

AN ABSTRACT OF THE THESIS OF

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Title: FORESTRY COMPETENCIES NEEDED BY HIGH SCHOOL GRADUATES

AS RATED BY EMPLOYERS, SECONDARY AND POST-SECONDARY INSTRUCTORS

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Abstract approved:

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Career Cluster Programs in Oregon's secondary schools are causing tremendous change in Oregon education as over 41 percent of our high school juniors and seniors are currently enrolled in a preparatory cluster program.

Forestry is one of the cluster programs in Oregon and instruction is provided under the Forest Products and Agriculture clusters. Students completing the program should leave the secondary school prepared with entry level competencies in the cluster or family of occupations in forestry.

The purpose of this study is to identify and give priority to the forestry competencies most commonly needed by high school graduates in Oregon. Instructional time can be better used when the competencies identified as the most important are taught first.

A survey instrument which identified 170 forestry competencies was mailed to 30 forestry employers, 29 secondary forest products

instructors, 23 community college forestry instructors in Oregon, 18 secondary agriculture forestry instructors, and 13 community college forestry instructors from Washington. Respondents expressed their opinion on each competency by checking whether it was "essential," "necessary," "nice to know," or "not necessary" for a graduate from a high school forestry program. Respondents were encouraged to write in additional competencies at the end of each section.

Eighty-five or 75.2 percent of the survey forms were returned. Total mean scores were used to rank the 170 competencies and the 26 units of instruction. Thirteen competencies were classified as "essential," 101 "necessary," 55 "nice to know" and one "not necessary." One unit of instruction in forestry was considered "essential," 17 units were classified as "necessary," and eight units were classified as "nice to know."

The major findings of the study indicated:

1. That forestry competencies needed by high school graduates can be identified and ranked.
2. There is a need for the forestry competencies rated "essential" and "necessary" to be taught in high school forestry programs.
3. Forestry competencies rated "nice to know" are not vital in a forestry program, but could be included if instructional time is available.
4. Forestry competencies rated "not necessary" should not be taught in high school forestry programs.

5. That priority needs to be given to competencies with highest rank order, when instructional time in forestry is limited.
6. That the importance of the forestry units of instruction be considered and the units be taught with the same emphasis as the rank order received.
7. Forestry employers rate competencies needed by high school graduates closer to the total mean score than the other groups surveyed.

**Forestry Competencies Needed by High School Graduates
As Rated by Employers, Secondary and Post-Secondary Instructors**

by

Roger Ellis Schoenborn

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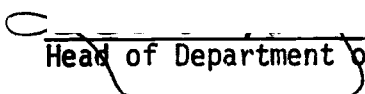
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FORESTRY COMPETENCIES NEEDED BY HIGH SCHOOL GRADUATES
AS RATED BY EMPLOYERS, SECONDARY AND POST-SECONDARY INSTRUCTORS

I. INTRODUCTION

Education in Oregon is currently undergoing tremendous change. Today's youth are faced with the challenge of preparing themselves academically and vocationally for their life's work. Many opportunities exist. The Careers Cluster Concept is providing opportunities for students to enroll in cluster programs that were not even provided a few years ago. Changes are also occurring in the forestry industry. With changes occurring in both our educational system and in forestry, an evaluation of the current curricula content is paramount.

Students and parents alike are finally getting the message-- "A college education does not guarantee employment." Today over 41 percent (23, p. 1) of our high school juniors and seniors are enrolled in a career cluster program. It becomes increasingly important that education in high school provide experiences that are skill and job oriented. These experiences must be meaningful and articulated with the next step in education and with the industry where the student will eventually be employed.

Career education in Oregon is being provided through the method entitled "The Oregon Way." This method stresses the dignity of work and provides students in grades kindergarten through six with an "awareness" of the real work world. An awareness of the relationship

of careers to the life roles of family, citizen and avocational interests is stressed (22). Positive attitudes toward work and society are encouraged along with respect and appreciation for workers in all fields. In grades seven through ten "career exploration" "encourages students to explore the world of work and to experience activities related to specific careers" (22). Students are given opportunities to explore working conditions, skills, knowledge, and technical requirements of each of the career fields that are open to them. Tentative career goals are made after interests, abilities, and aptitudes are explored. In high school grades 11 and 12, students have the opportunity to set a broad career goal and to enroll in a careers cluster program. Through the career cluster program, "career preparation" for the occupational fields of their choice begin, and skills and knowledges common to a number of related occupations are acquired. This will assist students in obtaining entry level employment in jobs not requiring advanced training, or in continuing their education and training in post-high school institutions in more specialized vocational programs.

Statement of the Problem and Need for the Study

Entry level skills are necessary when a student completes his secondary education if he expects to be employed. If he intends to seek further education in his chosen occupational field, the skills

and experiences in the secondary program should be the building blocks for the post-secondary program.

Specific jobs can be grouped into families or clusters of occupations. These clusters have similar skills or competencies that can be identified for the purpose of instruction. A need exists to determine the relevance of and give priority to the long list of individual competencies.

The purpose of the study is to place some order and priority upon the competencies needed by graduates of high school forestry, an occupational cluster and a specialized course in the agricultural occupational cluster.

In Oregon some 13 career cluster options have been developed to completion. Five additional cluster programs are in the planning stages and will be completed soon. Although it is impractical for each high school to provide all 18 of the cluster programs for its students, each school may incorporate any or all of the clusters into its career education program.

Forestry training is presently provided under the Forest Products Cluster and as a specialty program under the Agriculture Cluster. The Suggested Forest Products Core Curriculum (20, p. i-41) contains 19 instructional units or specialty areas. These units are normally taught in a two-hour class for 36 weeks for one or two years to high school juniors and seniors. The Agriculture Cluster Guide for Oregon (17, p. 1-151) does not specifically identify

forestry competencies, but does include Plant Science as one of the six occupational specialty areas. In regions of the state with high employment in forestry jobs, agriculture programs are providing two-hour classes daily for 18 or 36 weeks in specialty classes in forestry. The agriculture program in forestry parallels the forest products program. In other parts of the United States forestry is covered under Agriculture or Natural Resource Education in Agriculture. The forestry subject matter in both the Forest Products and Agriculture Clusters can be combined and treated through the 170 specific competencies.

There is a need to rank these 170 forestry competencies, to determine which competencies are commonly needed by graduates as viewed by forestry employers, secondary instructors in forestry, and post-secondary forestry instructors. Further, there is a need to determine which competencies are of the most importance. Those which rank highest should be given the highest priority of class instruction time. By determining the competencies that are "essential" and "necessary" in a secondary forestry program, priority can be placed on instruction time and the program can be more closely articulated with the needs of forest products industries and specialized post-high school training in forestry. Valuable suggestions can also be made concerning course content, scope and sequence of high school forestry instruction.

Objectives of the Study

This investigation shall achieve the following:

1. To identify forestry competencies commonly needed by high school graduates as rated by employers, secondary, and post-secondary instructors.
2. To rate the specific forestry competencies as being "essential," "necessary," "nice to know," or "not necessary."
3. To place a priority on specific forestry competencies by establishing a rank order of all identified competencies.
4. To rate the forestry units within the forestry cluster as being "essential," "necessary," "nice to know," or "not necessary," and place them in rank order.

Definition of Terms

1. Agriculture Forestry Instructor

A teacher in the agriculture occupational cluster that teaches a specialized course in forestry.

2. Agriculture Cluster

One of the 18 occupational clusters in Oregon where those related jobs are grouped into a family of occupations dealing with agriculture.

3. Articulation

When a secondary program relates its curriculum and

competencies with the next step so that a natural progression is achieved and the student is able to move directly to the job or to a higher level post-secondary occupational program.

4. Career

Deals with selecting a lifelong job, profession, occupation, or vocation.

5. Career Awareness

A part of Career Education in grades kindergarten through six that promotes learning about careers and the changing world of work. Students will develop awareness and attitudes, and gain knowledge and respect for all workers.

6. Career Cluster Concept

An approach to teaching secondary Career Preparation for a group or family of occupations requiring similar skills and knowledges of workers. Eighteen such clusters have been identified and are in operation in Oregon.

7. Career Education

An integral part of the total educational program that embraces the concept that each person functions in several roles during his lifetime; that of a lifelong learner, a citizen, a producer, a consumer, an individual and a family member. Career education in Oregon focuses on the economic or producer role, providing career awareness, career

exploration, career preparation, and career specialization.

8. Career Exploration

A part of Career Education in junior high school grades seven through ten that promotes exploration of the world of work and to experience activities related to specific careers. Students will determine interests, abilities, and aptitudes; explore key occupational areas; and make a tentative career choice.

9. Career Preparation

A part of Career Education for 11th and 12th grade students that promotes identifying a career cluster program that will begin to prepare them for a chosen occupation. Students will develop leadership, acceptable job attitudes, and skills and knowledge for either entry level employment or advanced occupational training.

10. Career Specialization

A part of Career Education for community college students that promotes building on a high school cluster program to acquire specialized skills required for a specific job. Students will develop specific occupational knowledge and preparation for a job.

11. Cluster

Selected occupations are clustered in logical groups in which the occupations are related because they have similar teachable skill and knowledge requirements (8, p. 1).

12. Competency

Skills, abilities, and knowledge that will make a student or worker better able to perform his duties.

13. Entry level skills

"Those competencies which every student should acquire from a careers cluster in order to gain basic employment within that cluster's family of occupations" (15, p. 10).

14. Forest Products Cluster

One of the 18 occupational clusters in Oregon where those related jobs are grouped into a family of occupations dealing with forest products industries.

15. Forestry employer

A person who employs forestry workers and knows the entry level skills necessary for the worker to perform.

16. The Oregon Way

The name given to the Career Education program in Oregon (22) that:

- is one of the dynamic forces in Oregon's schools.
- is for all students--and includes all occupations.
- brings more meaning to the curriculum.
- helps students see a relationship between their school experiences and what they need to meet the challenges of life.
- is the delivery system which helps students develop the competencies needed to function in the life role of producer.
- happens best when its basic concepts are used throughout the entire school program.
- is the result of school and community cooperation in providing learning experiences.

- is based on long-range planning, local community and citizen involvement, and student needs.
- provides students with the skills and self-confidence which will enable them to cope with whatever life throws at them.

17. World of Work

Deals with making a living after completing school.

Survey Terms Defined

1. Essential Competency

A competency which must be taught in the high school forestry program and must be mastered by the student in order to fulfill Forestry objectives.

2. Necessary Competency

A competency which should be taught in most situations and is usually needed by the student in order to fulfill Forestry objectives.

3. Nice to Know Competency

A competency which would be of some use to the student, but which is not necessary or essential in fulfilling Forestry objectives.

4. Not Necessary Competency

A competency to which the student needs no exposure in order to fulfill Forestry objectives.

5. No Opinion on this Competency

A competency that is not familiar to the observer or of which he does not care to give an opinion.

Limitations of the Study

This investigator assumes the following limitations of this study:

1. This study is limited specifically to secondary Forestry competencies taught in secondary forestry classes in the Forest Products Cluster and secondary specialty classes in forestry in the Agriculture Cluster.
2. This study is limited to the actual responses on the surveys returned to the investigator. It must be further assumed that the instrument used in the survey is valid and reliable.
3. The survey instrument used in this study was limited in distribution to 100 percent of the secondary forest products instructors, 100 percent of the secondary forestry instructors in agriculture, and 100 percent of the community college forestry instructors in Oregon. It was also limited in distribution to 100 percent of community college forestry instructors in Washington and to 30 key forestry employers in Oregon. Findings of this study can therefore be assumed to be valid only for the state of Oregon. Articulation with community college programs can be assumed to be valid for the states of Oregon and Washington.

4. The survey instrument was limited to 30 forestry employers in Oregon. It must be assumed that this sample is a valid representation of the forest industry in the state.
5. The same cover letter accompanied each of the survey instruments mailed. A better understanding of the purpose of the survey may have been accomplished if a separate letter would have been mailed to each of the separate groups being surveyed.

