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Perceptions and values of secondary education as expressed by professional foresters

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Perceptions and values of secondary education as expressed by professional foresters

by

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CHAPTER I. INTRODUCTION

> Where there is no vision, the people are unrestrained,...
> --Proverbs 29:18 (NASV)

Conceptually, "forestry education" 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 vocational agriculture 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, 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 officially in the form of lawsuits aired in U.S. federal courts. 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 researcher 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 classroom environments: science, agriculture, and 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 ever 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, agricultural education has included instructional units on forestry as a regular part of its standard curriculum, and in most 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 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 agriculture 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.

CHAPTER II. REVIEW OF LITERATURE

> Where there is no guidance, the people fall,
> But in abundance of counselors there is victory.
>
> --Proverbs 11:14 (NASV)

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)

In completing the review of related literature, the researcher believes that it is paramount to address the rationale, from a research perspective, which sanctions and necessitates this study. The first question needing to be

answered is, "What is the definition of research?" Ary, Cheser-Jacobs, and Razavieh (1990) suggested that:

> It is a way to acquire dependable and useful information. Its purpose is to discover answers to meaningful questions through the application of scientific procedures. ...Although it may take place in different settings and may utilize different methods, research is universally a systematic and objective search for reliable knowledge. (p. 22)

Borg and Gall (1989) further qualified the term "knowledge" and then proceeded to provide it with a specific application in terms of an educational setting. They suggested that:

> The major reason for educational research is to develop **new knowledge** about teaching and learning and administration. The new knowledge is valuable because it will lead eventually to the improvement of educational practice. (Borg & Gall, 1989, p. 4)

It is noteworthy that Borg and Gall used the word "new" to qualify the word "knowledge." By its very definition and its above usage, there is an implication that there already is an "old" or existing body of knowledge. It is imperative that any researcher design his/her investigation for the pursuit of new knowledge based upon the then current body of existing knowledge.

> Scientists build on previous results because it is not practical (or necessary) to reconstruct all the observations and theoretical constructs that go into an investigation. (National Academy of Sciences, 1989, p. 11)

In this discussion of "new" knowledge, however, there is no intent by the researcher to minimize or nullify the importance placed upon research replication. Borg and Gall (1989)

suggested that replication in educational research does not have to exactly repeat the conditions of previous work(s). They stated that a researcher can conduct a replication which "can duplicate critical elements and also extend the inquiry into new domains" (p. 40). As far as accepting a piece of new knowledge into the universally approved body of knowledge, Borg and Gall (1989, p. 57) suggested that "important studies should always be replicated before their findings are accepted by the scientific community." The National Academy of Sciences noted that "...the social structure of science minimizes errors in the long run through peer verification" (National Academy of Sciences, 1989, p. 11).

Since an accepted purpose of educational research is to pursue new knowledge, it then becomes appropriate to ask, "In what direction should this research be targeted? What constitutes important contributing research?" Williams (1991a) noted that while agricultural education has effectively developed mediums for the dissemination of research, it has not done a very good job in providing focus in its research. Williams (1991a) cited Warmbrod as stating that:

> ...progress during the past years in the technological and methodological aspects of research has not been accompanied by comparable improvements in another very important aspect of research; namely, the relevance, significance and importance of problems and issues that we investigate. (p. 8)

It is the contention of the researcher that this study evaluating the perceptions of professional foresters on various components of forestry education will in fact add new knowledge to the existing body of knowledge, and is focused in its intent, design, and useability. Williams (1991a) suggested a list of 14 strategies for focusing agricultural education research. This study is able to make part or full use of six of these strategies, namely: 1) It compares well with no less than seven of the twelve national agriculture priorities (as they apply to forestry) as set by the Joint Council on Food and Agricultural Sciences. 2) It is being conducted in co-sponsorship with the Oregon Department of Education and the Oregon Society of American Foresters. 3) A portion of it is tied to environmental education which is recognized as an educational center of excellence. 4) It attempts to address an issue in forestry education in a programmatic and sustained fashion. 5) It is being conducted with the intent that its findings will be implemented in the field. 6) It is being done with the intent that it will make a positive impact in the field of forestry education.

Williams (1991b, p. 17) stated, "The general processes used in agricultural education to apply teaching and learning are: 1) curriculum planning, 2) delivery methodologies, and 3) program evaluation." The second key question of this study specifically focuses on William's first point--curriculum

planning. That is, if forestry education should be integrated into Oregon secondary education, what units of instruction should constitute the curriculum?

Secondary vocational forestry education began in the State of Oregon in 1970. Its primary mission at that time was to implant forestry knowledge and skills training into students in order to supply the labor needs of the forest industry. The industry received employees who were already trained in job-entry-level skills and knowledge, and the students received specialized training which allowed them to secure employment in an industry which traditionally has paid fairly high salaries.

A significant amount of federal environmental legislation has been signed into law over the last few decades; especially during the 1970s (Dana & Fairfax, 1980). Public support for and membership in a rising number of preservationist organizations (Petersen, 1990) have increased the number of environmental appeals being filed in federal court by an unprecedented amount (Northwest Forest Resources Council, 1989). The general public has taken a very proactive role in the arena of environmental affairs, and from all indications will continue to do so (Petersen, 1990).

In light of these events, if forestry education should continue to be integrated into Oregon public school curriculum, it may need to broaden its focus; that is, not

simply providing secondary vocational training, but to also encompass the provision of educating about forests and forestry in a more general sense and to a larger segment of the secondary student population. If the Oregon Department of Education should ever be called upon to address this issue, the results of this study could be quite valuable.

CHAPTER III. DESIGN AND METHODOLOGY

> Give instruction to a wise man, and he will be still wiser, Teach a righteous man, and he will increase his learning.
> --Proverbs 9:9 (NASV)

The purpose of this chapter is to describe the methodology and procedures used in the implementation of this study. These shall be described in detail under each of the following headings: definition of terms, design, population identification and sample selection, instrumentation, data collection, and data analysis.

Definition of Terms

Given that forestry as an independent educational program entity is somewhat unique when examined along side traditional secondary instructional programs, it seems appropriate to define the following terms with regard to their usage in this study.

Conservationist--A person who subscribes to conservationism; that is, one who believes in the use of the earth's natural resources on a sustained basis in order to meet the needs, and perpetuate the existence of humankind. This individual believes that humankind must manage nature's resources in order to preserve them, and that while humans

possess the privilege of using (not abusing) these resources, they also have a responsibility to be good stewards of them.

Environmental issues--Those issues (e.g., clear-cutting, biodiversity, prescribed fire) which are often at the forefront of conservationist vs. preservationist debates. While there is scientific rationale for the various silvicultural practices which are often under debate, these same practices often constitute the issues which give way to emotionally charged controversy.

Forest industry--Technically, while there are many industries which conduct their business in and due to the existence of forests, this study is using this term specifically to define that industrial segment which, while managing for multiple uses during the maturation of the forest, is interested in harvesting from the forest for economic gain at the end of designated growing rotations. This term is being used synonymously with the term "timber industry."

Forestry--The science of developing, caring for, and cultivating forests for both the enhancement of the resource itself, as well as for the other natural resources which interact with it, while at the same time utilizing the products which come from it in meeting the needs of humankind.

Forestry education--Instruction which takes place in the public school system with regard to forests and forestry

practices as such practices pertain to the multiple use management of forests. This instruction may take place in the primary or secondary sectors of the public school system, and may be formal, informal, or vocational in nature.

Forestry/natural resources teachers--Those secondary instructors who teach in detail about forests and forestry practices either in formal forest products programs or as part of vocational agriculture programs.

Forestry practices--Those practices which occur as part of management prescriptions made by university trained foresters, including, but not limited to, site preparation, reforestation, silvicultural decisions, pest control, vegetative control, thinning, harvesting systems, prescribed burning, road construction, engineering decisions, and multiple use management.

