money in the development of educational materials for use in public schools.

4. Professional foresters do not believe that the timber industry has been sufficiently involved in past forestry education efforts.

5. A balanced curriculum concerning current environmental issues and stewardship of natural resources is necessary for all high school students.

6. First aid and safety training is still regarded as a high educational priority by professional foresters.

7. Industry foresters more strongly believe than do government foresters in the importance of, and their involvement in, forestry education in Oregon public schools.

8. Industry foresters more strongly believe in the value of various forestry instructional areas at the secondary level than do university foresters.

9. As their years of work experience increases, professional foresters tend to decrease the rating that they give to the value of various forestry instructional areas at the secondary level.

10. Bachelor's degree holding foresters more strongly believe than do their doctoral counterparts in the importance of, and their involvement in, forestry education in Oregon public schools.

11. Bachelor's degree holding foresters more strongly believe than do their doctoral counterparts in the value of various forestry instructional areas for both college-bound and job-oriented forestry students.

12. Given the instructional impetus towards forest ecology and forest management as indicated by this study, and given the historical role of agri-forestry programs, high school agriculture programs could once again contribute significantly to promoting forestry education in Oregon.

Based upon the findings and conclusions of this study, the researcher recommends the following:

1. The Oregon Department of Education might consider a state-wide policy that all Oregon school districts offer a balanced curriculum which addresses environmental issues and stewardship of natural resources.

2. The Oregon Department of Education should encourage the promotion and sustained support of vocational forestry/ natural resources programs at least in communities where natural resources provide the major means of employment.

3. Timber industry associations should become more proactive in their involvement in promoting and supporting forestry education via, but not limited to, the formation of educational partnerships, the development of quality educational materials, teacher internships, student work experience opportunities, etc.

4. Forestry/natural resources programs should maintain a priority emphasis on first aid and occupational safety instruction.

5. Forestry/natural resources programs should build within their programs strong curricular components in the areas of ecology, environmental issues, stewardship of natural resources, and multiple-use forest management.

6. University forestry programs should develop stronger working and educational relationships with high school forestry/natural resources programs.

7. Given the instructional impetus towards forest ecology and forest management in forestry education as indicated by this study, high school agricultural science and technology programs should be structured in such a way so as to include a significant forestry/natural resources component.

Based upon the findings and conclusions of this study, the researcher recommends the following additional research:

1. This same or similar research should be conducted on other populations of stakeholders such as members of a

representative preservationist organization, citizens in timber dependent communities, members of woodworking associations, various appropriate instructional disciplines, etc.

2. Research should be conducted on second semester high school seniors to evaluate their perceptions, values, and knowledge as these pertain to forestry education to ascertain how much they truly know about environmental issues, the science of forestry, rationale for various forestry practices, the true impacts of various practices, and what it is that they expect from the forests in their state.

3. Research should be conducted on the average Oregon registered voter concerning the same items mentioned above.

4. Research should be conducted comparing and contrasting the aforementioned variables between second semester high school seniors who have not been involved in a vocational forestry or agricultural science and technology program that includes forestry, and those students who have.

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Appendix A: Survey Instrument

IOWA STATE UNIVERSITY
of Science and Technology

THE IMPORTANCE OF FORESTRY EDUCATION IN OREGON

For questions 1-18, please fill in the blank with a number between 1 and 9 which most closely reflects your level of agreement with the question posed. When responding to the items below, please use the following scale:

1	3	5	7	9
NONE	LITTLE	SOME	MUCH	VERY MUCH

EXAMPLE: 4 To what degree do you believe that public educators have instilled in their students the importance of forest products in the daily lives of human beings?

PART I - FOREST EDUCATION PERCEPTIONS:

TO WHAT LEVEL DO YOU AGREE THAT:

1. ___ Teaching about forestry is important at most grade levels in the public school system?

2. ___ Education about forestry practices should be taught in the public high school curriculum?

3. ___ A curriculum concerning forestry education should be required in all Oregon school districts?

4. ___ Vocational forestry should be a part of most high school vocational/technology education departments in communities where the timber industry is a significant employer?

5. ___ Most public educators in your community favorably view professional foresters?

6. ___ Your local public educators are negative toward the practice of applied forestry as a whole?

7. ___ The news media has positively influenced the perceptions of public school teachers in your community with regard to the practice of forestry?

8. ___ The Oregon public school system, as a whole, has done a good job in instructing Oregon's youth about the importance of the practice of forestry?

PART II - FOREST EDUCATION SOLUTIONS:

TO WHAT LEVEL DO YOU AGREE THAT:

9. ___ Your local timber industry has done a good job in past years with regard to being involved with forestry education in your community's public high school(s)?

10. ___ The timber industry, as a whole, has done a good job in past years with regard to being involved in forestry education state wide at the high school level?

11. ___ Your local timber industry must greatly improve its efforts in promoting forestry education in your community's public schools?

(CONTINUE ON NEXT PAGE)

1	3	5	7	9
NONE	LITTLE	SOME	MUCH	VERY MUCH

12. ___ The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools?

13. ___ Professional foresters/timber industry should become involved in developing educational partnerships with local schools?

14. ___ Non-timber industry resources have been involved in teaching forestry in your local public schools?