II. REVIEW OF RELATED LITERATURE

High school programs in career cluster areas are designed for career preparation. When students reach the 11th and 12th grades, efforts are focused on setting broad career goals and identifying an occupational cluster which appears promising to them. Oregon's goal is to make cluster programs available to 70% of our high school juniors and seniors by 1978 (22). As a result of participating in a high school career cluster program, it is anticipated (22) that the student will be able to:

- Apply high school experience to solve daily problems.
- Develop leadership skills through participation in a vocational youth organization.
- Develop acceptable job attitudes. Participate in a work experience program.
- Develop skills and knowledge for either entry level employment or advanced occupational training.

Before these above goals can be achieved, the high school instructor should identify and review information on the tasks that are performed on the job, so that the identified competencies are taught in the career cluster program. If the competencies needed for entry level employment and for advanced occupational training have been identified, what is taught in the high school can and should be closely articulated with post-secondary instruction and with industry.

It naturally follows, that since the forest based industry is extremely important to the economy of the State of Oregon, there are many occupational opportunities in forestry. "Oregon is the nation's

leading timber state with over one fifth of the country's saw timber supply" (26, p. 13). High school students need to master the basic skills essential in forestry in order to be prepared to enter forestry jobs in the various aspects of production, processing, and marketing. Others will want to pursue further study in order to qualify for professional or technical work in forestry.

Exploring Forestry Competencies

Exploration of those competencies related to forestry instruction is essential before any priorities can be established. Once exploration is completed, priorities of individual competencies and instruction time can be formed.

In Oregon, forestry curriculum development first began in 1943. N. S. Rogers, State Forester, (19, preface) reports that:

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.

As a result of Rogers' concern, he and the Salem High School Principal developed an experimental forestry course that was taught during the 1942-1943 school year. Five foresters from the State Forestry Department and a Salem High School faculty member wrote the seven chapters that covered 28 units of instruction. Although no skills or competencies were identified, the seven chapters discussed the total field of forestry in a manner that is relevant today.

No further curriculum development for secondary forestry programs in Oregon can be found until 1970. Industry and education started working together using Oregon manpower data to analyze tasks and knowledge common in key forestry occupations. An Occupational Cluster Guide for Forest Products was developed and published in 1972. "Representatives of the forest products industry, special consultants and teachers have participated in analysis studies, workshops, and committee sessions..." (18, p. iii) in developing the guide. The Occupational Cluster Guide for Forest Products in Oregon (18, p. 53-163) proposes a complete two-year forestry program. The guide is divided into eight basic sections; each of which is divided into three sections: "Required Knowledge," "Expected Behaviors (Skills) The Student Will Be Able To," and "Suggested Learning Activities."

Loreen (11, p. 1-36) coordinated the development of a forestry guide for the teachers and students of the State of Washington. This guide is divided into 16 forestry units which are further separated into four sections: "Student Objectives--Upon completion of this unit the student will be able to," "References," "Topics for Study and Discussion," and "Activities." Loreen further states (11, p. viii):

"It is strongly recommended that students are given an opportunity to be involved in a considerable amount of field work either through class field trips or through cooperative occupational experience programs."

At Centralia, Washington, Coumbs (3, p. 211) reports that his

agriculture student enrollment "...has increased from 30 students to over 200 in four years...by stressing environmental and natural resources in conjunction with the practicality and activity long associated with Vo-Ag programs..."

Throughout the United States almost all of the secondary forestry programs are offered as part of the vocational agriculture program.

Wilmot and Tulloch (28, p. 176) report on a two part plan for vocational agriculture instructors who were interested in developing a high school forest and natural resource program. The program developed in cooperation with teacher educators from the University of Kentucky was devised to:

- 1) develop a more relevant course of study, and 2) to provide the teacher with up-to-date technical and central training to teach the course. After preliminary planning and making use of present competency-based forestry materials, the teacher of agriculture from the county spent many hours with government and private industry employers. His purpose was to determine what attitudes, knowledge, and skills would need to be developed by high school students in order to prepare them for job entry in the employment opportunities of the area.

Wilmot and Tulloch (28, p. 177) further report:

The "plan of action" provided on-the-job training for the teacher so that he could acquire, firsthand, the competencies required of students.

The competencies considered essential by the U. S. Forest Service and private businesses (28, p. 177) included:

Basic skills in or related to plane surveying; forest measurement by both direct and indirect measurement

and volume computation; applied silviculture including artificial reforestation, natural forestation, weeding, thinning, pruning and cutting techniques; forest soils; timber harvesting; and forest protection. Other areas in which the on-the-job training was essential included outdoor recreation and wildlife ecology.

In a related study Legacy (9, p.2) determined that competencies needed by teachers were similar to those needed by workers.

At White Pass High School, Randle, Washington, Sadler (25, p. 181) reports that "a two-year alternate program in forestry" has been created from "the advice offered by the Vocational Agricultural Advisory Committee." Sadler further states:

Agriculture IV, Forest Industries, is taught one year and the following year Agriculture V, Forestry and Natural Resources is offered. Our Forest Industries Course covers tree identification (dendrology), all the local forest industries, safety as related to the State of Washington Forest Industry Handbook, logging equipment, Industrial First Aid, maps and compass reading, chain saw operation, wildlife ecology, and timber cruising. Time is allowed for group and individual projects. The Forestry and Natural Resources Course duplicates timber identification, timber cruising, and map reading, because of the difficulty and need for this knowledge in forestry occupations. New units for this year are forest insects and disease, fire fighting, Christmas tree culture, raising seedlings, reforestation, management of the forest, forest laws, scaling timber, and an elementary transit and survey unit.

Michigan's Agriculture/Natural Resources Cluster Guide (13, p. 9) identifies ten "Instructional Task Modules" in Forestry and Recreation for eight selected entry occupations. The "Instructional Task Modules" include:

1. Establish a woodland.
2. Thin a tree stand.

3. Improve a tree stand.
4. Identify insect and disease damage.
5. Use and field service forestry tools.
6. Harvest stands.
7. Cruise and measure a stand.
8. Produce and harvest Christmas trees.
9. Cut and prepare pulp wood.
10. Identify forest management services.

Each of the above tasks are divided into "Behavioral Task Knowledges/Task Skills," "Instructional Methods," "Task Related Competencies," "Instructional Materials," "Language of the Task," "Quantitative Concepts," and "Suggestions" (13, p. 133-162).

Most of the forestry curriculum materials reviewed were developed for local departments or individual states use. Householder and Moore (5, p. 12), developed forestry units through the use of competency lists reviewed by forest industry representatives and vocational forestry teachers throughout the United States. The curriculum guide developed by Householder and Moore (5, p. 15-168) is composed of 30 units of instruction, organized under six general headings:

1. Forestry
2. Forest Establishment
3. Forest Protection
4. Logging-Harvesting and Transporting
5. Wood Utilization
6. Christmas Tree Production

The above instructional units (5, p. 3) "are based upon the competencies of entry level skilled occupations in forestry," as reviewed by four specialized high school forestry teachers, one from Oregon and Ohio, and two from Georgia; and two forestry industry

representatives from Georgia.

Priority of Forestry Competencies

Once the forestry competencies have been identified, priorities need to be placed on the instruction time, so those competencies that are essential will be taught. Amberson, Bishop, and Agocs (1, p. 3-4) state that:

The problem in the youth labor market is not in the number of jobs available but the fact that in the world of work, we have stacked the cards against our young people by not teaching them the necessary skills to be employable.

Gagnon (4, p. 346) points out "that a proper role of the community, the parents, and the students is to question what takes place inside the classroom." He further suggests that such questions might be:

- What is it the profession wants to teach?
- Why should these skills, ideas, values, etc., be taught?
- How does the profession know when these skills, ideas, and values have been taught?

Some suggested priorities have been developed for forestry instruction. In 1974, the Oregon State Department of Education published a core curriculum (20, p. i-41) listing 19 separate units in forestry. Each unit contained four subheadings including "Competency/Skill," "Performance Indicators," "Learning Activities," and "Estimated Time." This suggested core curriculum was written by four forestry products instructors pulling together those areas of

instruction and competencies considered essential. They suggest (20, p. i) that "Instructors with two year programs can expand the units presented in this guide and include additional units suggested in the Forest Products Cluster Guide (18) to reflect local needs."

Articulation of Forestry Instruction

Parnell (24, p. 104) states:

If a student goes through a good career-cluster program in high school, he should be prepared for an entry-level job but, more likely, he or she will be prepared for specialized, postsecondary education and training. Community colleges and high schools are urged to cooperate in planning an articulated educational program that will enable all students to achieve their career goals regardless of where they live.

The need for articulation between community colleges and secondary career-cluster programs has been recognized and suggested for several years. A Suggested Five Year Plan for Forest Products (21, p. 3) includes "Articulation" as one of the initial components of a forestry program.

Loewen (10, p. 51) states that the major problem of articulation is "determining what specifically was to be articulated and how was it to be accomplished." To avoid duplication it is necessary "to identify a common core of competencies which should be taught to all students in the base program."

According to Nelson and Ingvalson (14, p. 58) articulated programs should use the same "learning paks" at the secondary,

post-secondary or adult levels.

Articulation is thus accomplished by completion of tasks, competencies or performance objectives, as they are listed on the certificate or diploma...When the task is completed, it is not necessary to repeat it in an organized system of job oriented, individualized vocational instruction for career training.

The articulation of a popular high school "Vocational Forestry" course with a two-year "Forestry Technology" program at Williamsport, Pennsylvania, is reported by Sick (27, p. 58). The high school program includes:

An outdoor laboratory consisting of 12,000 acres of softwood plantations and hardwood stands of timber... Here the students get experience in most phases of timber management including harvesting, silvicultural practices, dendrology, and mensuration.

Several guides and handbooks have been developed for program articulation between secondary and post-secondary institutions. A student guide was developed by McKinnerney, Thomas and Todd (12, p. 1-58) which dealt primarily with problems the student encountered. Opacinch and Linkz (16, p. ii-73) prepared a Handbook for Articulating High School and Community College Programs. They state (16, p. 5-6) that:

Articulation between the education levels, especially in occupational education, has only benefits. Students are the most important beneficiaries; those who have taken high school programs in a similar technical specialty are not penalized by having to retake courses and are encouraged to prepare themselves for higher order jobs. The schools also benefit; they can maximize the use of their personnel, facilities, and equipment, thereby having available resources to devote to other pressing problems. Society benefits, too; aside from

the more effective use of resources, there is the more thorough training of skilled manpower.

Summary

For students to be the beneficiaries of a career cluster program in forestry, competencies need to be explored and identified; curriculums need to be changed so that those competencies identified as needed on the job are taught first at the secondary level; and the common core of competencies is closely articulated with the next educational step.

III. PROCEDURES OF THIS STUDY

Background

This investigation was designed with the primary objective of bringing some degree of order and priority to the competencies being taught in high school forestry programs in Oregon. A comprehensive study of the competencies needed by high school graduates has been completed. From the results of this investigation it is possible to suggest some revisions in high school forestry course content.

Methods of Gathering Data

Data was gathered primarily in the following ways:

1. Review of recently published curriculum guides in Forestry. Primary sources of information included A Suggested Forest Products Core Curriculum (20, p. i-41) and Career Preparation in Forestry: A Curriculum Guide for High School Vocational Agriculture (5, p. iii-168).
2. Study of graduate research conducted at Oregon State University and other Universities having Agricultural Education Departments.
3. Analysis of competencies needed by students in other occupational fields.

4. Reading professional journals in the field of Agricultural Education. The Agricultural Education Magazine was the primary source reviewed.
5. Personal interviews with specialists in forestry education and forest industry.
6. Review of texts written on the subject of Forestry.
7. Search of microfiche provided by Educational Resource Information Center.