Multiple-use practices/forestry--The idea that forests don't simply exist for timber production, but rather may be better suited for one or more of the following as defined by the United States Forest Service: outdoor recreation, range, timber, water, and wildlife and fish. Wilderness designations are included in this definition.

Preservationists--Those persons who believe that nature is not to be tampered with, and that natural resources do not simply exist for meeting the needs and wants of humankind. Subscribers to this philosophy do not believe that humans

possess a superior role in nature's hierarchy, and thereby have no more right to an existence than do any of the other animal or plant species on earth. Finally, they believe that the best way to protect the natural resources from human exploitation is to preserve them through public ownership and/or anti-use legislation.

Professional forester--A person who possesses a minimum of a 4-year degree in some facet of forestry or other closely related applied environmental science, and who practices or has retired from practicing the discipline of forestry as an occupational career.

Public educator--A person who possesses a minimum of a 4-year degree in either elementary education or a certifiable facet of secondary education, and who teaches in the public school system and possesses a valid teaching certificate.

Public school system--The state educational system composed of school districts which operate under, and in accordance with, the directives administered by a state department of education under the supervision of a state superintendent of public instruction.

Stewardship of natural resources--The idea that natural resources can and should be managed in such a way so that they will meet the needs of humankind, will be consumed only at a sustainable rate, and will be respected, cared for, and if at all possible, enhanced in their quality.

Timber industry--That industrial segment which, while managing for multiple uses during the maturation of the forest, is interested in harvesting from the forest for economic gain at the end of designated growing rotations. This term is being used synonymously with the term "forest industry."

Vocational forestry education--That portion of secondary public instruction which specifically teaches knowledge, skills, and attitudes as they pertain both to forests and gainful employment in woods and forestry careers.

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 defines "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 B.

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. Reliability will be addressed in more detail later in the chapter under the section Data Analysis.

Data Collection

After the survey instrument was initiated, validated, and refined into its final form, a letter of transmittal (Appendix C) 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 (Appendix D) 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 (Appendix E) 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). However, it was desirable, for analysis purposes, to cluster the 54 instructional units into the five broad categories that appear in the survey instrument. The Cronbach alpha for each of these five curriculum categories may be observed in Table 1.

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

Table 1. Reliability coefficients for the five broad categories of instructional units

Curriculum category	N items	N cases	Cronbach's alpha
Forest ecology	33	386	.9468
Forest management	33	391	.9561
Forest engineering	33	385	.9523
Forest harvesting	36	384	.9617
Milling, manufacturing and services	27	383	.9628

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.

CHAPTER IV. FINDINGS

> How blessed is the man who finds wisdom,
> And the man who gains understanding. For
> its profit is better than the profit of
> silver, And its gain than fine gold.
> --Proverbs 3:13-14 (NASV)

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 Table 2. Of the 400 subjects sampled, 46.9% practiced as forest managers, and 20.2% described themselves as being retired. 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 or doctorate. 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.

Table 2. Descriptive information about respondents

Descriptive item	Item descriptors	Frequency	Percent
Job classification	Ind-Forest manager	69	17.4
	Ind-Forest engineer	9	2.3
	Ind-Mill/processing	11	2.8
	Ind-Logger	6	1.5
	Industrial other	40	10.1
	Gov-Forest manager	117	29.5
	Gov-Forest engineer	3	.8
	Gov-Forest protect.	7	1.8
	Government other	34	8.6
	University forester	19	4.8
	Retired	80	20.2
	Non-forestry	2	.5
	Missing	3	0.0
		400	100.0
Gender	Male	362	90.7
	Female	37	9.3
	Missing	1	0.0
		400	100.0
Work experience (years)	1-5	19	4.9
	6-10	25	6.4
	11-15	79	19.9
	16-20	68	17.1
	21-25	26	6.6
	26-30	59	14.9
	31-35	54	13.6
	36-40	33	8.4
	41-45	21	5.4
	46 or more	12	3.3
	Missing	4	0.0
		400	100.0
	Mean = 24.05		
	Standard deviation = 11.97		
Years of education	12	3	.7
	14	2	.5
	15	2	.5
	16	163	40.7
	17	88	22.0
	18	80	20.0
	19	21	5.2
	20	17	4.2

Table 2. Continued

Descriptive item	Item descriptors	Frequency	Percent
Years of education (cont.)	21	12	3.0
	22	8	2.0
	23	3	.7
	25	1	.2
		400	100.0
	Mean = 17.25 Standard deviation = 1.68		
Highest degree attained	Bachelor's	267	66.9
	Master's	96	24.1
	Doctorate	36	9.0
	Missing	1	0.0
		400	100.0
Bachelor's degree	Forest Engineering	27	6.9
	Forest Management	283	72.6
	Forest Science	18	4.6
	Biology	8	2.1
	Fish and Wildlife	4	1.0
	Nat/Resource Mgmt.	14	3.6
	Earth Science	1	.3
	Other Nat/Science	12	3.1
	Non-Nat/Science	23	5.9
	Missing	10	0.0
		400	100.0
Region of schooling	West Coast	199	52.6
	Rocky Mountains	54	14.3
	Midwestern	38	10.0
	Southern	12	3.2
	Northern	36	9.5
	Northeastern	37	9.8
	Other	2	.5
	Missing	22	0.0
		400	100.0
Community population	1-10,000	107	28.0
	10,001-20,000	62	16.2
	20,001-30,000	33	8.6
	30,001-40,000	31	8.1
	40,001-50,000	32	8.4
	50,001-60,000	4	1.0
	60,001-70,000	1	.3

Table 2. Continued

Descriptive item	Item descriptors	Frequency	Percent
Community population (cont.)	70,001-80,000	0	0.0
	80,001-90,000	0	0.0
	90,001 or more	112	29.3
	Missing	18	0.0
		400	100.0

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 3). 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 4 it was observed that respondents believed strongly

Table 3. 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 3. 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 4. 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 4. 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

(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 4. 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 5). 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

Table 5. 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.

Tables 29 to 31 (Appendix F). In Table 6, 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 7). 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 8 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

Table 6. 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 7. 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 8. 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 8. 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

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.

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."

Employment status

Data in Table 9 compare the perceptions of working foresters with retired foresters concerning the importance of and emphasis on forestry education in Oregon public schools. Two of the six items had group means that were significantly different. Retired foresters had a higher mean than did their working counterparts concerning whether vocational forestry programs should exist in communities where the timber industry is a significant employer. Working foresters had a lower mean than did their retired counterparts for the item stating that "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."

Data in Table 10 compare the opinions of working and retired foresters concerning the involvement of their respective agencies in public school educational programs. These two groups differed on two main areas of the questions listed in Table 10. Retired foresters had a higher mean than did working foresters for the item stating that the timber industry in the respondents' immediate area needed to greatly improve its efforts in promoting forestry education in their local schools. While both groups believed that the timber

Table 9. Importance of and current emphasis on forestry education in Oregon public schools as compared by working foresters and retired foresters

Survey question		Working foresters	Retired foresters	t-value	t-prob.
To what level do you agree that:					
Teaching about forestry is important at most grade levels in the public school system?	M[a]	6.79	6.76	.10	.922
	SD[b]	2.00	1.86		
	N[c]	314	80		
Education about forestry practices should be taught in the public high school curriculum?		6.98	6.95	.16	.876
		1.75	1.81		
		315	79		
A curriculum concerning forestry education should be required in all Oregon school districts?		6.22	5.90	1.09	.278
		2.32	2.32		
		315	79		

[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.

[c]Number of observations.

Table 9. Continued

Survey question	Working foresters	Retired foresters	t-value	t-prob.
Vocational forestry should be a part of most high school vocational technology education departments in communities where the timber industry is a significant employer?	6.63 1.95 315	7.21 1.73 80	-2.44	.015
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?	3.30 1.31 306	3.92 1.60 80	-3.19	.002
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?	2.79 1.31 309	3.06 1.32 79	-1.65	.099

Table 10. Opinions of both working and retired foresters about the involvement of their agencies in public school educational programs

Survey question		Working foresters	Retired foresters	t-value	t-prob.
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?	M[a]	6.84	7.33	-2.24	.027
	SD[b]	2.13	1.62		
	N[c]	309	78		
The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools?		7.16	7.13	.16	.876
		1.92	1.67		
		312	79		
Professional foresters/timber industry should become involved in developing educational partnerships with local schools?		7.37	7.27	.49	.625
		1.68	1.68		
		314	79		

[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.