15. ___ Your firm/agency would be willing to provide cooperative work experience for vocational forestry/ natural resources students in order for them to apply and reinforce their skills?

16. ___ Your firm/agency would be willing to provide internships for forestry/natural resources teachers in order for them to provide better instruction to their students?

17. ___ Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula?

18. ___ Current high school graduates have been informed well enough with regard to forestry practices, that they can make intelligent decisions about environmental issues that might come up as ballot measures in Oregon elections?

PART III - HIGH SCHOOL INSTRUCTIONAL UNITS:

Questions 19 to 72 of this survey represent a list of potential curriculum topics which have been divided under five broad categories of forestry instruction. You will notice that there are three blanks (labeled A, B, & C) **IN FRONT** of the potential instructional topic. You are to identify your response (using the below scale) as to the importance you would place on its inclusion as part of instruction targeted for **(A) ALL high school students** regardless of career interest, **(B) high school forestry COLLEGE-BOUND students**, and **(C) high school forestry JOB-ORIENTED students**. In each blank, please respond to the curriculum unit by writing a number between 1 and 9. In all three situations, assume that **YOU** have been placed in charge of designing the curricula.

When responding to the items below, please use the following scale.

1	3	5	7	9
NO VALUE	LITTLE VALUE	SOME VALUE	MUCH VALUE	VERY MUCH VALUE

1 - I believe that this unit is of no value.
3 - I believe that this unit is of little value.
5 - I believe that this unit is of some value.
7 - I believe that this unit is of much value.
9 - I believe that this unit is of very much value. A B C

Example: 0. 1 2 7 Basal Pruning Trees

I BELIEVE THIS UNIT IS OF ___ VALUE TO:

A - ALL HIGH SCHOOL STUDENTS.
B - COLLEGE-BOUND STUDENTS.
C - JOB-OREINTED STUDENTS.

A B C

A - ALL HIGH SCHOOL STUDENTS.
B - COLLEGE-BOUND STUDENTS.
C - JOB-OREINTED STUDENTS.

A B C

FOREST ECOLOGY:

19. ___ ___ ___ Tree & Shrub Identification
20. ___ ___ ___ Soil Formation & Mechanics
21. ___ ___ ___ Natural Forest Succession
22. ___ ___ ___ Fish & Wildlife Identification
23. ___ ___ ___ Air Shed Quality
24. ___ ___ ___ Water Shed Quality
25. ___ ___ ___ Current Environmental Issues
26. ___ ___ ___ Ecosystems and Interactions
27. ___ ___ ___ Fire Ecology (Role Of Fire)
28. ___ ___ ___ Wild Fire Control Activities
29. ___ ___ ___ Wild Fire Prevention

FOREST MANAGEMENT:

30. ___ ___ ___ Timber Cruising
31. ___ ___ ___ Forest Pathology
32. ___ ___ ___ Stream Habitat Enhancement
33. ___ ___ ___ Wildlife Habitat Enhancement
34. ___ ___ ___ Seedling Production Processes
35. ___ ___ ___ Reforestation Methods
36. ___ ___ ___ Vegetative Control in Reprod
37. ___ ___ ___ Animal Pest Control in Reprod
38. ___ ___ ___ Thinning Effects on Stands
39. ___ ___ ___ Multiple-Use Practices
40. ___ ___ ___ Stewardship of Nat. Resources

FOREST ENGINEERING:

41. ___ ___ ___ Forest Land Surveying
42. ___ ___ ___ Basic Map Making Skills
43. ___ ___ ___ Forest Tool Identification
44. ___ ___ ___ Tractor Logging Methods
45. ___ ___ ___ Cable Logging Methods/Systems
46. ___ ___ ___ Planimetric Map Reading
47. ___ ___ ___ Topographic Map Reading
48. ___ ___ ___ Skyline Payload Analysis
49. ___ ___ ___ Computer Applications & Modeling
50. ___ ___ ___ Logging Plan Development
51. ___ ___ ___ Road Construction Principles

FOREST HARVESTING:

52. ___ ___ ___ High Climbing Trees (w/ Spurs)
53. ___ ___ ___ Chain Saw Operation & Safety
54. ___ ___ ___ First Aid & CPR Training
55. ___ ___ ___ Forest Practices Laws
56. ___ ___ ___ Rigging of Tail/Support Trees
57. ___ ___ ___ Timber Felling & Bucking
58. ___ ___ ___ Logging Equipment Operation
59. ___ ___ ___ Radio Communications Skills
60. ___ ___ ___ Basic Road Construction
61. ___ ___ ___ Basic Choker Setting
62. ___ ___ ___ Slash Burning
63. ___ ___ ___ Occupational Safety & Health

MILLING, MANUFACTURING, & SERVICES:

64. ___ ___ ___ Forest Product Markets
65. ___ ___ ___ Urban Forestry Skills
66. ___ ___ ___ Christmas Tree Production
67. ___ ___ ___ Paper Manufacturing Processes
68. ___ ___ ___ Lumber Sawing/Milling Processes
69. ___ ___ ___ Lamination Processes & Products
70. ___ ___ ___ Forest-By-Products
71. ___ ___ ___ Log Scaling
72. ___ ___ ___ Value-Added Products

(CONTINUE ON NEXT PAGE)

PART IV - DEMOGRAPHIC INFORMATION:

73. As a forestry professional, which branch of forestry do you devote the majority of your time? CIRCLE ONLY ONE NUMBER PLEASE!