Development of the Study

The original study began in August 1974 with an articulation project between the Clatsop County Intermediate Education District and Clatsop Community College. Several meetings were held to determine what forestry competencies were being taught in the high school program and in the post-secondary forestry program at Clatsop Community College. These competencies were assembled by the Intermediate Education District in 1975. No attempts were made, however, to determine which competencies should be taught. This original competency list came from the Curriculum Guide for Forest Products (18), A Suggested Forest Products Core Curriculum (20), and from individual sheets of a test edition from Career Preparation in Forestry: A Curriculum Guide for High School Vocational Agriculture (5). The survey was then printed and distributed to Mr. Howard Brock, Conservation and Forest Products

Specialist, State Department of Education; Mr. Gordon Galbraith, Vocational Agriculture Specialist, State Department of Education; Mr. Leno Christensen, Professor Agricultural Education, Oregon State University; and Mr. Dave Phillips, a former community college forestry instructor and presently Director of the Vocational-Technical Division, Clatsop Community College. With the many helpful suggestions these individuals offered, the survey was revised and a final draft was prepared.

When completed, the survey (Appendix I) contained 170 individual competencies under 26 major units of instruction.

The survey was organized so that each respondent could easily complete the form and express his opinion on each competency listed. A simple five number system was devised with the number code explained as follows:

- 5--ESSENTIAL that this competency be taught.
- 4--NECESSARY in most situation, usually needed.
- 3--NICE TO KNOW this competency, but not vital.
- 2--NOT NECESSARY to include this competency.
- 1--NO OPINION, this competency is not familiar.

The respondent had the opportunity to add additional competencies to the survey through the use of a section entitled "OTHER NEEDED COMPETENCIES" (Appendix II) which was placed at the end of each unit in the survey. Each respondent was strongly urged to add additional competencies which he would consider basic to that unit

of instruction.

The sample to be surveyed included all secondary forestry instructors in Oregon, both in forestry products and in agriculture; all post-secondary community college forestry instructors in Oregon and Washington; and 30 key forestry employers in Oregon. The names of the secondary and post-secondary forestry instructors in Oregon were secured from Mr. Howard Brock, Conservation and Forest Products Specialist, State Department of Education. The names of the post-secondary forestry instructors in Washington were obtained from a telephone call to Clayton J. Wray of Everett Community College. Names of key forestry employers were obtained by asking eight forestry instructors from different parts of the state to submit names of several key employers from their area who hire forestry or forest products workers and who would have knowledge of the competencies needed in forestry. Several additional names of key employers were obtained from Mr. Howard Brock. In all, 30 names of employers were obtained. Each one of these 30 key forestry employers was contacted by a personal telephone call verifying his forestry background and asking for his cooperation in completing the survey form.

Distribution of the survey was accomplished by mailing one numbered survey to each of the 30 key forest employers, 18 secondary forestry instructors in agriculture, 29 secondary forest products instructors, 23 post-secondary forestry instructors in Oregon, and

13 post-secondary forestry instructors in Washington. Mailing of all 113 surveys was accomplished on April 7, 1976.

A pre-addressed, stamped envelope was enclosed with each survey, so the completed survey could be quickly returned. Each survey was coded with a letter and a number, and a record was maintained of the return date of each survey. Each respondent who had not returned his survey within one week was called by telephone and was requested to complete the survey and to return it as soon as possible.

Individual survey responses were recorded as they arrived, on a general summary sheet showing a compilation of the total responses. This record was further broken down to show whether it was returned from a secondary forest products instructor, a secondary forestry instructor in agriculture, a post-secondary forestry instructor from Oregon, a post-secondary instructor from Washington, or from a forestry employer. Responses from each of these five groups were treated separately. From these summary records, findings were determined.

Mean Score Computation

Mean scores were computed for all 170 individual competencies listed on the survey instrument for the entire group of respondents and for the five different groups of respondents. The opinion codes expressed by numerical value aided in the computation of the responses.

The total number of responses under each opinion code number was counted. When this number equaled the total number of survey instruments returned, the number of responses was multiplied by the opinion code number 5, 4, 3, and 2, which yielded four separate products. The four products were added together and divided by the total number of responses to produce a total mean score. A mean score for each of the five groups of respondents was also computed. Responses given to opinion code number 1, indicating "no opinion" were not considered.

Mean Score--Units of Instruction

A mean score was computed for each of the 26 units of instruction in forestry. The following steps were used in computing these mean scores:

1. The mean scores for each individual competency within that unit were added together.
2. The sum of the mean scores was then divided by the number of competencies listed in that unit.

The above steps were repeated for each one of the 26 units of instruction in forestry to obtain a mean score for that unit as rated by the entire group of respondents. The above steps were also repeated for tabulation of mean scores for each of the five groups of respondents.

Opinion Code Application

The application of an opinion code (essential, necessary, nice to know, not necessary) was made on each of the 170 individual competencies in forestry. Mean scores were obtained on each competency. Those competencies receiving the highest mean score were considered "essential" and those that received the lowest score were considered "not necessary." A panel made up of Mr. Leno V. Christensen, Mr. Wright Noel, and the author, arbitrarily determined the scale used on the opinion codes prior to the beginning of the study. The scales for the opinion code follows:

Essential Competency.....5.000 - 4.251

Necessary Competency.....4.250 - 3.501

Nice to Know Competency.....3.500 - 2.751

Not Necessary Competency.....2.750 - 2.000

Determining Rank Order

The total mean scores obtained on each competency and on each forestry unit were used to determine rank order. The individual competency receiving the highest mean score received the highest rank or importance, that of number one. The individual competency receiving the lowest mean score received the lowest rank of importance, that of 170. The mean score was also used to rank the units of instruction in forestry, 1 through 26.

Other Needed Competencies

Each respondent was given an opportunity to add additional competencies under each of the 26 units of instruction in the survey instrument. The forestry competencies which respondents added were compiled and included under each unit heading and may be found in Appendix II.

Summary

The primary purpose of this comprehensive study was to place some order and importance on the 170 competencies and the 26 units of instruction in forestry by establishing a priority. The opinions of 113 individuals representing five groups were requested by using a five number, quick response scale. Mean scores and rank orders were determined on each of the 170 competencies and 26 units of instruction. The responses were further separated as to a mean score and rank by the five separate groups.

IV. PRESENTATION OF DATA

Since...

The forest products cluster is intended for those students planning to enter one of the forest products industries after completing high school, or for those who wish to enter specialized post-high school training...(18, p. 47),

educators are attempting to provide graduates with the competencies needed. In order to provide these competencies, high school instructors have often called upon local industry, advisory committees, and post-secondary instructors for their help in identifying and ranking the importance of the skills found in the industry. Once the skills have been identified and ranked, instruction can be concentrated on teaching those skills that have been determined "essential" or "necessary." Those skills rated "nice to know" should be taught only when the more important skills have been mastered.

This study surveyed 170 forestry competencies in order to place a priority (rank) on each one by forestry employers, secondary forestry instructors, and post-secondary forestry instructors.

Explanation of Tables

Eighty-five or 75.2 percent of the 113 mailed questionnaires were returned. Secondary agriculture forestry teachers returned the highest average, 17 of 18 for 94.4 percent; community college

instructors from Oregon, 17 of 23 for 73.9 percent; forestry employers, 21 of 30 for 70.0 percent; community college instructors from Washington, 9 of 13 for 69.4 percent; and secondary forest products instructors returned the lowest average, 19 of 29 for 65.2 percent. The tables which follow show the forestry competencies as "Essential," "Necessary," "Nice to Know," and "Not Necessary" as rated by the 85 returned surveys. Two surveys had the coded index number removed, so they could not be included in one of the groups but are included in the totals. Mean scores were determined for each competency as rated by each group and for the total surveys returned. Competencies were placed in the four categories according to their mean scores as explained in Chapter 3 (p. 28). The mean score value is shown as a four digit number and the value code of each category was determined prior to compilation. The competencies are divided into four tables according to the total mean score received as follows:

Essential Forestry Competencies.....5.000 - 4.251

Necessary Forestry Competencies.....4.250 - 3.501

Nice to Know Forestry Competencies.....3.500 - 2.751

Not Necessary Forestry Competencies.....2.750 - 2.000

The first column in the tables shows the rank order of the competency, listed in descending order, as determined by total mean score. Those competencies that received identical total mean scores were assigned the same rank order number. Several numbers were dropped when the competency following the duplications was assigned

the rank order it normally would have received had there been no duplication. The six columns following the competency show the total mean score and the mean score of each of the five groups surveyed. The headings of the columns, shown in parenthesis, indicate the group being surveyed:

(Employer) - Forestry Employer

(Forest Products) - Secondary Forest Products Instructor

(Ag Teacher) - Secondary Agriculture Forestry Instructor

(Oregon C. C.) - Post-Secondary Forestry Instructor from an
Oregon Community College.

(Wash. C. C.) - Post-Secondary Forestry Instructor from a
Washington Community College.

The Essential Forestry Competencies

Table 1 (p. 39) (Essential Forestry Competencies) contains 13, or 7.65 percent of the total 170 competencies. The number one competency "Demonstrate safe use and operation of all tools and equipment he/she might use," was closely followed by another competency from the First Aid and Safety unit. Three or 75 percent of the competencies from the Safety unit were ranked as "essential." The competencies earning the third and fourth rank order both came from the Occupational Opportunities unit.

Only four of the 26 units had competencies earning an "essential" classification. In addition to the two units already mentioned,

five competencies came from the unit on Hand Tools, and Hand Tool Reconditioning and three competencies from the Chain Saw Operation and Maintenance unit.

Mean scores from the five groups were close in descending order. Forestry Employers' mean scores were generally just under the total mean score, while Secondary Forest Products Instructors' and Secondary Agriculture Forestry Instructors' mean scores were usually higher than the total mean score. The mean scores from both groups of post-secondary community college Forestry Instructors usually rated below the total mean score with the Washington instructors considerably below those from Oregon.

Respondents suggested additional needed competencies for units of the high school forestry program by writing them in at the end of each unit. Appendix II contains a list of these suggested additions.

The Necessary Forestry Competencies

One hundred one, or 59.41 percent of the 170 forestry competencies as listed in Table 2 (p. 41) were classified as "necessary" in most situations. All 26 of the forestry units received at least one "necessary" competency with the exception of Servicing Heavy Equipment and Christmas Tree Production units.

Several areas had only one competency ranked in this category. The Tree and Pole Climbing unit's only competency ranked 89th;

Leadership Development's first one rated 98th; the one in Aerial Photography, 105th; and the highest ranking competency in Wire Rope Splicing ranked 106th. Marketing and Economics had two competencies listed as "necessary," but they rated a position of 107th and 112th.

The remaining 10 of 13 Chain Saw Operation and Maintenance competencies rated a high "necessary," as did all three of the competencies under Tree Growth. Eight competencies from the Hand Tool, Hand Tool Reconditioning and Shop Activities unit, all 11 of the Mapping and Compass competencies, and all six of the Chaining and Pacing unit competencies were ranked in this category.

"Accurately distinguish and compute height of instrument, and elevations from back site and fore site readings" from the Differential Surveying unit ranked 114th, last of the "necessary" forestry competencies.

The Nice to Know Forestry Competencies

Fifty-five, or 32.35 percent of the total 170 forestry competencies were ranked as "nice to know" and are listed in Table 3 (p. 56). Three of the first seven competencies are from the Aerial Photography unit. All three of the Christmas Tree Production and the five Servicing Heavy Equipment unit competencies finally appeared as "nice to know." The first Christmas Tree Production competency ranked 134th and the first Servicing Heavy Equipment competency ranked 137th. Five of the 12 competencies under Logging Methods;

four of the six Marketing and Economics competencies; three of the four Wire Rope Splicing competencies; and four of the five Tree and Pole Climbing competencies are listed as "nice to know" and are not considered vital to high school forestry instruction.

The only major surprises in the "nice to know" category were the rankings on four of the five Leadership Development competencies and the three Christmas Tree Production competencies. In the high school forestry program the observer considered the leadership competencies as necessary or essential. The unexpectedly low rank given the three competencies in Christmas Tree Production, 139, 149, and 156, were also considered to this observer as low.

The last competency in this category received a total mean score of 2.892 and a rank order of 169. This competency, "Build, mark, and finish a Biltmore stick," very closely ties to the 170th competency listed in the "not necessary" category.