[c]Number of observations.

Table 10. Continued

Survey question	Working foresters	Retired foresters	t-value	t-prob.
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?	5.92 2.24 291	6.10 2.27 49	-.53	.595
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?	5.37 2.42 283	5.09 2.60 46	.73	.465
Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula?	6.41 1.95 312	6.65 1.66 78	-1.03	.305
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)?	3.72 1.51 309	4.26 1.58 80	-2.82	.005
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?	3.54 1.37 308	4.04 1.26 79	-2.94	.003

industry had done a poor job in past years with regard to their involvement in forestry education at both the local and state level, working foresters indicated that the industry had done a poorer job than did retired foresters. The difference between the group means for these two items was statistically significant at less than the .01 level of probability.

When examining the perceptions of these two groups with regard to the five broad categories of forestry instruction, the following observations were made. Concerning a curriculum for all high school students, working foresters rated the value of forest ecology and milling, manufacturing, and services higher than did retired foresters (Table 11). The two groups did not differ significantly from each other on any of the instructional areas in either the college-bound curriculum or the job-oriented curriculum (Tables 12 and 13).

Job classification

Data in Table 14 compare the perceptions of industry, government, and university foresters concerning the importance of and emphasis on forestry education in Oregon public schools. In all of the questions posed, the means provided by industry foresters indicated stronger responses than those provided by government foresters. These differences were statistically significant at an alpha which was beyond the .01 level of probability. The means for university foresters

Table 11. The value of five broad areas of forestry instruction for all high school students as compared by working foresters and retired foresters

Area of instruction		Working foresters	Retired foresters	t-value	t-prob.
		(N=315)	(N=80)		
Forest ecology	M[a]	4.82	4.36	2.50	.013
	SD[b]	1.46	1.48		
Forest management		3.54	3.35	1.04	.301
		1.49	1.32		
Forest engineering		2.57	2.53	.28	.783
		1.25	1.28		
Forest harvesting		2.74	2.67	.43	.665
		1.33	1.18		
Mill, manufacturing, and services		2.90	2.48	2.42	.017
		1.61	1.29		

[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 12. The value of five broad areas of forestry instruction for college-bound students as compared by working foresters and retired foresters

Area of instruction		Working foresters	Retired foresters	t-value	t-prob.
		(N[a])	(N=80)		
Forest ecology	M[b]	6.18	6.19	-.08	.933
	SD[c]	1.56	1.48		
Forest management		5.43	5.53	-.43	.664
		1.94	1.83		
Forest engineering		4.83	4.98	-.58	.560
		2.10	2.10		
Forest harvesting		4.34	4.44	-.43	.665
		1.92	1.85		
Mill, manufacturing, and services		4.53	4.39	.61	.544
		1.94	1.90		

[a]N ranged from 313 to 314 respondents.

[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 13. The value of five broad areas of forestry instruction for job-oriented students as compared by working foresters and retired foresters

Area of instruction		Working foresters	Retired foresters	t-value	t-prob.
		(N[a])	(N=80)		
Forest ecology	M[b]	6.31	6.52	-1.15	.251
	SD[c]	1.48	1.38		
Forest management		6.05	6.35	-1.39	.165
		1.70	1.59		
Forest engineering		5.92	6.09	-.71	.481
		1.89	1.88		
Forest harvesting		5.93	6.07	-.57	.569
		1.99	1.86		
Mill, manufacturing, and services		5.12	5.33	-.93	.353
		1.83	1.70		

[a]N ranged from 314 to 315 respondents.

[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 14. Importance of and current emphasis on forestry education in Oregon public schools as compared by industry foresters, government foresters, and university foresters

Survey question		Groups: Industry foresters (1)	Government foresters (2)	University foresters (3)	F-value	F-prob.
To what level do you agree that:						
Teaching about forestry is important at most grade levels in the public school system?	M[a]	7.26	6.43	6.47	6.84	.001
	SD[b]	1.99	1.91	2.25	1>2[c]	
	N[d]	134	161	19		
Education about forestry practices should be taught in the public high school curriculum?		7.36	6.69	6.79	5.71	.004
		1.81	1.64	1.81	1>2[c]	
		135	161	19		
A curriculum concerning forestry education should be required in all Oregon school districts?		6.81	5.81	5.42	8.29	.001
		2.39	2.12	2.55	1>2,3[c]	
		135	161	19		

[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.

[c]Differences determined by Scheffé at the .05 level of significance.

[d]Number of observations.

Table 14. Continued

Survey question	Groups: Industry foresters (1)	Groups: Government foresters (2)	Groups: University foresters (3)	F-value	F-prob.
Vocational forestry should be a part of most high school vocational technology education departments in communities where the timber industry is a significant employer?	7.17 1.78 135	6.16 2.03 161	6.74 1.45 19	10.42 1>2[c]	.001
The Oregon public school system, as a whole, has done a good job in instructing Oregon's youth abut the importance of the practice of forestry?	3.01 1.34 133	3.53 1.24 154	3.53 1.39 19	5.87 1<2[c]	.003
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?	2.52 1.21 134	3.03 1.33 156	2.74 1.52 19	5.48 1<2[c]	.005

tended to be in the range between the industry foresters and government foresters group means.

Data in Table 15 compare the opinions of industry, government, and university foresters concerning the involvement of their respective agencies in public school educational programs. The industry foresters' mean scores were higher than their government colleagues' with regard to their perception that there needed to be more involvement on the part of foresters' various firms and agencies in public education, both at the local and state level. These differences were statistically significant, beyond the .001 level of probability. Concerning the item stating that timber industry companies should be investing more money in the development of educational materials to be used in the public school curricula, the industry foresters' mean score was the highest among the groups. It was noted that the industry foresters' mean score was higher than that of their government colleagues with a statistically significant (alpha <.001) level of probability. The mean scores for university foresters tended to be the lowest among the three groups.

When examining the perceptions of the three groups with regard to the five broad categories of forestry instruction, the following observations were made. Concerning a curriculum for all high school students, statistically significant differences (alpha <.05) were noted in the following

Table 15. Opinions of industry, government, and university foresters about the involvement of their respective agencies in public school educational programs

Survey question		Groups: Industry foresters (1)	Government foresters (2)	University foresters (3)	F-value	F-prob.
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?	M[a]	7.49	6.32	6.58	11.63	.001
	SD[b]	1.86	2.16	2.59	1>2[c]	
	N[d]	134	156	19		
The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools?		7.72	6.74	6.74	10.53	.001
		1.51	2.04	2.51	1>2[c]	
		135	158	19		

[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.

[c]Differences determined by Scheffé at the .05 level of significance.

[d]Number of observations.

Table 15. Continued

Survey question	Groups: Industry foresters (1)	Groups: Government foresters (2)	Groups: University foresters (3)	F-value	F-prob.
Professional foresters/timber industry should become involved in developing educational partnerships with local schools?	7.62 1.47 134	7.19 1.79 161	7.16 2.03 19	2.61	.075
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?	5.48 2.41 122	6.25 2.02 153	6.06 2.54 16	4.06 1<2[c]	.018
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?	4.99 2.57 118	5.68 2.23 148	5.35 2.67 17	2.66	.072
Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula?	6.98 1.79 133	5.97 1.96 160	6.11 2.05 19	10.53 1>2[c]	.001

Table 15. Continued

Survey question	Groups: Industry foresters (1)	Groups: Government foresters (2)	Groups: University foresters (3)	F-value	F-prob.
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)?	3.74 1.61 135	3.68 1.43 155	3.89 1.52 19	.18	.833
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?	3.45 1.46 134	3.63 1.28 155	3.37 1.50 19	.80	.452

instructional categories: forest ecology, forest management, and milling, manufacturing and services (Table 16). In these categories, the university foresters group mean scores were lower than that of their government counterparts regarding forest ecology, and lower than those of their industry counterparts in both forest management, and milling, manufacturing, and services.