1 - Industry: Forest Management
2 - Industry: Forest Engineering
3 - Industry: Milling/Processing
4 - Industry: Logging Contractor
5 - Industry: Other _____
6 - Government: Forest Management
7 - Government: Forest Engineering
8 - Government: Forest Protection
9 - Government: Other _____
10 - University Forester
11 - Retired

74. Your gender? ___ Male ___ Female

75. Number of years you have worked in the forestry profession: _____

76. Total number of years of schooling you have completed (Elementary, Secondary, College)? _____

77. What is the highest educational level you have attained?

1 - Bachelor's
2 - Master's
3 - Doctorate

78. Please list the Major that you received your B.S. degree in, and the institution that you received it from:

_____ _____

79. Have you ever taught forestry?

___ Yes ___ No

80. If so, circle those which apply?

1 - University
2 - Comm. College
3 - Public School
4 - Extension
4 - Employee Education
6 - Consultant
7 - Education Specialist
8 - Other _____

81. Your community's population: _____

THANK YOU!

Thank you very much for taking your valuable time to complete this questionnaire. The below code number is simply to record the fact that you have responded, and further promptings are not needed. Nothing about your personal identity will be revealed in that only group summary data is reported. If you would like a summary of this study, please check the blank indicating so.

Questionnaire Number: _____

Please send me a summary of this study: _____ YES _____ NO

Upon completion of this survey questionnaire, please place it in the enclosed self-addressed business reply mail envelope, and send it to:

GRANT TIPTON
AGRICULTURAL EDUCATION & STUDIES
223-A CURTISS HALL
IOWA STATE UNIVERSITY
AMES, IOWA 50011

Appendix B: Respondent demographics

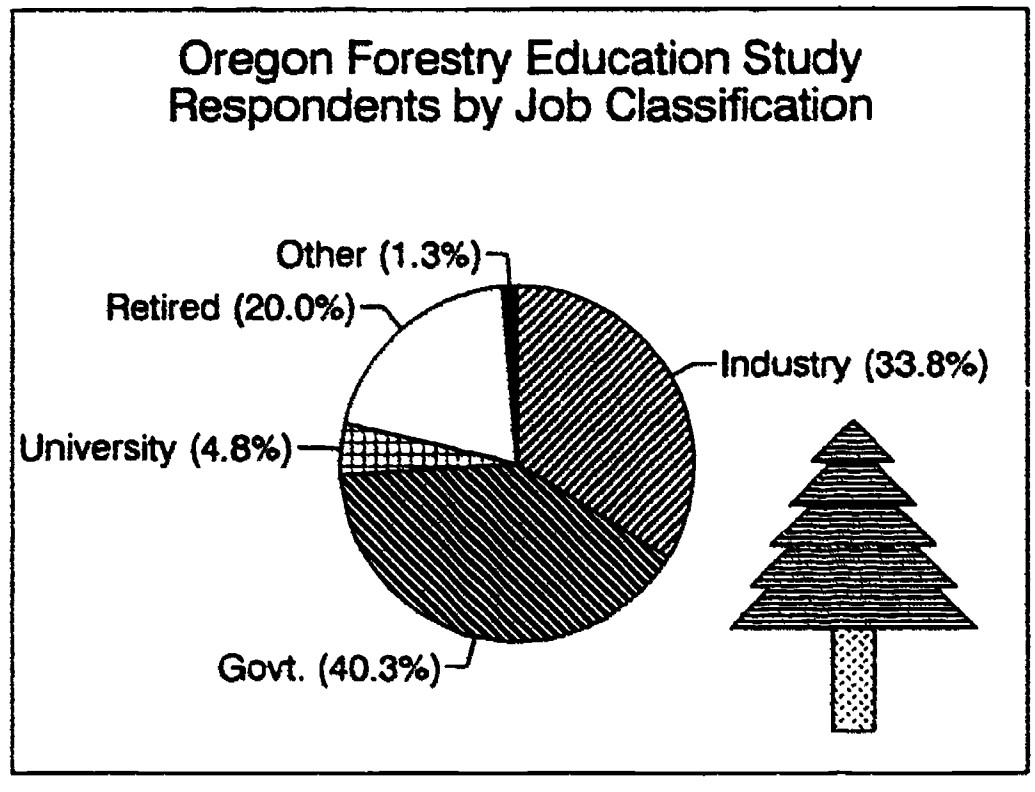

Figure 1

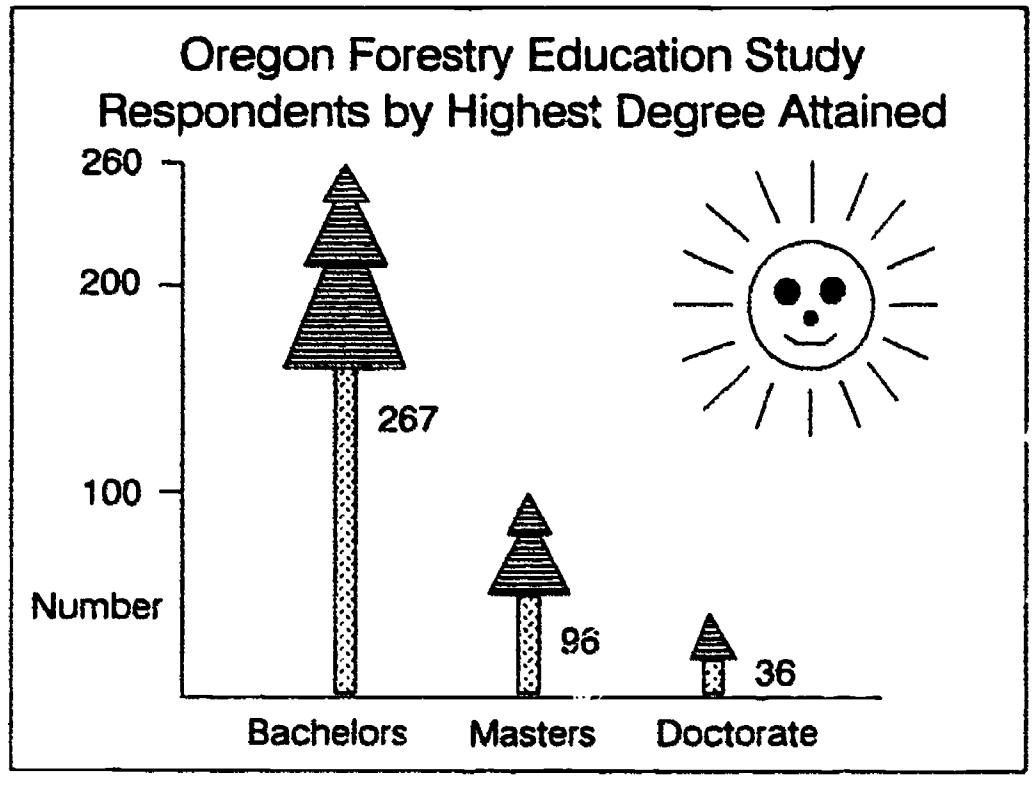

Figure 2

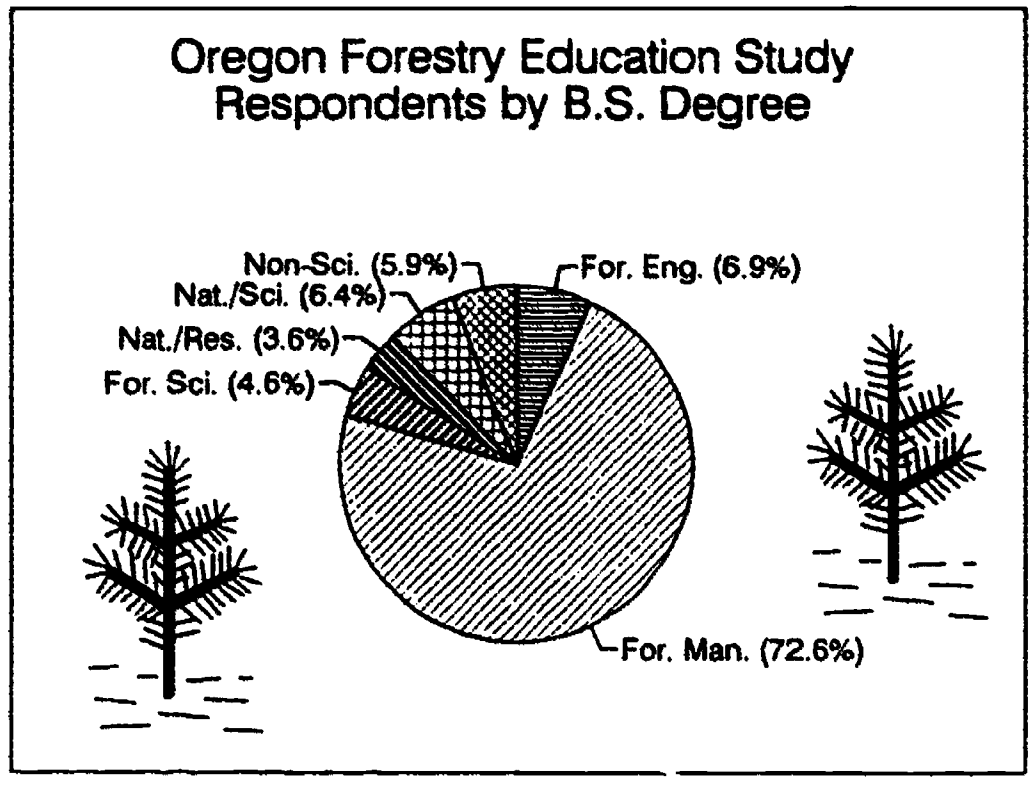

Figure 3

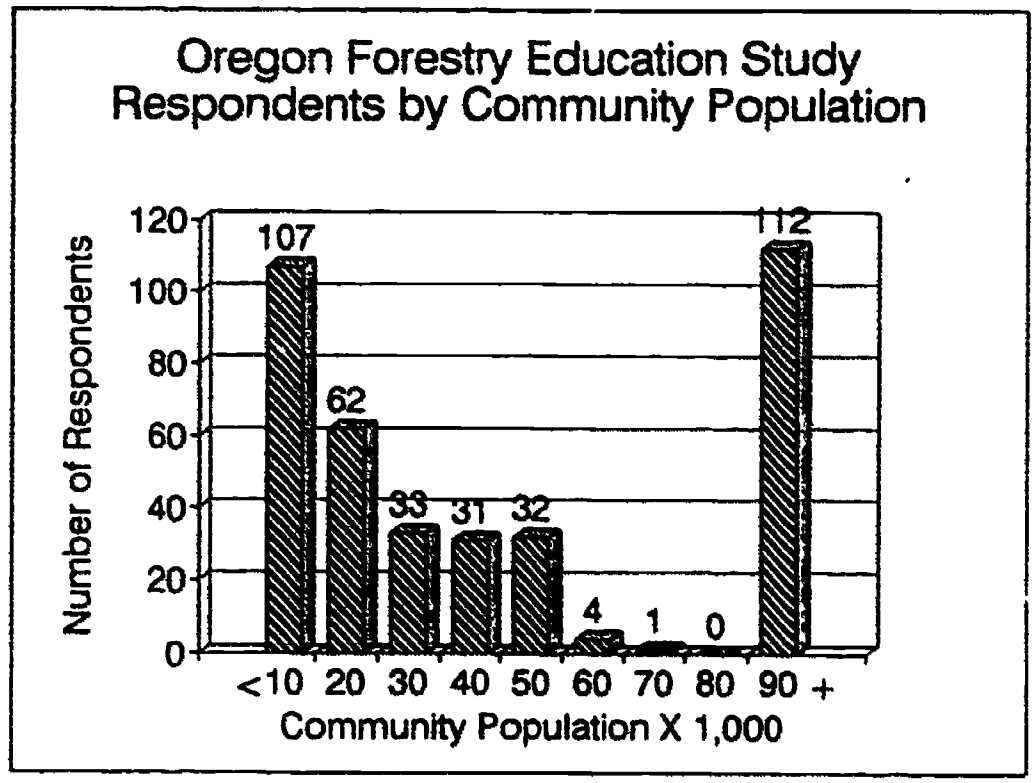

Figure 4

Appendix C: Findings Tables

Table 1. Importance of and current emphasis on forestry education in Oregon public schools

Survey question	N	Mean[a]	SD[b]
To what level do you agree that:			
Teaching about forestry is important at most grade levels in the public school system?	399	6.79	1.97
Education about forestry practices should be taught in the public high school curriculum?	399	6.96	1.76
A curriculum concerning forestry education should be required in all Oregon school districts?	399	6.13	2.32
Vocational forestry should be a part of most high school vocational technology education departments in communities where the timber industry is a significant employer?	400	6.74	1.92
Overall importance mean	399	6.66	1.99
The Oregon public school system, as a whole, has done a good job in instructing Oregon's youth about the importance of the practice of forestry?	391	3.42	1.40

[a]Scale values: 1.00-2.60 = None
2.61-4.20 = Little
4.21-5.80 = Some
5.81-7.40 = Much
7.41-9.00 = Very much.

[b]Standard deviation.

Table 1. Continued

Survey question	N	Mean	SD
Current high school graduates have been informed well enough with regard to forestry practices, that they can make intelligent decisions about environmental issues that might come up as ballot measures in Oregon elections?	393	2.84	1.32
Overall current emphasis mean	392	3.13	1.36

Table 2. Opinions of foresters about the involvement of their agencies in public school educational programs

Survey question	N	Mean[a]	SD[b]
To what level do you agree that:			