The Not Necessary Forestry Competencies

Only one competency "Properly set and use table saw to cross-cut and rip lumber for making a Biltmore stick," Table 4 (p. 64) ranked as "not necessary." The observer was surprised not to find additional competencies from Tree and Pole Climbing, Servicing Heavy Equipment, and Wire Rope Splicing units in this section. Several competencies from those units narrowly missed being ranked as "not necessary" and are included as "nice to know."

The Forestry Units

Table 5 (p. 65) lists the 26 Forestry instructional units within the high school forestry program as ranked by the five groups. The rank order for these units was determined by the total mean score received on each unit. The same opinion code scale was used to determine which units were classified as "essential," "necessary," and "nice to know." None of the 26 units received low enough total mean scores to be classified as "not necessary."

Only one unit, the First Aid and Safety unit, ranked as essential. This unit was ranked 1st by four of the five groups and 3rd by the secondary agriculture forestry instructors.

Seventeen of the 26 units were considered "necessary" and received rank order number from 2 through 18. Chain Saw Operation and Maintenance ranked 2nd and Differential Surveying ranked 18th.

Eight of the 26 units were considered "nice to know" with Servicing Heavy Equipment ranking 26th with a total mean score of 3.299.

Mean scores from the forestry employers most closely paralleled the total mean scores, and were usually slightly under the total. The secondary instructors', both forest products and agriculture forestry instructors, mean scores were usually higher than the total mean score. Only three of the forest products instructors' mean scores are lower than the total--these were on the Forest Soils, the

Aerial Photography, and the Christmas Tree Production units. Community College forestry instructors' mean scores were generally lower than the total mean score.

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. They indicated it is "their job to teach technical forestry skills."

Several secondary Forest Products instructors wrote additional comments indicating that it was not their job to prepare students for post-high school training, but rather it was their job to provide them with skills in logging.

Summary

If the entry level competencies needed by high school graduates are to be taught, priorities need to be established in the instructional time.

Opinions on 170 forestry competencies were obtained from 85 respondents involved in the forestry field. Thirteen of these competencies were found to be "essential," 101 were found to be "necessary," 55 were found to be "nice to know," and one competency

was found to be "not necessary." From these rankings priorities can be established in the instructional time.

TABLE 1. ESSENTIAL FORESTRY COMPETENCIES
Listed in Rank Order

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
1	Demonstrate safe use and operation of all tools and equipment he/she might use.	4.671	4.571	4.895	4.882	4.588	4.111
2	Demonstrate safe work habits that will prevent accidents to himself and to his fellow students.	4.624	4.619	4.895	4.706	4.412	4.222
3	Determine the requirements and competencies needed to enter a job in forestry.	4.553	4.619	4.421	4.353	4.647	4.889
4	Demonstrate acceptable classroom behavior and acceptable classroom and lab performance.	4.471	4.333	4.684	4.647	4.235	4.556
5	Start and stop a chain saw in a safe manner.	4.452	4.333	4.684	4.765	4.250	3.889
6	Demonstrate knowledge of chain saw safety and fire regulations.	4.440	4.381	4.737	4.765	4.125	3.889

TABLE 1. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
7	Lubricate and clean a chain saw, bar and sprockets, for chain saw efficiency.	4.345	4.000	4.684	4.765	4.000	4.125
7	Demonstrate the proper care and maintenance of the compass.	4.345	4.190	4.421	4.765	4.118	4.000
9	Demonstrate the proper use and maintenance of the axe.	4.333	4.000	4.632	4.588	4.353	3.875
10	Explain the importance of keeping the bus or "crummy" safe.	4.294	4.143	4.579	4.353	4.294	3.778
11	Demonstrate proper use and maintenance of the shovel.	4.282	3.952	4.474	4.647	4.294	3.889
11	Demonstrate the proper care and maintenance of the diameter tape.	4.282	4.048	4.368	4.706	4.176	3.889
13	Demonstrate correct sharpening procedure for cutting and scraping tools.	4.253	4.095	4.353	4.647	4.118	3.778

TABLE 2. NECESSARY FORESTRY COMPETENCIES
Listed in Rank Order

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
14	Sharpen saw chains using appropriate files, file holder and depth gauge with accuracy required to make straight, efficient cuts.	4.250	3.857	4.684	4.647	3.941	3.875
15	Identify and describe a variety of forest tools.	4.247	3.810	4.875	4.563	4.154	3.667
15	Determine the distance of his pace accurately on level ground and on slopes.	4.247	3.952	4.474	4.529	4.118	4.111
17	Measure the diameter inside the bark of the small end of a log accurately.	4.229	4.048	4.611	4.706	3.875	3.556
18	Set the east/west declination on a hand compass.	4.226	4.238	4.211	4.588	4.059	3.875
19	Name three identifying characteristics, bark, bud and cone, of the region's number one tree, Douglas-fir.	4.212	4.095	4.316	4.706	3.882	4.000
20	Make minor adjustments on chain saw filters.	4.205	3.762	4.684	4.765	3.706	3.857

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL- MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
20	Make minor adjustments on chain saw chain, bar and sprockets.	4.205	3.714	4.684	4.765	3.765	3.857
22	Determine the scale and distances on a map.	4.202	4.286	4.158	4.529	4.059	3.625
23	Demonstrate proper use and maintenance of the Pulaski.	4.193	3.857	4.278	4.529	4.294	3.875
23	Measure correct length of a log, allowing for proper trim allowance using a logger's tape.	4.193	4.048	4.556	4.706	3.875	3.444
25	Demonstrate the proper care and maintenance of the level.	4.190	3.952	4.222	4.706	4.059	3.778
25	Complete Red Cross multi-media first aid course and obtain standard first aid card.	4.190	4.048	4.611	4.059	4.059	4.000
27	Describe the basic principles of the fire triangle.	4.179	4.050	4.316	4.471	4.059	3.889
27	Measure a stand of trees at the proper D.B.H. accurately, using a Biltmore stick, and a diameter tape.	4.179	4.100	4.579	4.588	3.824	3.222

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
27	Locate and identify a meridian line, a base line, a range line, a township line, a township, and a section.	4.179	4.190	4.263	4.588	3.882	3.750
30	Demonstrate proper technique in planting seedlings.	4.176	4.048	4.263	4.294	4.118	4.000
31	Determine the age of a tree by counting the annual rings.	4.157	3.800	4.368	4.647	3.941	4.000
32	Demonstrate proper use and maintenance of the hoe.	4.169	3.857	4.222	4.529	4.235	3.875
33	Demonstrate skill in determining the distance between two points in chains and/or feet by pacing.	4.153	3.857	4.474	4.471	3.941	3.889
34	Run a given bearing using either a quadrant or azimuth hand compass.	4.143	4.048	4.316	4.471	4.059	3.750
35	Accurately identify the species of logs using bark or wood characteristics.	4.133	4.095	4.333	4.471	3.938	3.444
36	Identify the basic parts of a tree and explain their function.	4.131	3.905	4.211	4.529	4.000	4.000

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
37	Operate a chain saw safely when limbing.	4.120	3.900	4.579	4.412	3.941	3.125
38	Determine percent slope.	4.118	4.095	4.105	4.588	3.941	3.556
39	Operate a chain saw safely when bucking.	4.108	3.800	4.579	4.412	3.941	3.250
40	Identify 30 important tree species of the Northwest by common name when given cones, leaves or needles, bark, range, flowers, odor, or other visual characteristics.	4.106	3.857	4.158	4.471	4.176	3.778
41	Plant trees in a safe and efficient manner using proper spacing and trees per acre.	4.082	3.857	4.105	4.294	4.059	4.000
42	Demonstrate proper care of planting stock.	4.071	3.857	4.000	4.412	4.059	3.889
43	Demonstrate proper care and maintenance of the scale stick.	4.060	3.762	4.053	4.588	4.118	3.375
44	Demonstrate proper handle installation or replacement on hand tools.	4.048	3.762	4.278	4.529	3.941	3.333

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
45	Use tables to compute volumes of standing timber.	4.047	4.000	4.368	4.529	3.706	3.111
46	Describe the effects of topography and weather on fire behavior.	4.048	4.050	4.211	4.294	3.824	3.667
47	Describe land features and demonstrate knowledge of symbols illustrated in a legend.	4.024	4.048	3.842	4.529	3.941	3.500
47	Properly care for tree planting equipment: planting hoe and planting bag.	4.024	3.667	3.947	4.294	4.176	4.000
47	Operate a chain saw safely when felling.	4.024	3.800	4.526	4.235	3.824	3.222
50	Name, identify, and describe the use of hand tools in fire fighting.	4.012	3.650	4.158	4.353	4.059	3.778
50	Make minor adjustments on a chain saw carburetor.	4.012	3.619	4.474	4.588	3.471	3.625

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
50	Visually inspect and repair any exterior worn or broken parts of a chain saw.	4.012	3.619	4.278	4.588	3.706	3.625
53	Locate and give function of outer bark, inner bark, cambium, sapwood, heartwood, pith, annual rings, springwood and summerwood on a cross section of a tree.	4.000	3.857	4.053	4.529	3.824	3.500
54	Determine rings per inch with the use of an increment borer.	3.988	3.905	4.167	4.471	3.647	3.444
54	Explain the purpose and function of the Oregon Forest Practices Act.	3.988	4.095	4.118	4.250	3.625	3.556
56	Demonstrate proper use and maintenance of the brush hook.	3.976	3.762	4.056	4.412	3.882	3.429
56	Lay out a chain and accurately measure the distance between two points.	3.976	4.000	4.053	4.188	3.882	3.444
58	Measure the height of a stand of trees in the number of 16 or 32 foot logs using a clinometer.	3.965	3.952	4.105	4.353	3.765	3.222

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
59	Compute the amount of square feet in a given area and calculate the correct acreage.	3.964	3.952	3.947	4.529	3.706	3.250
60	Measure the height of a stand of trees in the number of 16 or 32 foot logs using an abney level.	3.952	3.905	4.000	4.471	3.765	3.222
61	Name the basic parts of a chain saw.	3.940	3.381	4.526	4.412	3.529	3.750
62	Convert azimuth bearings to true bearings and true bearings to azimuth bearings.	3.929	3.762	3.947	4.529	3.765	3.375
63	Identify log defects.	3.928	3.905	4.056	4.118	3.813	3.444
64	Define logging operations terminology; (rigging, landing, spar pole, choker, etc.) and know where used.	3.918	3.810	4.316	4.353	3.588	3.333
65	Demonstrate proper use and maintenance of a machette.	3.914	3.714	3.882	4.118	4.000	3.250

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
66	Identify a forestry job in which he/she is interested.	3.882	3.810	4.000	4.118	3.647	3.778
67	Use a staff compass to determine or run a given bearing.	3.881	3.714	4.053	4.294	3.706	3.250
68	Describe the operation of cat--tractor/skidder logging.	3.869	3.810	4.389	4.059	3.588	3.222
69	Determine the gross volume of a log using east side and west side scaling tables and rules.	3.867	3.857	4.056	4.235	3.688	3.222
70	Develop a personal plan for gaining experiences necessary for gainful employment in a given forestry area.	3.859	4.000	3.684	3.941	3.765	4.000
71	Demonstrate the progressive method of fire line building.	3.833	3.600	3.842	4.353	3.824	3.333
72	Use a map and orient the map with the world and determine position in the field by triangulation.	3.819	3.762	3.895	4.000	3.882	3.125

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
73	Identify the forest regions of his state and list the important tree species of each region.	3.812	3.619	3.895	4.353	3.588	3.444
74	Measure the height of a stand of trees in the number of 16 or 32 foot logs using visual estimation.	3.810	3.857	4.000	4.000	3.529	3.333
75	Properly care for a surveying instrument and other surveying equipment.	3.807	3.750	3.684	4.500	3.765	3.000
76	Demonstrate a basic knowledge of local manufacturing processes.	3.795	3.650	4.111	4.176	3.412	3.333
77	Describe the operation of high-lead logging systems.	3.788	3.762	4.211	4.000	3.471	3.222
78	Compute spacing where recommended trees per acre is known.	3.788	3.619	3.632	4.118	3.882	3.667
79	Recognize damage done by major tree diseases and insects.	3.786	3.714	4.000	4.294	3.471	3.222