With regard to a curriculum for college-bound forestry students, statistically significant differences (alpha <.05) were noted in the following instructional categories: forest ecology, forest engineering, and milling, manufacturing and services (Table 17). In these categories, university foresters group mean scores were lower than their government colleagues' score with regard to forest ecology, and lower than their industry colleagues' scores in both forest engineering, and milling, manufacturing and services.

Concerning a curriculum for job-oriented forestry students, a statistically significant difference (alpha <.05) was observed only in the instructional category of forest ecology (Table 18). In this occurrence, the industry foresters group mean score was lower than the government foresters group mean score.

Table 16. The value of five broad areas of forestry instruction for all high school students as compared by industry, government, and university foresters

Area of instruction		Groups: Industry foresters (1)	Government foresters (2)	University foresters (3)	F-value	F-prob.
		(N=135)	(N=161)	(N=19)		
Forest ecology	M[a]	4.69	5.00	4.21	3.46	.033
	SD[b]	1.43	1.45	1.49	2>3[c]	
Forest management		3.71	3.47	2.84	3.15	.044
		1.58	1.41	1.27	1>3[c]	
Forest engineering		2.62	2.56	2.28	.64	.528
		1.30	1.24	1.04		
Forest harvesting		2.81	2.69	2.61	.36	.697
		1.35	1.36	.88		
Mill, manufacturing, and services		3.12	2.80	2.16	3.63	.028
		1.76	1.49	1.16	1>3[c]	

[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.

[c]Differences determined by Duncan at the .05 level of significance.

Table 17. The value of five broad areas of forestry instruction for college-bound students as compared by industry, government, and university foresters

Area of instruction		Groups: Industry foresters (1)	Government foresters (2)	University foresters (3)	F-value	F-prob.
		(N=135)	(N[a])	(N=19)		
Forest ecology	M[b]	6.06	6.38	5.24	5.21	.006
	SD[c]	1.64	1.41	1.89	2>3[d]	
Forest management		5.53	5.43	4.75	1.35	.261
		1.99	1.92	1.79		
Forest engineering		5.08	4.74	3.78	3.56	.030
		2.19	2.03	1.75	1>3[d]	
Forest harvesting		4.61	4.14	4.01	2.55	.079
		1.88	1.94	1.85		
Mill, manufacturing, and services		4.82	4.40	3.66	3.80	.023
		1.98	1.90	1.66	1>3[e]	

[a]N ranged from 159 to 161 respondents.

[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.

[d]Differences determined by Scheffé at the .05 level of significance.

[e]Differences determined by Duncan at the .05 level of significance.

Table 18. The value of five broad areas of forestry instruction for job-oriented students as compared by industry, government, and university foresters

Area of instruction		Groups: Industry foresters (1)	Government foresters (2)	University foresters (3)	F-value	F-prob.
		(N[a])	(N[b])	(N=19)		
Forest ecology	M[c]	6.16	6.50	5.82	3.10	.047
	SD[d]	1.46	1.42	1.87	1<2[e]	
Forest management		6.05	6.07	5.92	.06	.940
		1.65	1.74	1.80		
Forest engineering		5.96	5.93	5.67	.19	.831
		1.80	1.98	1.90		
Forest harvesting		6.03	5.82	6.27	.67	.510
		1.94	2.01	2.15		
Mill, manufacturing, and services		5.20	5.10	4.62	.86	.426
		1.77	1.86	1.96		

[a]N ranged from 134 to 135 respondents.

[b]N ranged from 160 to 161 respondents.

[c]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.

[d]Standard deviation.

[e]Differences determined by Duncan at the .05 level of significance.

Gender

A table noting the differences between male and female respondents concerning the findings is located in Appendix G. Very few statistically significant (alpha <.05) differences were observed. Out of the 29 data points which were consistently used throughout this study, statistically significant gender differences occurred only three times. Concerning the item stating that vocational education should be a part of most high school vocational technology education departments in communities where the timber industry is a significant employer, the male mean score was higher than the female mean score. The male mean score was also higher than the female mean score concerning the item which states that the timber industry should be investing more money in the development of educational materials to be used in the public school curricula. However, with regard to the value of including forest ecology in a curriculum for all high school students, the female mean score was higher than the male mean score.

Years of work experience

Data in Table 19 compare the perceptions of foresters concerning the importance of and emphasis on forestry education in Oregon public schools, when the foresters have been separated into 10-year incremented categories based upon

Table 19. Importance of and current emphasis on forestry education in Oregon public schools as compared by foresters grouped in 10-year increments

Survey question		Groups 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
To what level do you agree that:							
Teaching about forestry is important at most grade levels in the public school system?	M[a]	6.42	6.93	6.74	6.72	.77	.514
	SD[b]	2.01	2.04	1.88	2.03		
	N[c]	43	144	68	57		
Education about forestry practices should be taught in the public high school curriculum?		6.67	7.23	6.99	6.66	2.08	.103
		1.74	1.70	1.80	1.80		
		43	144	68	58		

[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.

[c]Number of observations.

Table 19. Continued

Survey question	Groups 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
A curriculum concerning forestry education should be required in all Oregon school districts?	5.98 2.40 43	6.44 2.27 144	6.34 2.17 68	5.74 2.52 58	1.50	.216
Vocational forestry should be a part of most high school vocational technology education departments in communities where the timber industry is a significant employer?	6.14 2.07 43	6.69 1.87 144	6.59 1.96 68	6.95 2.00 58	1.49	.217
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?	3.34 1.30 41	3.30 1.27 139	3.40 1.45 68	3.16 1.30 56	.34	.795
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?	2.66 1.32 41	2.85 1.30 141	2.82 1.40 67	2.69 1.26 58	.36	.782

their years of work experience. It was noted that the foresters group mean scores did not ever statistically differ from one another, nor was there any noticeable pattern in their mean scores.

Data in Table 20 compare the opinions of foresters concerning the involvement of their respective agencies in public school educational programs, when the foresters have been separated into 10-year incremented categories based upon their years of work experience. In this case as well, it was noted that the foresters group mean scores did not ever statistically differ from one another, nor was there any noticeable pattern in their mean scores.

However, when examining the perceptions of the four work experience groups with regard to the five broad categories of forestry instruction, the following observations were made. Concerning a curriculum for all high school students, statistically significant differences (alpha $<.05$) were noted in every one of the five curriculum categories (Table 21). In each of these categories, foresters with 31+ years of work experience indicated group mean scores which were lower than both the 1-10 year work experience group mean scores and the 11-20 year work experience group mean scores, except in the category of forest engineering. In this category, the 31+ group mean score was lower than only the 1-10 group mean score. In all curriculum categories, there was a general

Table 20. Opinions of foresters grouped in 10-year increments concerning the involvement of their respective agencies in public school educational programs

Survey question		Groups 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
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?	M[a]	6.37	6.72	6.94	7.39	2.13	.096
	SD[b]	2.48	2.11	2.00	2.04		
	N[c]	41	142	67	57		
The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools?		6.88	7.08	7.31	7.45	.96	.414
		2.09	2.02	1.71	1.79		
		42	143	67	58		

[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.

[c]Number of observations.