Your local timber industry must greatly improve its efforts in promoting forestry education in your community's public schools?	391	6.92	2.06
The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools?	395	7.14	1.89
Professional foresters/timber industry should become involved in developing educational partnerships with local schools?	397	7.34	1.68
Your firm/agency would be willing to provide cooperative work experience for vocational forestry/ natural resources students in order for them to apply and reinforce their skills?	344	5.93	2.25
Your firm/agency would be willing to provide internships for forestry/ natural resources teachers in order for them to provide better instruction to their students?	333	5.33	2.44

[a]Scale values: 1.00-2.60 = None
2.61-4.20 = Little
4.21-5.80 = Some
5.81-7.40 = Much
7.41-9.00 = Very much.

[b]Standard deviation.

Table 2. Continued

Survey question	N	Mean	SD
Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula?	395	6.45	1.91
Overall involvement mean	376	6.52	2.04
Your local timber industry has done a good job in past years with regard to being involved with forestry education in your community's public high school(s)?	394	3.82	1.54
The timber industry, as a whole, has done a good job in past years with regard to being involved in forestry education state-wide at the high school level?	392	3.64	1.37
Overall past mean	393	3.73	1.45

Table 3. The value foresters place on five broad areas of forestry instruction for use in three curricula

Area of instruction[a]		All students	College-bound students	Job-oriented students
Forest ecology	M[b]	4.73	6.18	6.36
	SD[c]	1.47	1.54	1.46
	R[d]	1	1	1
Forest management		3.50	5.45	6.12
		1.45	1.91	1.68
		2	2	2
Forest engineering		2.56	4.86	5.96
		1.26	2.09	1.89
		5	3	4
Forest harvesting		2.73	4.36	5.96
		1.30	1.90	1.96
		4	5	3
Mill, manufacturing, and services		2.81	4.50	5.15
		1.55	1.93	1.81
		3	4	5

[a]The N for each group fell between 392 and 400.