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
80	Select, mark, and remove trees to be thinned utilizing spacing, trees per acre, and most desired species.	3.774	3.619	4.222	4.176	3.588	2.667
81	Identify common wildlife in the area.	3.765	3.667	3.842	4.118	3.529	3.444
82	Run a closed traverse and draw a traverse map to scale.	3.756	3.762	3.778	4.059	3.412	3.125
83	Measure the height of a stand of trees in the number of 16 or 32 foot logs using a Merritt Hypsometer (Biltmore Stick).	3.753	3.238	4.368	4.235	3.412	3.222
83	Develop and write a personal resume which gives all the necessary details about his education, experience, personal qualities and references.	3.753	3.762	3.421	4.118	4.000	3.333
83	Gather sufficient data to compute form class for volumes and species of trees.	3.753	3.905	3.579	4.294	3.588	2.889
86	Set a choker on a log in a safe manner.	3.706	3.429	4.474	4.059	3.235	2.889

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
87	Record field survey notes.	3.704	3.550	3.667	4.375	3.625	2.889
88	Describe the "flow" of a log through the various processing in a lumber mill.	3.690	3.500	4.105	4.176	3.294	3.889
89	Describe the safety hazards of tree/pole climbing.	3.675	3.714	4.000	3.882	3.333	3.111
89	Describe the five major silvi-cultural systems used in the United States.	3.675	3.286	4.000	4.125	3.647	3.222
91	Sub-divide a section down to 1.25 acres and legally describe the area.	3.667	3.571	3.632	4.353	4.294	3.250
92	Demonstrate skill in cruising by using various cruise methods, (fixed plot, variable plot, and 100% cruises) on established areas to determine total volume.	3.659	3.619	4.000	4.235	3.235	2.556
92	Identify common fish in the area.	3.659	3.571	3.842	3.941	3.471	3.111
94	Describe the "flow" of a log through the various processing in a plywood mill.	3.655	3.450	4.053	4.118	3.294	2.889

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
95	Identify and explain the basic operating principles of two-cycle engines.	3.643	3.381	3.842	4.059	3.353	3.375
96	Correctly use the correction marks on the back of a topographic trailer tape at one chain and at the end of two chains.	3.642	3.619	3.611	3.929	3.588	3.333
97	Determine the net volume of a log using east side and west side scaling tables and rules.	3.639	3.667	3.722	3.941	3.625	2.889
98	Participate in public speaking by presenting a formal speech or class demonstration on an agricultural or forest subject.	3.602	3.600	3.500	3.529	3.588	3.778
98	Describe the "flow" of a log through the various processing in a veneer plant.	3.602	3.450	4.000	4.000	3.294	2.778
100	Coil and throw a tape and/or chain.	3.600	3.476	3.579	3.824	3.647	3.333
100	Take survival plot information and determine percentage survival.	3.600	3.667	3.526	3.765	3.765	2.778

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
100	Determine depth of top soil and/or subsoil by noting textural change, color change, or both.	3.600	3.286	3.526	4.471	3.412	3.111
103	Describe common methods used in forest insect and disease control.	3.595	3.429	3.842	4.059	3.588	2.667
103	Write an application letter of three or four paragraphs featuring the best qualities of the applicant.	3.595	3.762	3.105	3.882	3.688	3.444
105	Locate different areas and features on the ground using an aerial photo.	3.588	3.810	3.316	3.647	3.706	3.000
106	Identify safety hazards of wire rope splicing.	3.571	3.571	4.000	3.765	3.250	2.778
107	Identify and explain the different methods of marketing forest products, such as stumpage, at the mill, or at the roadside, and the advantages of each method.	3.566	3.550	3.737	4.059	3.471	2.556

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
108	Develop interviewing techniques.	3.565	3.333	3.316	3.824	3.824	3.556
109	Determine forest site classification and woodland suitability groups.	3.553	3.762	3.263	4.059	3.294	3.000
110	Describe the "flow" of a log through the various processing in a pulp and paper plant.	3.536	3.400	3.947	3.824	3.176	2.889
111	Correctly pick-up a topographic trailer tape.	3.531	3.286	3.412	3.867	3.706	3.333
112	Explain laws and regulations affecting harvesting and marketing of forest products in his region.	3.530	3.700	3.500	3.824	3.412	2.889
113	Group insects as to bark beetles, defoliators, scales, and leaf miners, and wood borers, and recognize damage.	3.524	3.524	3.526	3.882	3.235	3.000

Table 2. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
114	Accurately distinguish and compute height of instrument, and elevations from back site and fore site readings.	3.519	3.200	3.500	4.438	3.438	2.667

TABLE 3. NICE TO KNOW FORESTRY COMPETENCIES.
Listed in Rank Order

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
115	Set up aerial photos for the easiest and most accurate stereoscopic viewing.	3.494	3.476	3.474	3.765	3.588	3.111
115	Determine distance and direction from one reference point to another using an aerial photo.	3.494	3.619	3.316	3.706	3.529	2.778
117	Explain various methods of loading logs.	3.488	3.286	3.737	4.063	3.294	2.778
117	Formulate a simple logging plan.	3.488	3.571	3.737	3.875	3.176	2.667
117	Set up and adjust a level.	3.488	3.200	3.526	4.375	3.375	2.556
120	Participate in club activities including: business meetings, degree ceremonies, forestry skills contests, shop skills contests, and other.	3.482	3.300	3.778	3.706	3.294	3.222
120	Locate and explain the meaning of information printed at the top of each photo.	3.482	3.524	3.316	3.647	3.529	3.111

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
122	Determine the market demand for different types of timber products, such as saw timber, pulpwood, and poles, in the area.	3.476	3.400	3.944	3.765	3.294	2.556
122	Describe the "flow" of a log through the various processing in a composition or pressboard facility.	3.476	3.263	3.842	3.882	3.063	2.889
124	Adjust a stereoscope to the proper interpupillary distance.	3.471	3.524	3.211	3.765	3.588	3.889
125	Explain various methods of transporting logs.	3.470	3.238	3.684	4.133	3.235	2.889
126	Name, identify and describe pumping equipment used in fire fighting.	3.458	3.400	3.579	3.706	3.471	2.889
127	Discuss and show importance of soil formation and soil layers.	3.452	3.286	3.474	3.824	3.250	3.333
128	Identify the advantages or disadvantages of buying or selling timber using various log rules common to his region.	3.451	3.400	3.444	3.765	3.625	2.667

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
129	Accurately grade logs according to species regulations.	3.432	3.381	3.438	3.529	3.563	2.889
130	Explain various methods of unloading logs.	3.422	3.286	3.632	4.000	3.176	2.778
131	Accurately read a Philadelphia rod.	3.413	3.050	3.412	4.313	3.250	2.667
132	Participate in or preside over a business meeting using correct parliamentary procedure.	3.410	3.350	3.333	3.471	3.412	3.333
132	Describe the maintenance of climbing equipment.	3.410	3.095	3.684	3.353	3.000	2.667
134	Identify the different species of Christmas trees, their characteristics and market potential.	3.386	3.158	3.158	4.176	3.176	3.000
135	Run a percent grade line using profile surveying and compute out.	3.383	3.300	3.333	4.125	3.188	2.556
136	Identify the tools used in wire rope splicing.	3.381	3.333	4.000	3.471	3.188	2.333

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
137	Measure bark thickness at proper heights using a bark gauge.	3.370	3.333	3.294	3.412	3.059	3.111
137	Develop a daily maintenance plan for a tractor/skidder.	3.370	3.450	3.556	3.824	3.000	2.444
139	Identify tree climbing tools.	3.361	3.286	3.684	3.706	3.000	2.778
140	Identify the criteria for timber bids and view a timber auction.	3.353	3.381	3.579	3.471	3.412	2.556
141	Actively serve as a committee member in the local club Program of Activities.	3.346	3.200	3.353	3.529	3.176	3.111
141	Develop a daily maintenance plan for a log truck.	3.346	3.450	3.444	3.824	3.000	2.444
143	Determine compactability of forest soils under heavy equipment usage.	3.345	3.476	3.211	3.529	3.353	2.625
144	Identify finished lumber by species.	3.341	3.050	3.611	3.765	3.125	2.778

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
144	Demonstrate knowledge of various log rules; Schribner, Schribner Dec. c., International $\frac{1}{4}$ inch, Doyle, etc..	3.341	3.190	3.579	4.000	3.000	2.556
146	Identify the tools used in servicing heavy equipment.	3.333	3.350	3.556	3.647	3.067	2.444
146	Cut wire rope with any of the accepted methods.	3.333	3.333	3.895	3.471	3.063	2.333
148	Locate and place the effective mapping area on desired photo.	3.329	3.238	3.211	3.647	3.353	2.889
149	Determine and use cultural practices in pruning and shearing (Christmas) trees to develop proper shape.	3.321	3.150	3.211	4.000	3.176	2.667
150	Set up and adjust a transit.	3.317	3.150	3.526	3.875	3.063	2.556
151	Demonstrate basic understanding of servicing terminology.	3.309	3.400	3.588	3.647	2.938	2.444
152	Demonstrate the use of signals in high-lead and cat logging.	3.294	3.143	3.632	3.647	2.941	3.000
153	Prune trees for log improvement.	3.288	2.684	3.579	4.000	3.313	2.375

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
154	Demonstrate skill in wire rope splicing.	3.286	3.190	3.789	3.471	3.000	2.444
155	Locate and explain fiducial marks, principal points, flight lines, and conjugate principal points.	3.277	3.190	3.111	3.438	3.529	2.778
156	Evaluate and select appropriate sites (for Christmas trees) considering soil requirements, topography, marketing, accessibility, and protection.	3.250	3.150	3.053	3.882	3.118	2.667
157	Properly adjust tree climbing equipment.	3.241	3.143	3.737	3.353	3.000	2.444
158	Determine the current value of timber inventories, vs. projected future value.	3.205	3.200	3.222	3.588	3.235	2.333
159	Discuss and show importance of soil series and soil type.	3.202	3.095	3.278	3.706	2.882	3.667
160	Identify the forest regions of the United States and list the important tree species of each region.	3.165	3.095	3.000	3.647	3.118	2.778

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
161	Service heavy logging equipment.	3.136	3.200	3.556	3.412	2.600	2.333
162	Judge soil profiles and make management recommendations based on the "Oregon Soil Judging Card."	3.131	3.000	3.000	3.824	2.882	2.556
163	Perform the various jobs in a high-lead logging operation.	3.107	3.238	3.556	3.059	2.588	3.000
164	Identify the history, aims and purposes, and organizational structure of forestry youth organizations on the local, district, state and National levels.	3.084	2.700	3.389	3.471	2.941	2.778
165	Identify 30 important tree species of the Northwest by genus species, when given cones, leaves or needles, bark, range, flowers, odor, or other visual characteristics.	3.083	4.048	2.684	3.235	3.353	2.875
166	Operate safely a cat--tractor/skidder.	3.071	2.857	3.722	3.059	2.706	2.778

Table 3. Continued.