Table 20. Continued

Survey question	Groups 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
Professional foresters/timber industry should become involved in developing educational partnerships with local schools?	7.65 1.73 43	7.42 1.76 144	7.18 1.54 68	7.33 1.63 57	.74	.529
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?	6.21 2.51 39	6.13 2.15 135	5.80 1.93 61	5.33 2.53 54	1.92	.126
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?	5.61 2.47 38	5.62 2.27 131	5.47 2.48 60	4.60 2.51 52	2.43	.065
Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula?	5.86 2.01 43	6.35 2.03 142	6.75 1.70 68	6.63 1.93 57	2.14	.096

Table 20. Continued

Survey question	Groups: 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
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)?	3.71 1.54 41	3.75 1.62 141	3.73 1.40 67	3.66 1.41 58	.06	.982
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?	3.59 1.41 41	3.45 1.39 141	3.66 1.39 67	3.53 1.32 57	.35	.787

Table 21. The value of five broad areas of forestry instruction for all high school students as compared by foresters grouped in 10-year increments

Area of instruction		Groups: 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
		(N=43)	(N=144)	(N[a])	(N=58)		
Forest ecology	M[b]	5.13	5.06	4.67	4.16	6.58	.001
	SD[c]	1.44	1.47	1.21	1.52	4<1,2[d]	
Forest management		3.83	3.69	3.47	2.99	3.85	.010
		1.66	1.46	1.44	1.36	4<1,2[d]	
Forest engineering		2.93	2.64	2.59	2.14	3.67	.013
		1.46	1.28	1.12	1.06	4<1[d]	
Forest harvesting		3.17	2.85	2.65	2.27	4.48	.004
		1.41	1.38	1.35	.94	4<1,2[d]	
Mill, manufacturing, and services		3.41	3.10	2.80	2.17	6.64	.001
		1.90	1.53	1.71	1.13	4<1,2[d]	

[a]N ranged from 67 to 68 respondents.

[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.

[d]Differences determined by Scheffé at the .05 level of significance.

trend observed--that as the number of years in the work experience category increased, the group mean score concerning any given instructional area decreased.

With regard to a curriculum for college-bound forestry students, statistically significant differences (alpha <.05) were noted in the following instructional categories: forest ecology, forest management, and milling, manufacturing and services (Table 22). In these categories, the 31+ years of work experience group mean scores were lower than those of varying combinations of work experience groups identified with fewer years of work experience. As in the aforementioned instance, within most curriculum categories, there was a general trend observed--that as the number of years in the work experience category increased, the group mean score concerning any given instructional area decreased.

Concerning a curriculum for job-oriented forestry students, a statistically significant difference (alpha =.01) was observed in the instructional category, forest ecology (Table 23). In this occurrence, the 31+ years of work experience group mean score was lower than the 11-20 year group mean score. And again, in general, as the number of years in the work experience category increased, the group mean score concerning any given instructional area tended to decrease.

Table 22. The value of five broad areas of forestry instruction for college-bound students as compared by foresters grouped in 10-year increments

Area of instruction		Groups: 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
		(N=43)	(N[a])	(N=67)	(N=58)		
Forest ecology	M[b]	6.23	6.43	6.28	5.39	6.67	.001
	SD[c]	1.44	1.49	1.30	1.86	4<2,3[d]	
Forest management		5.54	5.61	5.58	4.76	2.95	.033
		1.96	1.92	1.82	2.05	4<2[d]	
Forest engineering		5.11	4.96	4.85	4.31	1.62	.185
		2.11	2.00	2.29	2.09		
Forest harvesting		4.61	4.53	4.26	3.81	2.28	.079
		1.90	1.89	2.05	1.77		
Mill, manufacturing, and services		5.01	4.76	4.52	3.70	5.27	.001
		2.19	1.79	2.05	1.79	4<1,2[d]	

[a]N ranged from 143 to 144 respondents.

[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.

[d]Differences determined by Scheffé at the .05 level of significance.

Table 23. The value of five broad areas of forestry instruction for job-oriented students as compared by foresters grouped in 10-year increments

Area of instruction		Groups: 1-10 years work exp. (1)	11-20 years work exp. (2)	21-30 years work exp. (3)	31+ years work exp. (4)	F-value	F-prob.
		(N=43)	(N[a])	(N=68)	(N=58)		
Forest ecology	M[b]	6.50	6.53	6.17	5.81	3.82	.010
	SD[c]	1.41	1.39	1.35	1.76	4<2[d]	
Forest management		6.23	6.13	6.15	5.64	1.50	.215
		1.96	1.62	1.52	1.85		
Forest engineering		6.26	5.98	5.88	5.58	1.11	.344
		1.98	1.80	1.95	1.99		
Forest harvesting		6.05	6.06	5.90	5.60	.81	.489
		2.08	1.90	2.09	2.01		
Mill, manufacturing, and services		5.51	5.26	4.98	4.64	2.42	.066
		2.15	1.71	1.86	1.73		

[a]N ranged from 143 to 144 respondents.

[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.

[d]Differences determined by Scheffé at the .05 level of significance.

Highest degree held

Data in Table 24 compare the perceptions of foresters holding bachelor's, master's, and doctoral degrees concerning the importance of and emphasis on forestry education in Oregon public schools. Doctoral degree foresters group mean scores were lower than both the bachelor's and master's degree foresters group mean scores concerning the item stating that teaching about forestry is important at most grade levels in the public school system, and concerning the item stating that a forestry education curriculum should be required in all Oregon school districts. These differences were statistically significant at the .05 and .01 levels (respectively) of probability.

Data in Table 25 compare the opinions of foresters holding bachelor's, master's, and doctoral degrees concerning the involvement of their respective agencies in public school educational programs. It was observed that doctoral degree holding foresters group mean scores were lower than the bachelor's degree holding foresters group mean scores on the following items: 1) Your local timber industry must greatly improve its efforts in promoting forestry education in your community's public schools; 2) The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools; 3) Professional foresters/ timber industry should become involved in developing

Table 24. Importance of and current emphasis on forestry education in Oregon public schools as compared by foresters with bachelor's, master's, and doctorate degrees

Survey question		Groups: Bachelor's degree (1)	Groups: Master's degree (2)	Groups: Doctorate degree (3)	F-value	F-prob.
To what level do you agree that:						
Teaching about forestry is important at most grade levels in the public school system?	M[a]	6.85	6.91	6.00	3.23	.041
	SD[b]	1.94	1.96	2.11	3<1,2[c]	
	N[d]	267	95	36		
Education about forestry practices should be taught in the public high school curriculum?		7.00	7.08	6.33	2.61	.075
		1.75	1.82	1.55		
		266	96	36		

[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.

[c]Differences determined by Duncan at the .05 level of significance.

[d]Number of observations.

Table 24. Continued

Survey question	Groups: Bachelor's degree (1)	Groups: Master's degree (2)	Groups: Doctorate degree (3)	F-value	F-prob.
A curriculum concerning forestry education should be required in all Oregon school districts?	6.28 2.29 266	6.14 2.36 96	5.00 2.22 36	4.89 3<1,2[e]	.008
Vocational forestry should be a part of most high school vocational technology education departments in communities where the timber industry is a significant employer?	6.86 1.87 267	6.57 2.02 96	6.28 1.89 36	1.96	.143
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?	3.44 1.44 263	3.33 1.38 92	3.60 1.26 35	.51	.603
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?	2.83 1.28 263	2.94 1.44 93	2.72 1.30 36	.39	.680

[e]Differences determined by Scheffé at the .05 level of significance.

Table 25. Opinions of foresters holding bachelor's, master's, and doctorate degrees about the involvement of their respective agencies in public school educational programs

Survey question		Groups: Bachelor's degree (1)	Groups: Master's degree (2)	Groups: Doctorate degree (3)	F-value	F-prob.
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?	M[a]	7.16	6.51	6.12	6.17	.002
	SD[b]	1.92	2.22	2.39	1>2,3[c]	
	N[d]	264	94	32		
The timber industry, as a whole, must greatly improve its efforts in promoting forestry education in Oregon public schools?		7.35	6.83	6.29	6.51	.002
		1.70	2.09	2.36	1>3[c]	
		265	95	34		

[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.

[c]Differences determined by Scheffé at the .05 level of significance.

[d]Number of observations.