[b]Mean, scale values: 1.00-2.60 = None
2.61-4.20 = Little
4.21-5.80 = Some
5.81-7.40 = Much
7.41-9.00 = Very much.

[c]Standard deviation.

[d]Ranked order.

Table 4. Instructional units perceived by foresters to be of much or more importance for all high school students

R[a]	Instructional unit	CC[b]	N	Mean[c]	SD[d]
1	Current environmental issues	EC	400	6.67	1.93
2	First aid and CPR training	FH	400	6.30	2.55
3	Stewardship of natural resources	FM	398	6.04	2.28

[a]Ranked order.

[b]Curriculum category: EC = Forest ecology
FM = Forest management
FH = Forest harvesting.

[c]Scale values: 5.81-7.40 = Much
7.41-9.00 = Very much.

[d]Standard deviation.

Table 5. Instructional units perceived by foresters to be of much or more importance for college-bound forestry students

R[a]	Instructional unit	CC[b]	N	Mean[c]	SD[d]
1	Current environmental issues	EC	399	7.47	1.67
2	Stewardship of natural resources	FM	397	7.20	1.94
3	Ecosystems and interactions	EC	397	6.88	2.03
4	Multiple-use practices	FM	399	6.77	2.04
5	First aid and CPR training	FH	399	6.77	2.23
6	Natural forest succession	EC	399	6.70	1.98
7	Tree and shrub identification	EC	398	6.28	2.11
8	Watershed quality	EC	399	6.23	1.96
9	Fire ecology	EC	399	6.13	2.10
10	Wildfire prevention	EC	398	6.09	2.07
11	Forest practices laws	FH	397	5.98	2.49
12	Topographic map reading	FE	399	5.88	2.24

[a]Ranked order.

[b]Curriculum category: EC = Forest ecology
FM = Forest management
FE = Forest engineering
FH = Forest harvesting.

[c]Scale values: 5.81-7.40 = Much
7.41-9.00 = Very much.

[d]Standard deviation.

Table 6. Instructional units perceived by foresters to be of much or more importance for job-oriented forestry students

R[a]	Instructional unit	CC[b]	N	Mean[c]	SD[d]
1	First aid and CPR training	FH	400	7.43	1.99
2	Current environmental issues	EC	400	7.34	1.75
3	Stewardship of natural resources	FM	397	7.29	1.89
4	Multiple-use practices	FM	399	7.02	1.89
5	Tree and shrub identification	EC	399	6.93	1.86
6	Occupational safety and health	FH	398	6.91	2.09
7	Topographic map reading	FE	400	6.86	2.10
8	Wildfire prevention	EC	399	6.79	1.90
9	Forest practices laws	FH	400	6.75	2.13
10	Chain saw operation and safety	FH	398	6.67	2.26
11	Reforestation methods	FM	399	6.66	2.05
12	Ecosystems and interactions	EC	397	6.61	2.10
13	Natural forest succession	EC	400	6.58	2.00
14	Planimetric map reading	FE	400	6.52	2.22
15	Basic map making skills	FE	397	6.46	2.20
16	Timber cruising	FM	399	6.45	2.30
17	Wildfire control activities	EC	397	6.39	2.14
18	Forest tool identification	FE	396	6.31	2.38
19	Cable logging methods/ systems	FE	396	6.26	2.31
20	Tractor logging methods	FE	396	6.24	2.27
21	Fire ecology	EC	399	6.24	2.09
22	Thinning effects on stands	FM	399	6.20	2.06

[a]Ranked order.

[b]Curriculum category: EC = Forest ecology
FM = Forest management
FE = Forest engineering
FH = Forest harvesting
MM = Milling, manufacturing, and services.

[c]Scale values: 5.81-7.40 = Much
7.41-9.00 = Very much.

[d]Standard deviation.

Table 6. Continued

R	Instructional unit	CC	N	Mean	SD
23	Watershed quality	EC	400	6.18	1.93
24	Forest land surveying	FE	396	6.12	2.30
25	Timber felling and bucking	FH	399	6.01	2.44
26	Slash burning	FH	400	5.95	2.40
27	Log scaling	MM	398	5.91	2.36
28	Logging equipment operation	FH	399	5.89	2.55
29	Vegetative control in reproduction	FM	399	5.88	2.20
30	Fish and wildlife identification	EC	400	5.82	1.97

Table 7. The value that foresters place on selected units of forestry instruction for all high school students