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
167	Summarize the historical development of national forest management and the logging industry in the United States.	3.037	3.048	3.333	3.118	2.688	2.875
168	Climb a tree or pole.	2.976	2.905	3.421	3.000	2.800	2.333
169	Build, mark, and finish a Biltmore stick.	2.892	2.476	3.316	3.118	2.875	2.500

TABLE 4. NOT NECESSARY FORESTRY COMPETENCIES
Listed in Rank Order

RANK ORDER	COMPETENCY	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
170	Properly set and use table saw to crosscut and rip lumber for making a Biltmore stick.	2.671	2.333	3.000	2.882	2.625	2.375

TABLE 5. FORESTRY INSTRUCTIONAL UNITS
Listed in Rank Order

RANK ORDER	FORESTRY INSTRUCTIONAL UNIT	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
ESSENTIAL UNITS							
1	First Aid and Safety	4.445	4.345	4.745	4.500	4.338	4.028
NECESSARY UNITS							
2	Chain Saw Operation and Maintenance	4.135	3.811	4.535	4.552	3.812	3.651
3	Tree Growth	4.096	3.854	4.211	4.568	3.922	3.833
4	Hand Tools, Hand Tool Recon- ditioning and Shop Activities.	3.990	3.705	4.162	4.355	3.949	3.526
5	Mapping and Compass	3.981	3.939	4.004	4.406	3.797	3.443
6	Fire Fighting and Surpression	3.906	3.750	4.021	4.235	3.847	3.511
7	Chaining and Pacing	3.858	3.698	3.934	4.135	3.814	3.574
8	Tree Planting	3.957	3.786	3.912	4.196	4.010	3.722
9	Log Scaling	3.917	3.857	4.110	4.244	3.768	3.270
10	Occupational Opportunities	3.839	3.833	3.746	4.000	3.812	3.804
11	Timber Cruising	3.802	3.728	4.004	4.235	3.503	3.081

Table 5. Continued.

RANK ORDER	FORESTRY INSTRUCTIONAL UNIT	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
12	Wildlife and Fish Identification	3.712	3.619	3.842	4.030	3.500	3.278
13	Tree Identification	3.676	3.743	3.611	4.082	3.623	3.375
14	Forest Diseases and Insects	3.635	3.556	3.789	4.078	3.431	2.963
15	Lumber, Plywood and Paper Production	3.585	3.395	3.953	3.992	3.237	2.921
16	Other Silvicultural Practices	3.579	3.196	3.934	4.100	3.516	2.755
17	Logging Methods	3.551	3.460	3.934	3.880	3.219	3.009
18	Differential Surveying	3.519	3.314	3.521	4.286	3.386	2.699
NICE TO KNOW UNITS							
19	Forest Soils	3.486	3.429	3.408	4.000	3.288	2.978
20	Aerial Photography	3.448	3.483	3.279	3.659	3.546	2.937
21	Marketing and Economics	3.430	3.439	3.571	3.745	3.408	2.593
22	Wire Rope Splicing	3.393	3.357	3.921	3.545	3.125	2.472
23	Leadership Development	3.385	3.230	3.471	3.541	3.282	3.244
24	Tree and Pole Climbing	3.333	3.229	3.705	3.459	3.027	2.667

Table 5. Continued.

RANK ORDER	FORESTRY INSTRUCTIONAL UNIT	TOTAL MEAN SCORE	EMPLOYER MEAN SCORE	FOREST PRODUCTS SCORE	AG TEACHER SCORE	OREGON C.C. SCORE	WASH. C.C. SCORE
25	Christmas Tree Production	3.319	3.153	3.141	4.019	3.157	2.778
26	Servicing Heavy Equipment	3.299	3.370	3.540	3.671	2.921	2.422

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The high school career preparation cluster programs are causing tremendous changes in Oregon's secondary schools. Two cluster programs, Forest Products and Vocational Agriculture, are presently preparing high school graduates for entry level employment in the field of forestry. Some 170 individual competencies can be identified in these high school forestry programs.

The purpose of this study is to identify the forestry competencies most commonly needed by high school graduates and determine which competencies are of the most importance, and should receive the highest priority of class instruction time.

A survey instrument which identified the 170 competencies was developed and mailed to 113 individuals--30 forestry employers, 29 secondary forest products instructors, 23 community college forestry instructors in Oregon, 18 secondary agriculture forestry instructors, and 13 community college forestry instructors from Washington. Respondents were asked to express their opinion on each competency as to whether it was "essential," "necessary," "nice to know," or "not necessary" for a graduate from a high school forestry program. Respondents were encouraged to add additional competencies at the end of each instructional unit under a section titled "Other Needed Competencies." Eighty-five completed surveys were received for a

75.2 percent return.

The surveys were compiled and total mean scores were computed for each competency and for each of the five groups being surveyed. The competencies were placed in four categories either "essential," "necessary," "nice to know," or "not necessary." The total mean score was used to rank the 170 competencies in descending rank order. By using a mean score opinion scale, 13 competencies were classified as "essential," 101 "necessary," 55 "nice to know" and one "not necessary." The 26 units of instruction in forestry were placed in descending rank order according to the total mean score on each unit. One unit was considered "essential," 17 units were considered "necessary," and eight units were considered as "nice to know" by using the mean score opinion scale.

Conclusions

Based on the study, the following conclusions were developed:

1. That forestry competencies needed by high school graduates can be identified and ranked.
2. That there is a need for the forestry competencies rated "essential" and "necessary" to be taught in high school forestry programs.
3. That forestry competencies rated "nice to know" are not vital in a forestry program, but could be included if instructional time is available.

4. That forestry competencies rated "not necessary" should not be taught in high school forestry programs.
5. That priority needs to be given to competencies with highest rank order, when instructional time in forestry is limited.
6. That the importance of the forestry units of instruction be considered and the units be taught with the same emphasis as the rank order received.
7. That forestry employers rate competencies needed by high school graduates closer to the total mean score than the other groups surveyed.
8. That post-secondary forestry instructors rate competencies needed by high school graduates lower than the total mean score.
9. That secondary forestry instructors, both in Forest Products and Agriculture, rate competencies needed by high school graduates higher than the total mean score.
10. That there is a need to give priority to those forestry competencies related to first aid and safety.

Recommendations

Based upon the study, and the subsequent conclusions, the following recommendations are submitted:

1. That schools in Oregon base the priority of the forestry instruction upon teaching the "essential" and "necessary" competencies first, and if time permits, include "nice to know" competencies.
2. That schools in Oregon give consideration to the rank order of both individual forestry competencies and the units of instruction in planning high school forestry programs.
3. That the Oregon State Department of Education consider re-evaluating A Suggested Forest Products Core Curriculum. Several units, including: Servicing Heavy Equipment, Tree and Pole Climbing, and Wire Rope Splicing, considered part of their essential core, are rated low in this survey in the "nice to know" category.
4. That forestry leadership competencies be reviewed and re-evaluated to determine additional competencies that may be needed by high school graduates.
5. That greater articulation take place between secondary and post-secondary forestry programs to provide graduates with the needed competencies.
6. That high school programs in forestry be combined under one Career Cluster Program, either under Agriculture or under Forest Products.
7. That forestry competencies be reviewed and updated every five years to reflect educational trends and change in the forestry industry.

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APPENDICES

APPENDIX I

HIGH SCHOOL FORESTRY COMPETENCIES SURVEY

This survey of competencies to determine what should be taught in a high school vocational agriculture or specialized forestry program is being conducted to assist instructors in teaching those competencies most commonly needed by graduates. Your opinion is requested in evaluating the importance of each competency, and whether it would be of value in the student's next step beyond high school. This step could be a community college forestry program, a four-year college program, or a forestry or forest products job.

The 170 competencies have been arranged so that you may quickly express your opinion. Simply circle the number, one through five, that most clearly expresses your opinion on that competency. The numbers represent the following opinions:

- 5 - ESSENTIAL that this competency be taught.
- 4 - NECESSARY in most situations, usually needed.
- 3 - NICE TO KNOW this competency, but not vital.
- 2 - NOT NECESSARY to include this competency.
- 1 - NO OPINION, this competency is not familiar.

This survey is divided into 26 major divisions of Forestry. Each division contains an additional section where you are given an opportunity to add other competencies that you feel should be included in the survey. Add these additional competencies under "OTHER

NEEDED COMPETENCIES" that you would consider basic to that division of forestry. Add the numerical ratings, one through five, as needed.

Appendix I. Continued.

Please circle only one number following each competency.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

I. OCCUPATIONAL OPPORTUNITIES:

- | | | | | | |
|--|---|---|---|---|---|
| 1) Determine the requirements and competencies needed to enter a job in forestry. | 5 | 4 | 3 | 2 | 1 |
| 2) Identify a forestry job in which he/she is interested. | 5 | 4 | 3 | 2 | 1 |
| 3) Develop a personal plan for gaining experiences necessary for gainful employment in a given forestry area. | 5 | 4 | 3 | 2 | 1 |
| 4) Develop and write a personal resume which gives all the necessary details about his education, experience, personal qualities and references. | 5 | 4 | 3 | 2 | 1 |
| 5) Write an application letter of three or four paragraphs featuring the best qualities of the applicant. | 5 | 4 | 3 | 2 | 1 |
| 6) Develop interviewing techniques. | 5 | 4 | 3 | 2 | 1 |
| 7) Demonstrate acceptable classroom behavior and acceptable classroom and lab performance. | 5 | 4 | 3 | 2 | 1 |
| 8) Summarize the historical development of national forest management and the logging industry in the United States. | 5 | 4 | 3 | 2 | 1 |
| 9) <u>OTHER NEEDED COMPETENCIES</u> basic to occupational opportunities: (Please add numerical ratings as needed.) | | | | | |
| A) | | | | | |
| B) | | | | | |
| C) | | | | | |

Appendix I. Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

II. TREE IDENTIFICATION:

- | | 5 | 4 | 3 | 2 | 1 |
|--|---|---|---|---|---|
| 1) Identify 30 important tree species of the Northwest by common name when given cones, leaves or needles, bark, range, flowers, odor, or other visual characteristics. | 5 | 4 | 3 | 2 | 1 |
| 2) Identify 30 important tree species of the Northwest by genus species, when given cones, leaves or needles, bark, range, flowers, odor, or other visual characteristics. | 5 | 4 | 3 | 2 | 1 |
| 3) Name three identifying characteristics, bark, bud and cone, of the region's number one tree, Douglas-fir. | 5 | 4 | 3 | 2 | 1 |
| 4) Identify the forest regions of the United States and list the important tree species of each region. | 5 | 4 | 3 | 2 | 1 |
| 5) Identify the forest regions of his state and list the important tree species of each region. | 5 | 4 | 3 | 2 | 1 |
| 6) <u>OTHER NEEDED COMPETENCIES</u> basic to tree identification: (Please add numerical ratings as needed.) | | | | | |
| A) | | | | | |
| B) | | | | | |
| C) | | | | | |

III. TREE GROWTH:

- | | 5 | 4 | 3 | 2 | 1 |
|--|---|---|---|---|---|
| 1) Identify the basic parts of a tree and explain their function. | 5 | 4 | 3 | 2 | 1 |
| 2) Locate and give function of outer bark, inner bark, cambium, sapwood, | 5 | 4 | 3 | 2 | 1 |

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
heartwood, pith, annual rings, springwood and summerwood on a cross section of a tree.					
3) Determine the age of a tree by counting the annual rings.	5	4	3	2	1
4) <u>OTHER NEEDED COMPETENCIES</u> basic to tree growth: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

IV. CHAINING AND PACING:

1) Determine the distance of his pace accurately on level ground and on slopes.	5	4	3	2	1
2) Demonstrate skill in determining the distance between two points in chains and/or feet by pacing.	5	4	3	2	1
3) Coil and throw a tape and/or chain.	5	4	3	2	1
4) Lay out a chain and accurately measure the distance between two points.	5	4	3	2	1
5) Correctly pick-up a topographic trailer tape.	5	4	3	2	1
6) Correctly use the correction marks on the back of a topographic trailer tape at one chain and at the end of two chains.	5	4	3	2	1

Appendix I. Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

- 7) OTHER NEEDED COMPETENCIES basic to chaining and pacing: (Please add numerical ratings as needed.)