Table 25. Continued

Survey question	Groups: Bachelor's degree (1)	Groups: Master's degree (2)	Groups: Doctorate degree (3)	F-value	F-prob.
Professional foresters/ timber industry should become involved in developing educational partnerships with local schools?	7.40 1.59 265	7.42 1.73 96	6.66 2.07 35	3.20 1>3[c]	.042
Your firm/agency would be willing to provide cooperative work experience for vocational forestry/natural resource students in order for them to apply and reinforce their skills?	5.90 2.33 234	6.05 2.09 81	5.89 2.11 28	.13	.874
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?	5.35 2.50 225	5.24 2.43 78	5.45 2.13 29	.09	.916
Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula?	6.64 1.76 262	6.18 2.05 96	5.72 2.39 36	4.99 1>3[c]	.007

Table 25. Continued

Survey question	Groups: Bachelor's degree (1)	Groups: Master's degree (2)	Groups: Doctorate degree (3)	F-value	F-prob.
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)?	3.83 1.56 266	3.97 1.47 94	3.39 1.60 33	1.69	.186
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?	3.63 1.35 265	3.87 1.38 93	3.15 1.28 33	3.50 2>3[c]	.031

educational partnerships with local schools; and 4) Timber industry companies should be investing more money in the development of educational materials to be included in the public school curricula. Three of the four of these differences were statistically significant at probabilities which were beyond the .01 level.

When examining the perceptions of the three groups with regard to the five broad categories of forestry instruction, the following observations were made. Concerning a curriculum for all high school students, there were no differences noted between the groups (Table 26).

With regard to a curriculum for college-bound forestry students, statistically significant differences were noted in all of the instructional categories (Table 27). In four of the five categories, these statistically significant differences possessed a probability alpha which was less than .01. In all five cases, doctoral degree holding foresters group mean scores were lower than the bachelor's degree holding foresters group mean scores.

Concerning a curriculum for job-oriented forestry students, statistically significant differences were noted in all of the instructional categories (Table 28). In four of the five categories, these statistically significant differences were equal to or less than the .01 level of probability. In all five cases, doctoral degree holding

Table 26. The value of five broad areas of forestry instruction for all high school students as compared by foresters with bachelor's, master's, and doctorate degrees

Area of instruction		Groups: Bachelor's degree (1)	Master's degree (2)	Doctorate degree (3)	F-value	F-prob.
		(N=267)	(N=96)	(N=36)		
Forest ecology	M[a]	4.75	4.68	4.70	.09	.909
	SD[b]	1.49	1.37	1.61		
Forest management		3.54	3.41	3.34	.52	.598
		1.52	1.28	1.42		
Forest engineering		2.61	2.51	2.32	.93	.393
		1.35	1.11	.91		
Forest harvesting		2.80	2.63	2.44	1.55	.214
		1.41	1.09	.88		
Mill, manufacturing, and services		2.92	2.62	2.37	2.89	.057
		1.67	1.24	1.13		

[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 27. The value of five broad areas of forestry instruction for college-bound students as compared by foresters with bachelor's, master's, and doctorate degrees

Area of instruction		Groups: Bachelor's degree (1)	Master's degree (2)	Doctorate degree (3)	F-value	F-prob.
		(N[a])	(N=96)	(N=36)		
Forest ecology	M[b]	6.31	6.05	5.54	4.45	.012
	SD[c]	1.50	1.43	1.84	1>3[d]	
Forest management		5.64	5.24	4.58	5.73	.003
		1.90	1.89	1.79	1>3[d]	
Forest engineering		5.17	4.50	3.56	12.01	.001
		2.04	2.12	1.77	1>2,3[d]	
Forest harvesting		4.63	3.94	3.46	9.43	.001
		1.85	1.91	1.83	1>2,3[d]	
Mill, manufacturing, and services		4.76	4.17	3.38	10.42	.001
		1.85	1.99	1.79	1>2,3[d]	

[a]N ranged from 265 to 266 respondents.

[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.

[d]Differences determined by Scheffé at the .05 level of significance.

Table 28. The value of five broad areas of forestry instruction for job-oriented students as compared by foresters with bachelor's, master's, and doctorate degrees

Area of instruction		Groups: Bachelor's degree (1)	Master's degree (2)	Doctorate degree (3)	F-value	F-prob.
		(N[a])	(N=96)	(N=36)		
Forest ecology	M[b]	6.50	6.27	5.57	6.85	.001
	SD[c]	1.46	1.30	1.57	3<1,2[d]	
Forest management		6.23	6.08	5.33	4.67	.010
		1.65	1.68	1.67	1>3[d]	
Forest engineering		6.12	5.93	4.80	8.06	.001
		1.80	1.91	2.05	3<1,2[d]	
Forest harvesting		6.11	5.85	5.17	3.87	.022
		1.84	2.14	2.14	1>3[d]	
Mill, manufacturing, and services		5.35	4.94	4.17	7.96	.001
		1.76	1.78	1.85	1>3[d]	

[a]N ranged from 266 to 267 respondents.

[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.

[d]Differences determined by Scheffé at the .05 level of significance.

foresters group mean scores were lower than the bachelor's degree holding foresters group mean scores.

Major Findings

The following observations are considered to be the major findings of this study, with regard to the values and perceptions of members of the Oregon Society of American Foresters:

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.

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.

CHAPTER V. DISCUSSION

> A wise man will hear and increase in learning, And a man of understanding will acquire wise counsel, To understand a proverb and a figure, The words of the wise and their riddles. The fear of the Lord is the beginning of knowledge; Fools despise wisdom and instruction.
> --Proverbs 1:5-7 (NASV)

The purposes of this study were to determine whether forestry education should be integrated into Oregon's overall public instruction (particularly at the secondary level); and if so, what educational units of instruction should constitute the curriculum? From these key questions, three objectives were formulated in the development of 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.

Overall, the design of the study was appropriate relative to the objectives set forth. As Borg and Gall (1989) noted,

descriptive research is intended to produce statistical information about aspects of various educational programs for the benefit of policymakers. This study, as a piece of descriptive research, proved to be of interest to certain policymakers even before it was formally implemented. Clearly, the question of "what is" must be answered before questions of "why" can be pursued. This piece of work is adding to a body of knowledge which is, relative to other educational areas, very small. The findings, conclusions, and recommendations of this work may be of significant value to others who are interested in this area of education.

The frame used herein was appropriate in that it allowed for sampling the broadest distribution of university trained forestry professionals. The sample size that was used proved to be more than adequate to allow for the generalization of the findings to the larger population of OSAF foresters. While the procedure used to assure content validity appeared to have been acceptable, the instrument should have been pretested with a greater number of individuals, making the first 18 questions less divergent in nature. Overall, the factoring of the curriculum units proved to be satisfactory, as indicated by their strong reliability coefficients. The methodology in analyzing the data was effective in meeting the objectives. Finally, the high respondent rate (83.3%) suggests that professional foresters were very interested in

expressing their views on the issue of forestry education, and its value in Oregon's public schools.

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 (Table 3). 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 (Table 3).

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 (Table 3). 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 (Table 4). 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 (Table 4). In attempting to ascertain their degree of commitment on a personal level, the strength of their responses dropped (Table 4). 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 (Table 4).

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 (Table 5). 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

agriculture 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 should advocate a state-wide mandate that all Oregon school districts offer a balanced forestry education curriculum which specifically 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 agriculture 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 agriculture-forestry program, and those students who have.

CHAPTER VI. SUMMARY

> There is an appointed time for everything. And there is a time for every event under heaven--A time to give birth, and a time to die; A time to plant, and a time to uproot what is planted. ...A time to search, and a time to give up as lost; A time to keep, and a time to throw away. A time to tear apart, and a time to sew together; A time to be silent, and a time to speak.
>
> --Ecclesiastes 2:1-2, 6-7 (NASV)

The purposes of this study were to determine whether forestry education should be integrated into Oregon's overall public instruction (particularly at the secondary level); and if so, what educational units of instruction should constitute the curriculum. Three objectives were formulated in the development of 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.