R[a]	Instructional unit	N	Mean[b]	S.D.[c]
MUCH VALUE:				
1	Current environmental issues	400	6.67	1.93
2	First aid and CPR training	400	6.30	2.55
3	Stewardship of natural resources	398	6.04	2.28
SOME VALUE:				
4	Ecosystems and interactions	397	5.39	2.37
5	Multiple-use practices	400	5.36	2.29
6	Wildfire prevention	399	5.25	2.26
7	Natural forest succession	399	5.04	2.22
8	Watershed quality	400	4.87	2.03
9	Fire ecology	400	4.51	2.13
10	Air shed quality	400	4.51	2.03
11	Tree and shrub identification	399	4.48	1.94
LITTLE VALUE:				
12	Fish and wildlife identification	400	4.18	1.92
13	Forest practices laws	397	3.97	2.38
14	Occupational safety and health	396	3.93	2.61
15	Reforestation methods	400	3.83	2.13
16	Topographic map reading	399	3.82	2.16
17	Wildfire control activities	399	3.62	1.93
18	Wildlife habitat enhancement	400	3.55	1.87
19	Stream habitat enhancement	400	3.51	1.87
20	Soil formation and mechanics	397	3.50	1.85

[a]Ranked order.

[b]Scale values: 1.00-2.60=None
2.61-4.20=Little
4.21-5.80=Some
5.81-7.40=Much
7.41-9.00=Very much.

[c]Standard deviation.

Table 7. Continued

R	Instructional unit	N	Mean	S.D.
LITTLE VALUE: (Cont.)				
21	Planimetric map reading	398	3.47	2.16
22	Urban forestry skills	399	3.42	2.09
23	Forest product markets	398	3.26	2.06
24	Basic map making skills	399	3.26	2.07
25	Thinning effects on stands	400	3.24	1.97
26	Forest by-products	397	3.09	2.00
27	Vegetative control in reproduction	399	2.91	1.89
28	Paper manufacturing processes	397	2.87	1.86
29	Lumber sawing/milling processes	398	2.85	1.86
30	Value-added products	393	2.78	2.00
31	Chain saw operation and safety	397	2.77	1.95
32	Animal pest control in reproduction	400	2.71	1.69
33	Computer applications and modeling	395	2.68	2.09
NO (NONE) VALUE:				
34	Forest pathology	398	2.60	1.63
35	Seedling production processes	400	2.52	1.60
36	Lamination processes and products	395	2.50	1.79
37	Christmas tree production	397	2.42	1.64
38	Slash burning	396	2.40	1.87
39	Radio communications skills	395	2.35	1.76
40	Forest land surveying	397	2.33	1.60
41	Tractor logging methods	397	2.30	1.50
42	Cable logging methods/ systems	397	2.29	1.52
43	Road construction principles	397	2.26	1.59
44	Timber cruising	398	2.19	1.46
45	Forest tool identification	396	2.19	1.46
46	Basic road construction	395	2.07	1.51
47	Log scaling	395	2.02	1.48
48	Timber felling and bucking	395	1.97	1.50
49	Logging plan development	394	1.95	1.46
50	Logging equipment operation	394	1.81	1.42

Table 7. Continued

R	Instructional unit	N	Mean	S.D.
NO (NONE) VALUE: (Cont.)				
51	Rigging of tail/support trees	394	1.63	1.20
52	Basic choker setting	393	1.62	1.16
53	Skyline payload analysis	392	1.55	1.04
54	High climbing trees (w/spurs)	394	1.54	1.07

Table 8. The value that foresters place on selected units of forestry instruction for college-bound students

R[a]	Instructional unit	N	Mean[b]	S.D.[c]
VERY MUCH VALUE:				
1	Current environmental issues	399	7.47	1.67
MUCH VALUE:				
2	Stewardship of natural resources	397	7.20	1.94
3	Ecosystems and interactions	397	6.88	2.03
4	Multiple-use practices	399	6.77	2.04
5	First aid and CPR training	399	6.77	2.23
6	Natural forest succession	399	6.70	1.98
7	Tree and shrub identification	398	6.28	2.11
8	Watershed quality	399	6.23	1.96
9	Fire ecology	399	6.13	2.10
10	Wildfire prevention	398	6.09	2.07
11	Forest practices laws	397	5.98	2.49
12	Topographic map reading	399	5.88	2.24
SOME VALUE:				
13	Air shed quality	399	5.77	2.02
14	Reforestation methods	399	5.76	2.26
15	Soil formation and mechanics	396	5.59	2.14
16	Planimetric map reading	398	5.53	2.38
17	Fish and wildlife identification	398	[illegible]	2.07
18	Thinning effects on stands	399	5.49	2.39
19	Occupational safety and health	395	5.45	2.48
20	Basic map making skills	398	5.40	2.32

[a]Ranked order.

[b]Scale values: 1.00-2.60=None
2.61-4.20=Little
4.21-5.80=Some
5.81-7.40=Much
7.41-9.00=Very much.

[c]Standard deviation.