A)

B)

C)

V. MAPPING AND COMPASS:

- | | | | | | |
|--|---|---|---|---|---|
| 1) Locate and identify a meridian line, a base line, a range line, a township line, a township, and a section. | 5 | 4 | 3 | 2 | 1 |
| 2) Sub-divide a section down to 1.25 acres and legally describe the area. | 5 | 4 | 3 | 2 | 1 |
| 3) Compute the amount of square feet in a given area and calculate the correct acreage. | 5 | 4 | 3 | 2 | 1 |
| 4) Determine the scale and distances on a map. | 5 | 4 | 3 | 2 | 1 |
| 5) Describe land features and demonstrate knowledge of symbols illustrated in a legend. | 5 | 4 | 3 | 2 | 1 |
| 6) Use a map and orient the map with the world and determine position in the field by triangulation. | 5 | 4 | 3 | 2 | 1 |
| 7) Set the east/west declination on a hand compass. | 5 | 4 | 3 | 2 | 1 |
| 8) Convert azimuth bearings to true bearings and true bearings to azimuth bearings. | 5 | 4 | 3 | 2 | 1 |
| 9) Run a given bearing using either a quadrant or azimuth hand compass. | 5 | 4 | 3 | 2 | 1 |

Appendix I. Continued.

				81	
	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
10) Use a staff compass to determine or run a given bearing.	5	4	3	2	1
11) Run a closed traverse and draw a traverse map to scale.	5	4	3	2	1
12) <u>OTHER NEEDED COMPETENCIES</u> basic to mapping and compass: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

VI. FOREST SOILS:

1) Determine depth of top soil and/or subsoil by noting textural change, color change, or both.	5	4	3	2	1
2) Determine percent slope.	5	4	3	2	1
3) Discuss and show importance of soil formation and soil layers.	5	4	3	2	1
4) Discuss and show importance of soil series and soil type.	5	4	3	2	1
5) Determine forest site classification and woodland suitability groups.	5	4	3	2	1
6) Judge soil profiles and make management recommendations based on the "Oregon Soil Judging Card."	5	4	3	2	1
7) Determine compactability of forest soils under heavy equipment usage.	5	4	3	2	1
8) <u>OTHER NEEDED COMPETENCIES</u> basic to forest soils: (Please add numerical ratings as needed.)					

Appendix I. Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

A)

B)

C)

VII. FIRST AID AND SAFETY:

- | | | | | | |
|--|---|---|---|---|---|
| 1) Complete Red Cross multi-media first aid course and obtain standard first aid card. | 5 | 4 | 3 | 2 | 1 |
| 2) Demonstrate safe work habits that will prevent accidents to himself and to his fellow students. | 5 | 4 | 3 | 2 | 1 |
| 3) Explain the importance of keeping the bus or "crummy" safe. | 5 | 4 | 3 | 2 | 1 |
| 4) Demonstrate safe use and operation of all tools and equipment he/she might use. | 5 | 4 | 3 | 2 | 1 |
| 5) <u>OTHER NEEDED COMPETENCIES</u> basic to first aid safety: (Please add numerical ratings as needed.) | | | | | |

A)

B)

C)

VIII. LOGGING METHODS:

- | | | | | | |
|--|---|---|---|---|---|
| 1) Describe the operation of cat--tractor/skidder logging. | 5 | 4 | 3 | 2 | 1 |
| 2) Operate safely a cat--tractor/skidder. | 5 | 4 | 3 | 2 | 1 |
| 3) Describe the operation of high-lead logging systems. | 5 | 4 | 3 | 2 | 1 |

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
4) Perform the various jobs in a high-lead logging operation.	5	4	3	2	1
5) Demonstrate the use of signals in high-lead and cat logging.	5	4	3	2	1
6) Define logging operations terminology; (rigging, landing, spar pole, choker, etc.) and know where used.	5	4	3	2	1
7) Set a choker on a log in a safe manner.	5	4	3	2	1
8) Formulate a simple logging plan.	5	4	3	2	1
9) Explain various methods of loading logs.	5	4	3	2	1
10) Explain various methods of transporting logs.	5	4	3	2	1
11) Explain various methods of unloading logs.	5	4	3	2	1
12) Explain the purpose and function of the Oregon Forest Practices Act.	5	4	3	2	1
13) <u>OTHER NEEDED COMPETENCIES</u> basic to logging methods: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

IX. FIRE FIGHTING AND SUPPRESSION:

1) Describe the basic principles of the fire triangle.	5	4	3	2	1
--	---	---	---	---	---

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
2) Describe the effects of topography and weather on fire behavior.	5	4	3	2	1
3) Name, identify, and describe the use of hand tools in fire fighting.	5	4	3	2	1
4) Demonstrate the progressive method of fire line building.	5	4	3	2	1
5) Name, identify and describe pumping equipment used in fire fighting.	5	4	3	2	1
6) <u>OTHER NEEDED COMPETENCIES</u> basic to fire fighting and suppression: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XI. MARKETING AND ECONOMICS:

1) Determine the market demand for different types of timber products, such as saw timber, pulpwood, and poles, in the area.	5	4	3	2	1
2) Identify and explain the different methods of marketing forest products, such as stumpage, at the mill, or at the roadside, and the advantages and disadvantages of each method.	5	4	3	2	1
3) Identify the advantages or disadvantages of buying or selling timber using various log rules common to his region.	5	4	3	2	1

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
4) Identify the criteria for timber bids and view a timber auction.	5	4	3	2	1
5) Determine the current value of timber inventories vs. future value.	5	4	3	2	1
6) Explain laws and regulations affecting harvesting and marketing of forest products in his region.	5	4	3	2	1
7) <u>OTHER NEEDED COMPETENCIES</u> basic to marketing and economics: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XII. LEADERSHIP DEVELOPMENT:

1) Identify the history, aims, and purposes, and organizational structure of forestry youth organizations on the local, state, and National levels.	5	4	3	2	1
2) Participate in club activities including: business meetings, degree ceremonies, forestry skills contests, shop skills contests and others.	5	4	3	2	1
3) Actively serve as a committee member in the local club Program of Activities.	5	4	3	2	1
4) Participate in public speaking by presenting a formal speech or class demonstration on an agricultural or forest subject.	5	4	3	2	1

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
5) Participate in or preside over a business meeting using correct parliamentary procedure.	5	4	3	2	1
6) <u>OTHER NEEDED COMPETENCIES</u> basic to Leadership development: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XIII. HAND TOOLS, HAND TOOL RECONDITIONING AND SHOP ACTIVITIES:

1) Identify and describe a variety of forest tools.	5	4	3	2	1
2) Demonstrate proper use and maintenance of the following tools:					
A) Shovel	5	4	3	2	1
B) Axe	5	4	3	2	1
C) Hoe	5	4	3	2	1
D) Pulaski	5	4	3	2	1
E) Brush Hook	5	4	3	2	1
F) Machette	5	4	3	2	1
G) Other _____	5	4	3	2	1
3) Demonstrate correct sharpening procedure for cutting and scraping tools.	5	4	3	2	1

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
4) Demonstrate proper handle installation or replacement on hand tools.	5	4	3	2	1
5) Demonstrate the proper care and maintenance of the following equipment:					
A) Diameter Tape	5	4	3	2	1
B) Level	5	4	3	2	1
C) Compass	5	4	3	2	1
D) Scale Stick	5	4	3	2	1
E) Other _____	5	4	3	2	1
6) Properly set and use table saw to crosscut and rip lumber for making a Biltmore stick.	5	4	3	2	1
7) Build, mark and finish a Biltmore stick.	5	4	3	2	1
8) <u>OTHER NEEDED COMPETENCIES</u> basic to hand tools, hand tool reconditioning and shop activities: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XIV. CHAIN SAW OPERATION AND MAINTENANCE:

1) Identify and explain the basic operating principles of two cycle engines.	5	4	3	2	1
2) Name the basic parts of a chain saw.	5	4	3	2	1

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
3) Make minor adjustments on a chain saw including:	5	4	3	2	1
A) the carburetor	5	4	3	2	1
B) the chain, bar and sprockets	5	4	3	2	1
C) the filters					
4) Visually inspect and repair any exterior worn or broken parts.	5	4	3	2	1
5) Sharpen saw chains using appropriate files, file holder and depth gauge with accuracy required to make straight, efficient cuts.	5	4	3	2	1
6) Lubricate and clean a chain saw, bar and sprockets, for chain saw efficiency.	5	4	3	2	1
7) Demonstrate knowledge of chain saw safety and fire regulations.	5	4	3	2	1
8) Start and stop a chain saw in a safe manner.	5	4	3	2	1
9) Operate a chain saw safely:					
A) Felling	5	4	3	2	1
B) Bucking	5	4	3	2	1
C) Limbing	5	4	3	2	1
10) <u>OTHER NEEDED COMPETENCIES</u> basic to chain saw operation and maintenance: (Please add numerical ratings as needed.)					
A)					

Appendix I, Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

B)

C)

XV. CHRISTMAS TREE PRODUCTION:

- | | | | | | |
|---|---|---|---|---|---|
| 1) Identify the different species of Christmas trees, their characteristics and market potential. | 5 | 4 | 3 | 2 | 1 |
| 2) Evaluate and select appropriate sites considering soil requirements, topography, marketing, accessibility, and protection. | 5 | 4 | 3 | 2 | 1 |
| 3) Determine and use cultural practices in pruning and shearing trees to develop proper shape. | 5 | 4 | 3 | 2 | 1 |
| 4) <u>OTHER NEEDED COMPETENCIES</u> basic to Christmas tree production: (Please add numerical ratings as needed.) | | | | | |

A)

B)

C)

XVI. TREE PLANTING:

- | | | | | | |
|--|---|---|---|---|---|
| 1) Demonstrate proper care of planting stock. | 5 | 4 | 3 | 2 | 1 |
| 2) Compute spacing where recommended trees per acre is known. | 5 | 4 | 3 | 2 | 1 |
| 3) Demonstrate proper technique in planting seedlings. | 5 | 4 | 3 | 2 | 1 |
| 4) Plant trees in a safe and efficient manner using proper spacing and trees per acre. | 5 | 4 | 3 | 2 | 1 |

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
5) Properly care for tree planting equipment: planting hoe and planting bag.	5	4	3	2	1
6) Take survival plot information and determine percentage survival.	5	4	3	2	1
7) <u>OTHER NEEDED COMPETENCIES</u> basic to tree planting: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XVII. AERIAL PHOTOGRAPHY:

1) Adjust a stereoscope to the proper interpupillary distance.	5	4	3	2	1
2) Set up aerial photos for the easiest and most accurate stereoscopic viewing.	5	4	3	2	1
3) Locate and explain the meaning of information printed at the top of each photo.	5	4	3	2	1
4) Locate and explain fiducial marks, principal points, flight lines, and conjugate principal points.	5	4	3	2	1
5) Locate and place the effective mapping area on desired photo.	5	4	3	2	1
6) Use an aerial photo to:					
A) Locate different areas and features on the ground.	5	4	3	2	1
B) Determine distance and direction	5	4	3	2	1

Appendix I. Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

from one reference point to
another.

- 7) OTHER NEEDED COMPETENCIES basic to
aerial photography: (Please add
numerical ratings as needed.)

A)

B)

C)

XVIII. TIMBER CRUISING:

- | | | | | | |
|---|---|---|---|---|---|
| 1) Measure a stand of trees at the
proper D.B.H. accurately, using a
Biltmore stick, and a diameter tape. | 5 | 4 | 3 | 2 | 1 |
| 2) Measure the height of a stand of
trees in the number of 16 or 32
foot logs using: | | | | | |
| A) Abney Level | 5 | 4 | 3 | 2 | 1 |
| B) Clinometer | 5 | 4 | 3 | 2 | 1 |
| C) Merritt Hypsometer (Biltmore
stick) | 5 | 4 | 3 | 2 | 1 |
| D) Visual Estimation | 5 | 4 | 3 | 2 | 1 |
| 3) Measure bark thickness at proper
heights using a bark gauge. | 5 | 4 | 3 | 2 | 1 |
| 4) Determine rings per inch with the
use of an increment borer. | 5 | 4 | 3 | 2 | 1 |
| 5) Gather sufficient data to compute
form class for volumes and species
of trees. | 5 | 4 | 3 | 2 | 1 |

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
6) Use tables to compute volumes of standing timber.	5	4	3	2	1
7) Demonstrate skill in cruising by using various cruise methods, (fixed plot, variable plot, and 100% cruises) on established areas to determine total volume.	5	4	3	2	1
8) Demonstrate knowledge of various log rules; Schribner, Schribner Dec. c., International $\frac{1}{4}$ inch, Doyle, etc..	5	4	3	2	1
9) <u>OTHER NEEDED COMPETENCIES</u> basic to timber cruising: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XIX. DIFFERENTIAL SURVEYING:

1) Set up and adjust a level.	5	4	3	2	1
2) Set up and adjust a transit.	5	4	3	2	1
3) Accurately read a Philadelphia rod.	5	4	3	2	1
4) Record field survey notes.	5	4	3	2	1
5) Accurately distinguish and compute height of instrument, and elevations from back site and fore site readings.	5	4	3	2	1
6) Run a percent grade line using profile surveying and compute out.	5	4	3	2	1
7) Properly care for a surveying instrument and other surveying equipment.	5	4	3	2	1

Appendix I. Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

- 8) OTHER NEEDED COMPETENCIES basic to differential surveying: (Please add numerical ratings as needed.)