This study was descriptive in its methodology. The population of interest in this study was "full members" of the Oregon Society of American Foresters. It was determined that a sample size of 400 would adequately represent the population, and allow inferences to be made. The survey instrument consisted of four parts: forest education perceptions, forest education solutions, high school instructional units, and demographic information. The section on high school instructional units was designed to collect perceptions on curriculum from professional foresters for three target audiences: all high school students, college-bound forestry students, and job-oriented forestry students. The data were collected over the course of three mailings. At the official cut-off date, the researcher had acquired an 81.17% response rate. The data were entered onto and analyzed with an HDS-AS/9180 mainframe computer using SPSS. Statistical tools included frequencies, percents, measures of central tendency, t-tests, and ONE-WAY ANOVAs.

The following observations are considered to be the major findings of this study, with regard to the values and perceptions of members of the Oregon Society of American Foresters:

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

2. Respondents believed strongly 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 strongly 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 at the local level as well as the state level was rather 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.

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 were virtually no differences 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. Foresters who had a Ph.D. degree tended to rate the importance of forestry education in Oregon schools lower than did those whose highest degree was a B.S.

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.

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 in at least 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 agriculture 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. 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 topics and issues 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 agriculture-forestry program, and those students who have.

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The researcher would like to introduce this section of thanks and gratitude with the following profound observation:

> I used to think that the lengthy and flowery expressions of gratitude which grace the front of most books, and which indeed are the liveliest part of many, were simple vanity. Now I see otherwise. ...I now believe that the length and fervor of acknowledgements is simply a recognition of the special joy of the collegial relationship. The labor is lengthy, tedious, and frequently conflicts with most human impulses--'I can't; I have to work on the book.' ...Therefore, people write windy acknowledgements. So be it. This is the passionate part of an otherwise analytical and hopefully objective study. (Dana & Fairfax, 1980, pp. xv-xvi)

My greatest thanks of all is to my God and Savior, Jesus Christ, for having given me the strength, endurance, guidance, protection, and provision through this, the most challenging academic endeavor of my life. "...for I know whom I have believed and I am convinced that He is able to guard what I have entrusted to Him until that day" (II Timothy 1:12). "For I am confident of this very thing, that He who began a good work in [me] will perfect it until the day of Christ Jesus" (Philippians 1:6).

From an earthly perspective, I owe a great debt of gratitude, thanks, and love to my darling wife, Debbie; for without her, I most literally would not have been able to earn this degree. Certainly, it belongs to her as much as it belongs to me. I also thank my two daughters, Heather and

Heidi, for their understanding and love in order for their father to finish the "big book" and become "Dr. Daddy."

I wish to express my most sincere thanks to my parents, Grant and Bonnie Tipton, and my parents-in-law, Andy and Bobbie Zedwick, for their constant support, encouragement, and prayers. Mom, thanks for your constant faith and inspiration!

I wish to thank my co-major professor, Dr. Alan Kahler, for his friendship, spiritual insight, and leadership in directing this study. I would like to thank as well, Dr. Richard Lee Cole, my undergraduate and graduate professor at Oregon State University, for the same three things; his friendship, spiritual insight, and leadership in preparing me to become a forestry/natural resources instructor, as well as for later introducing me to his doctoral major professor--Dr. Alan Kahler.

I wish to thank my co-major professor, Dr. Wade Miller, for his role in guiding the research aspect of this study, as well as for teaching me to write like a professional. My appreciation is extended to him as well for his thoughtfulness and consideration toward the needs of my family.

I wish to thank my minor area professor, Dr. Steven Jungst, for his role in broadening my perspective of the profession of forestry, as well as for his modeling of what constitutes a truly effective forestry professor.

I wish to thank Dr. Anton Netusil for his help in guiding the statistical analysis component of this study, as well as for performing the miracle of transforming this individual from someone who did not believe that they could ever understand or apply statistics, to someone who has come to truly enjoy the application of his newly acquired skill.

I wish to thank Dr. Richard Carter for his contributions to this work, and for his personal touch in helping me to recognize and understand my strengths and weaknesses as a leader.

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My thanks to Mr. Clark Seely, the 1991 President of the Oregon Society of American Foresters, for his vision in, and support of, this study.

I wish to thank my pastors, Daniel Stipp and Tom Nesbitt, for their friendship, wise counsel, and Godly leadership. I would also like to thank the class members of the Median 'A' Life Group at Grand Avenue Baptist Church for their commitment to praying me through this entire process--step-by-step.

Finally, I would like to especially thank my peers and colleagues; Felix Gooding, Gary White, Roger Roe, and Gaylan Scofield, for their deep friendship, and for touching my life in a very special way. Thanks, guys!

APPENDIX A.

HUMAN SUBJECTS APPROVAL

Information for Review of Research Involving Human Subjects

Iowa State University

(Please type and use the attached instructions for completing this form)

1. Title of Project: An Evaluation of the Perceptions and Values of Forest Education in the Oregc Public School System, as Indicated by Professional Foresters in Oregon.

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2. I agree to provide the proper surveillance of this project to insure that the rights and welfare of the human subjects are protected. I will report any adverse reactions to the committee. Additions to or changes in research procedures after the project has been approved will be submitted to the committee for review. I agree to request renewal of approval for any project continuing more than one year.

Grant M. Tipton III	02-06-91	Grant M. Tipton III
Typed Name of Principal Investigator	Date	Signature of Principal Investigator

Agricultural Education & Studies	223-A Curtiss Hall	4-0901
Department	Campus Address	Campus Telephone

3. Signatures of other investigators

	Date	Relationship to Principal Investigator
Clark Kelly	2/6/91	Co-Major Professor
W. Wade Miller	2/6/91	Co-Major Professor

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4. Principal Investigator(s) (check all that apply)
☐ Faculty ☐ Staff ☒ Graduate Student ☐ Undergraduate Student

5. Project (check all that apply)
☐ Research ☒ Thesis or dissertation ☐ Class project ☐ Independent Study (490, 590, Honors project)

6. Number of subjects (complete all that apply)
600 # Adults, non-students ___ # ISU student ___ # minors under 14 ___ # minors 14 - 17 ___ other (explain)

7. Brief description of proposed research involving human subjects: (See instructions, Item 7. Use an additional page if needed.) To examine the perception and values placed upon various components of forest education as provided by professional foresters in Oregon. Furthermore, to determine what units of instruction said professionals would recommend in curricula for both science/biology course work, and vocational forestry/natural resources programs. A survey questionnaire will be distributed to a random sample of professional forester drawn from the membership list of the Oregon Society of American Foresters. Followup techniques will include one post card followed by a second questionnaire. A summary statement of the data will be given a an incentive to those who wish to receive a copy (A copy of the questionnaire and the Letter of Transmittal is enclosed.)

(Please do not send research, thesis, or dissertation proposals.)

8. Informed Consent:
☐ Signed informed consent will be obtained. (Attach a copy of your form.)
☒ Modified informed consent will be obtained. (See instructions, item 8.)
☐ Not applicable to this project.

9. Confidentiality of Data: Describe below the methods to be used to ensure the confidentiality of data obtained. (See instructions, item 9.) Each name on the acquired membership list will be assigned a code number (only on random names selected for participation). That same number will be placed on the questionnaire which will be mailed to the corresponding individual. Upon completion of the research, all data collection instruments including the membership list will be destroyed.

10. What risks or discomfort will be part of the study? Will subjects in the research be placed at risk or incur discomfort? Describe any risks to the subjects and precautions that will be taken to minimize them. (The concept of risk goes beyond physical risk and includes risks to subjects' dignity and self-respect as well as psychological or emotional risk. See instructions, item 10.)

None.