Table 8. Continued

R	Instructional unit	N	Mean	S.D.
SOME VALUE: (Cont.)				
21	Wildlife habitat enhancement	399	5.33	2.17
22	Wildfire control activities	397	5.32	2.13
23	Computer applications and modeling	395	5.27	2.71
24	Stream habitat enhancement	399	5.27	2.17
25	Forest product markets	396	5.20	2.34
26	Vegetative control in reproduction	399	5.04	2.39
27	Forest pathology	398	5.01	2.35
28	Urban forestry skills	397	4.88	2.18
29	Forest land surveying	397	4.84	2.35
30	Animal pest control in reproduction	399	4.83	2.37
31	Road construction principles	397	4.72	2.55
32	Forest by-products	395	4.66	2.27
33	Timber cruising	398	4.64	2.39
34	Cable logging methods/ systems	396	4.63	2.48
35	Seedling production processes	399	4.61	2.28
36	Value-added products	393	4.59	2.36
37	Tractor logging methods	396	4.56	2.43
38	Logging plan development	394	4.55	2.63
39	Lumber sawing/milling processes	396	4.54	2.21
40	Paper manufacturing processes	395	4.42	2.16
41	Slash burning	396	4.37	2.48
42	Chain saw operation and safety	396	4.35	2.36
43	Forest tool identification	397	4.34	2.32
44	Basic road construction	396	4.27	2.50
45	Log scaling	395	4.21	2.42
LITTLE VALUE:				
46	Lamination processes and products	394	4.17	2.17
47	Radio communications skills	395	4.10	2.42
48	Timber felling and bucking	394	3.87	2.26
49	Christmas tree production	395	3.86	2.03
50	Skyline payload analysis	392	3.77	2.41

Table 8. Continued

R	Instructional unit	N	Mean	S.D.
LITTLE VALUE: (Cont.)				
51	Logging equipment operation	394	3.66	2.26
52	Rigging of tail/support trees	394	3.33	2.19
53	Basic choker setting	392	3.30	2.16
54	High climbing trees (w/spurs)	393	2.64	1.85

Table 9. The value that foresters place on selected units of forestry instruction for job-oriented students

R[a]	Instructional unit	N	Mean[b]	S.D.[c]
VERY MUCH VALUE:				
1	First aid and CPR training	400	7.43	1.99
MUCH VALUE:				
2	Current environmental issues	400	7.34	1.75
3	Stewardship of natural resources	397	7.29	1.89
4	Multiple-use practices	399	7.02	1.89
5	Tree and shrub identification	399	6.93	1.86
6	Occupational safety and health	398	6.91	2.09
7	Topographic map reading	400	6.86	2.10
8	Wildfire prevention	399	6.79	1.90
9	Forest practices laws	400	6.75	2.13
10	Chain saw operation and safety	398	6.67	2.26
11	Reforestation methods	399	6.66	2.05
12	Ecosystems and interactions	397	6.61	2.10
13	Natural forest succession	400	6.59	2.00
14	Planimetric map reading	400	6.52	2.23
15	Basic map making skills	397	6.46	2.20
16	Timber cruising	399	6.45	2.30
17	Wildfire control activities	397	6.39	2.14
18	Forest tool identification	396	6.31	2.38
19	Cable logging methods/ systems	396	6.26	2.31
20	Tractor logging methods	396	6.24	2.27
21	Fire ecology	399	6.24	2.09
22	Thinning effects on stands	399	6.20	2.06

[a]Ranked order.

[b]Scale values: 1.00-2.60=None
2.61-4.20=Little
4.21-5.80=Some
5.81-7.40=Much
7.41-9.00=Very much.

[c]Standard deviation.

Table 9. Continued

R	Instructional unit	N	Mean	S.D.
MUCH VALUE: (Cont.)				
23	Watershed quality	400	6.18	1.93
24	Forest land surveying	396	6.12	2.30
25	Timber felling and bucking	399	6.01	2.44
26	Slash burning	400	5.95	2.40
27	Log scaling	398	5.91	2.36
28	Logging equipment operation	399	5.89	2.55
29	Vegetative control in reproduction	399	5.88	2.20
30	Fish and wildlife identification	400	5.82	1.97
SOME VALUE:				
31	Wildlife habitat enhancement	399	5.73	2.00
32	Road construction principles	400	5.72	2.30
33	Air shed quality	400	5.70	2.03
34	Stream habitat enhancement	399	5.68	2.03
35	Basic road construction	400	5.64	2.42
36	Animal pest control in reproduction	398	5.64	2.19
37	Basic choker setting	397	5.55	2.63
38	Radio communications skills	399	5.50	2.49
39	Soil formation and mechanics	397	5.43	2.05
40	Forest product markets	397	5.42	2.10
41	Forest pathology	399	5.40	2.16
42	Logging plan development	398	5.39	2.40
43	Seedling production processes	398	5.38	2.15
44	Urban forestry skills	399	5.34	2.13
45	Lumber sawing/milling processes	398	5.24	2.13
46	Computer applications and modeling	397	5.20	2.40
47	Forest by-products	395	5.15	2.19
48	Rigging of tail/support trees	398	5.13	2.59
49	Value-added products	396	5.03	2.25
50	Lamination processes and products	397	4.79	2.15
51	Paper manufacturing processes	397	4.76	2.06

Table 9. Continued

R	Instructional unit	N	Mean	S.D.
SOME VALUE: (Cont.)				
52	Christmas tree production	399	4.76	2.18
53	Skyline payload analysis	398	4.49	2.43
LITTLE VALUE:				
54	High climbing trees (w/spurs)	396	4.14	2.49