11. CHECK ALL of the following that apply to your research:

- ☐ A. Medical clearance necessary before subjects can participate
- ☐ B. Samples (Blood, tissue, etc.) from subjects
- ☐ C. Administration of substances (foods, drugs, etc.) to subjects
- ☐ D. Physical exercise or conditioning for subjects
- ☐ E. Deception of subjects
- ☐ F. Subjects under 14 years of age and/or ☐ Subjects 14 - 17 years of age
- ☐ G. Subjects in institutions (nursing homes, prisons, etc.)
- ☐ H. Research must be approved by another institution or agency (Attach letters of approval)

None.

If you checked any of the items in 11, please complete the following in the space below (include any attachments):

Items A - D *Describe the procedures and note the safety precautions being taken.*

Item E Describe how subjects will be deceived; justify the deception; indicate the debriefing procedure, including the timing and information to be presented to subjects.

Item F For subjects under the age of 14, indicate how informed consent from parents or legally authorized representatives as well as from subjects will be obtained.

Items G & H Specify the agency or institution that must approve the project. If subjects in any outside agency or institution are involved, approval must be obtained prior to beginning the research, and the letter of approval should be filed.

Checklist for Attachments and Time Schedule 138

The following are attached (please check):

12. [X] Letter or written statement to subjects indicating clearly:
    a) purpose of the research
    b) the use of any identifier codes (names, #'s), how they will be used, and when they will be removed (see Item 17)
    c) an estimate of time needed for participation in the research and the place
    d) if applicable, location of the research activity
    e) how you will ensure confidentiality
    f) in a longitudinal study, note when and how you will contact subjects later
    g) participation is voluntary; nonparticipation will not affect evaluations of the subject

13. [ ] Consent form (if applicable)

14. [ ] Letter of approval for research from cooperating organizations or institutions (if applicable)

15. [X] Data-gathering instruments

16. Anticipated dates for contact with subjects:

First Contact	**Last Contact**
March 29, 1991	May 10, 1991
Month / Day / Year	Month / Day / Year

17. If applicable: anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased:

August 1, 1992
Month / Day / Year

18. Signature of Departmental Executive Officer | Date | Department or Administrative Unit


2/18/91 | Agricultural Education & Studies

19. Decision of the University Human Subjects Review Committee:

X Project Approved ___ Project Not Approved ___ No Action Required

Patricia M. Keith — Name of Committee Chairperson

2/21/91 — Date


Signature of Committee Chairperson

APPENDIX B.

SURVEY INSTRUMENT

IOWA STATE UNIVERSITY
of Science and Technology
140

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 I9 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-OREINTED 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

(CONTINUE ON NEXT PAGE)

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

(STOP)

APPENDIX C.

FIRST MAILING: LETTER OF TRANSMITTAL

Iowa State University of Science and Technology Ames, Iowa 50011-1050

March 22, 1991

Department of Agricultural Education and Studies
201 Curtiss Hall
Telephones:
Administration and Graduate Programs 515-294-5904
Research and Extension Programs 515-294-5872
Undergraduate Programs 515-294-6924

ATT: Joe Forester 777
777 Sample-Name Lane
Tree City, OR 97777-7777

Dear Joe Forester:

You have been randomly selected as a participant in a state-wide study on the importance of forestry education in Oregon Public Schools. We are interested in your perceptions and values in identifying what role forestry education should have in the curriculum of secondary public instruction. The information you provide may be valuable in potentially modifying future instruction concerning forest science and forest practices in Oregon schools.

This project is a cooperative effort between Iowa State University [ISU], the Oregon Department of Education-Division of Vocational Technical Education, and the Oregon Society of American Foresters. Grant Tipton, a former Oregon forestry educator, will conduct the data collection and statistical analysis at ISU.

We will appreciate approximately twenty minutes of your time to fill out the enclosed questionnaire. The information you voluntarily provide will be treated with strict confidence. Your identity will not be revealed, as only group summary information will be reported. An identification number has been printed on the enclosed questionnaire to prevent sending a second questionnaire once you have responded.

We are greatly interested in your perceptions, and we stress the need for your participation. Upon completion of the questionnaire, please place it in the enclosed business reply envelope, and drop it in the mail. If you do not wish to participate in the survey, please indicate this on the questionnaire, and return it. We need your response by <u>April 12, 1991</u>.

Together, we can provide answers to questions that will improve forestry education in Oregon Schools. We thank you in advance for your response. If you have any questions concerning the study, feel free to call Grant Tipton at (515) 294-0895.

Sincerely,

Grant M. Tipton
Iowa State University

Don L. Sligar
Forestry Specialist
Oregon Dept. of Education-
Div. of Vocational Technical
Education

Clark W. Seely
President
Oregon S.A.F

APPENDIX D.

POSTCARD FOLLOW-UP

Grant & Debbie Tipton
156-A University Village
Ames, IA 50010-8802

PROFESSIONAL OREGON FORESTER:

A short time ago you were personally invited to take part in a survey of professional Oregon foresters. Thus far, we have not received your completed questionnaire. Your response is **important** and will make a difference in the study.

Please complete the questionnaire and return it as soon as possible. If you need another copy of the survey, call Grant Tipton at 515-294-0895.

If you have already sent your response, please disregard this reminder and thanks for your cooperation.

APPENDIX E.

THIRD MAILING: LETTER OF TRANSMITTAL

Iowa State University of Science and Technology Ames, Iowa 50011-1050

Department of Agricultural Education and Studies
201 Curtiss Hall
Telephones:
Administration and Graduate Programs 515-294-5904
Research and Extension Programs 515-294-5872
Undergraduate Programs 515-294-6924

April 29, 1991

Dear Oregon Forestry Professional:

About a month ago, you were sent a questionnaire and a personal letter stating that you had been randomly selected as a participant in a state-wide study on the importance of forestry education in Oregon Public Schools. Two weeks ago you were sent a follow-up postcard stating that we had not yet received your completed questionnaire at that time. We are very interested in your perceptions and values in identifying what role (if any) forestry education should have in the curriculum of secondary public instruction, and to assure you that the information you provide will be valuable in modifying future instruction concerning forest science and forest practices in Oregon schools. With this in mind, we have provided you with a second questionnaire. **If you have already sent your response, please disregard this reminder, and thanks for your cooperation.**

This project is a cooperative effort between Iowa State University [ISU], the Oregon Department of Education-Division of Vocational Technical Education, and the Oregon Society of American Foresters. Grant Tipton, a former Oregon forestry educator, will conduct the data collection and statistical analysis at ISU.

The information you voluntarily provide will be treated with strict confidence. Your identity will not be revealed, as only group summary information will be reported. Again, we are greatly interested in your perceptions, and we stress the need for your participation. Upon completion of the questionnaire, please place it in the enclosed self-addressed, stamped envelope, and drop it in the mail. If you do not wish to participate in the survey, please indicate this on the questionnaire, and return it. We need your response by <u>May 10, 1991</u>.

Together, we can provide answers to questions that will improve forestry education in Oregon Schools. We thank you in advance for your response. If you have any questions concerning the study, feel free to call Grant Tipton at (515) 294-0895.

Sincerely,

Grant M. Tipton
Iowa State University

Don L. Sligar
Forestry Specialist
Oregon Dept. of Education-
Div. of Vocational Technical
Education

Clark W. Seely
President
Oregon S.A.F

APPENDIX F.

COMPLETE TABLES OF INSTRUCTIONAL UNIT MEANS

Table 29. 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 29. 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 29. 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 30. 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	5.50	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 30. 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 30. 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 31. 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 31. 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 31. 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

APPENDIX G.

STATISTICALLY SIGNIFICANT GENDER DIFFERENCES

Table 32. Statistically significant differences noted between male and female respondents

Item		Males	Females	t-value	t-prob.
		(N=315)	(N=80)		
Survey question #4	M[a]	6.71	6.00	2.03	.043
	SD[b]	1.94	1.98		
	N	279	35		
Survey question #17		6.40	5.68	2.33	.021
		1.94	1.95		
		277	34		
Forest ecology for all high school students		4.75	5.36	-2.34	.020
		1.46	1.37		
		279	35		

[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.