A)

B)

C)

XX. LOG SCALING:

- | | | | | | |
|---|---|---|---|---|---|
| 1) Measure the diameter inside the bark of the small end of a log accurately. | 5 | 4 | 3 | 2 | 1 |
| 2) Measure correct length of a log, allowing for proper trim allowance using a logger's tape. | 5 | 4 | 3 | 2 | 1 |
| 3) Accurately identify the species of logs using bark or wood characteristics. | 5 | 4 | 3 | 2 | 1 |
| 4) Identify log defects. | 5 | 4 | 3 | 2 | 1 |
| 5) Determine the gross volume of a log using east side and west side scaling tables and rules. | 5 | 4 | 3 | 2 | 1 |
| 6) Determine the net volume of a log using east side and west side scaling tables and rules. | 5 | 4 | 3 | 2 | 1 |
| 7) Accurately grade logs according to species regulations. | 5 | 4 | 3 | 2 | 1 |
| 8) <u>OTHER NEEDED COMPETENCIES</u> basic to log scaling: (Please add numerical ratings as needed.) | | | | | |
| A) | | | | | |
| B) | | | | | |

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
C)					
XXI. <u>OTHER SILVICULTURAL PRACTICES:</u>					
1) Describe the five major silvi-cultural systems used in the United States.	5	4	3	2	1
2) Select, mark, and remove trees to be thinned, utilizing spacing trees per acre, and most desired species.	5	4	3	2	1
3) Prune trees for log improvement.	5	4	3	2	1
4) <u>OTHER NEEDED COMPETENCIES</u> basic to other silvicultural practices: (Please add numerical ratings as needed.)					
A)					
B)					
C)					
XXII. <u>LUMBER, PLYWOOD AND PAPER PRODUCTION:</u>					
1) Demonstrate a basic knowledge of local manufacturing processes.	5	4	3	2	1
2) Identify finished lumber by species.	5	4	3	2	1
3) Describe the "flow" of a log through the various processing:					
A) Lumber Mill	5	4	3	2	1
B) Plywood Mill	5	4	3	2	1
C) Veneer Plant	5	4	3	2	1
D) Pulp and Paper Plant	5	4	3	2	1

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
E) Composition or Pressboard Facility	5	4	3	2	1
4) <u>OTHER NEEDED COMPETENCIES</u> basic to Tumber, plywood and paper production: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

XXIII. SERVICING HEAVY EQUIPMENT:

1) Identify the tools used in servicing heavy equipment.	5	4	3	2	1
2) Develop a daily maintenance plan for a tractor/skidder.	5	4	3	2	1
3) Develop a daily maintenance plan for a log truck.	5	4	3	2	1
4) Service heavy logging equipment.	5	4	3	2	1
5) Demonstrate basic understanding of servicing terminology.	5	4	3	2	1
6) <u>OTHER NEEDED COMPETENCIES</u> basic to servicing heavy equipment: (Please add numerical ratings as needed.)					
A)					
B)					
C)					

Appendix I. Continued.

	ESSENTIAL	NECESSARY	NICE TO KNOW	NOT NECESSARY	NO OPINION
XXIV. <u>WIRE ROPE SPLICING:</u>					
1) Identify the tools used in wire rope splicing.	5	4	3	2	1
2) Cut wire rope with any of the accepted methods.	5	4	3	2	1
3) Identify safety hazards of wire rope splicing.	5	4	3	2	1
4) Demonstrate skill in wire rope splicing.	5	4	3	2	1
5) <u>OTHER NEEDED COMPETENCIES</u> basic to wire rope splicing: (Please add numerical ratings as needed.)					
A)					
B)					
C)					
XXV. <u>TREE AND POLE CLIMBING:</u>					
1) Identify tree climbing tools.	5	4	3	2	1
2) Describe the safety hazards of tree/pole climbing.	5	4	3	2	1
3) Properly adjust tree climbing equipment.	5	4	3	2	1
4) Describe the maintenance of climbing equipment.	5	4	3	2	1
5) Climb a tree or pole.	5	4	3	2	1
6) <u>OTHER NEEDED COMPETENCIES</u> basic to tree and pole climbing: (Please add numerical ratings as needed.)					

Appendix I. Continued.

NO OPINION
NOT NECESSARY
NICE TO KNOW
NECESSARY
ESSENTIAL

A)

B)

C)

XXVI. WILDLIFE AND FISH IDENTIFICATION:

1) Identify common wildlife in the area. 5 4 3 2 1

2) Identify common fish in the area. 5 4 3 2 1

3) OTHER NEEDED COMPETENCIES basic to
wildlife and fish identification:
(Please add numerical ratings as
needed.)

A)

B)

C)

APPENDIX II

FORESTRY COMPETENCIES
SUGGESTED BY SURVEY RESPONDENTS

I. Occupational Opportunities:

- Develop a sense of responsibility towards an employer with the understanding that his problems are your problems also.
- Locate information relative to occupational opportunities.
- Observe and/or interview an employee.
- Complete job applications.
- Develop good work habits--be on time, good attendance, and safe habits.
- Develop an awareness that a desired occupation may not be available upon graduation.
- Employable personality.
- Learn that an employer can only profit if the employee produces.
- Demonstrate ability to work with classmates and to be supervised by teacher.

II. Tree Identification:

- Should know by sight the commercial conifers and hardwoods of the Pacific Northwest.
- Know the value of species in relation to each other.
- Be able to use common plant keys.
- Correctly spell the common names.
- Be able to identify uses, i.e., lumber, paper, furniture, etc.
- Identify major edible and poisonous plants of his region for survival purposes.

III. Tree Growth:

- Explain species and site adaptability and how it affects tree growth.
- Identify and discuss tree growth factors, i.e., soil, water, light, exposure, and stand density.
- Determine results when one cell is damaged, i.e., defoliation, insect damage, fire, etc.
- Fertilizer and its effects.
- Seed germination and planting.
- Explain the meaning of site or site index.

Appendix II, Continued.

- Thinning compared to non-thinning.
- Determine the stages that a tree goes through.
- Make growth studies in a given area.

IV. Chaining and Pacing:

- Use Calder's table in converting slope distance to horizontal distance.
- Use Calder's table in determining the rise or difference in elevation.
- Correctly pull a chain from one location to another avoiding kinks in the tape.
- Learn to estimate visually a pace on steep ground and forget counting extra steps.
- Understand horizontal and slope measurement.

V. Mapping and Compass:

- Orient student to types of maps.
- Read old survey notes and locate section corners.
- Use proper headings, numerical, explanatory notes and sketches when collecting field data on a traverse.
(field notes)
- Name the parts of a compass and describe the function of each.

VI. Forest Soils:

- Show the importance of soil structure in forest road layout, design and construction.
- Consider site classification in determining land values and timber growth.
- Slope percent in connection with slides.
- Compaction in connection with tractor logging.
- Describe sheet erosion, slumps, and the impact of erosion.
- List the basic minerals and conditions necessary for proper growth of the region's economically important trees.
- Determine pH values.
- Soil borne diseases and treatment.

VII. First Aid and Safety:

- Safe operation of chain saw.
- The individual be aware of safe practices at all times and practice them.

Appendix II. Continued.

- Review and read "Logging Safety Code."
- Form and function as a crew or unit on assigned tasks.
- Know plan of action to follow in case of an emergency.
- Demonstrate ability to swim.

VIII. Logging Methods:

- Road location, design and drainage.
- Learn of the several yarding systems.
- Timber felling techniques.

IX. Fire Fighting and Suppression:

- Fire safety while hunting.
- Develop fire protection plan for logging contractor situation.
- Learn basic state forest fire laws.
- Identify various fuel types and learn terminology.
- Know how aircraft are used in detection and suppression work.

X. Forest Diseases and Insects:

- List uses for insect and disease destroyed timber.
- Identify major insects in the area by bark pattern.
- Affects of various logging practices on same.

XI. Marketing and Economics:

- Forest taxation.
- Teach economics so that the students recognize in a capitalistic system companies MUST make a legitimate profit while being competitive and efficient and that EVERY action, with few exceptions, must be considered from a "dollar" standpoint.
- Learn methods to protect resources.
- Understanding of free enterprise system.
- General background in business and finance.

XII. Leadership Development:

- Know your abilities and don't get in over your head--learn to say "no."
- Practice common courtesy.

Appendix II. Continued.

- Respect supervisory authority.
- Respect subordinates.
- Develop skills in human relations.
- Learn to listen.

XIII. Hand Tools, Hand Tool Reconditioning and Shop Activities:

- Demonstrate proper use, care, and maintenance of these additional tools or equipment: Planting Bar, Speigel Nel-Spot 50 ft., Relaskop, Marking gun, Logger tape, Biltmore stick, Abney level, Clinometer, Prism, Peavy, Hookaroon, McLeod, Increment borer, Pruning saw, Hazel hue, Topographic chain.

XIV. Chain Saw Operation and Maintenance:

- Describe the various articles of safety clothing and their purpose.
- Unique dangers unique to different saw sizes.
- Demonstrate a proper fuel mix using both 30 and 40 weight bulk oil.

XV. Christmas Tree Production:

- Know production costs and possible profit.

XVI. Tree Planting:

- Determine plantable species for particular site.
- Determine seed needs per species for planting.
- Evaluate cone crop and determine seed count by individual species.
- Explain proper procedure for ordering planting stock.
- Determine when it is to your advantage to plant by 1) hour wage, 2) per tree or per 1000, and 3) per acre.
- Understand advantages of differently prepared stock, i.e., 2-0 vs. 2-1 vs. containerized.

XVII. Aerial Photography:

- Determine irregularity of terrain--steepness.
- Differentiate tree species.
- Explain or demonstrate the use of photos when locating property corners and survey lines, etc..

Appendix II. Continued.

- Photo cruising skills.

XVIII. Timber Cruising:

- Understanding of cords (for pulpwood), cunits which is involved in utility and chip logs.
- Estimate defect and breakage.

XIX. Differential Surveying:

- Building and road layout.
- Construct topographic map.

XX. Log Scaling:

- (None Listed)

XXI. Other Silvicultural Practices:

- Discuss and compare silvicultural practices.
- Knowledge of the "Natural Forest Cycle."
- Safety in thinning.
- Explain methods for control of undesirable species or brush control.
- Use of various chemicals.
- Exhibit a basic understanding of the principles of forest ecology.

XXII. Lumber, Plywood and Paper Production:

- "Flow" of log through shingle and shake mill.
- "Flow" of log through a pole and piling plant - pressure treatment.

XXIII. Servicing Heavy Equipment:

- Know which greases and oils are used for what purpose.
- Demonstrate proper use of owners guides and service manuals.

XXIV. Wire Rope Splicing:

- Identify types of wire rope.
- Decide which types and sizes for logging.
- Accent splicing on various line sizes and the many types of splices--eye splice, long splice, etc..

Appendix II. Continued.

XXV. Tree and Pole Climbing:

- Be aware of state regulations.

XXVI. Wildlife and Fish Identification:

- Effects of logging activities on wildlife.
- Effects of logging activities on fish and streams.
- Discuss fish and game interaction with forestry.
- Total community relations in forest--(plants, animals, fish).
- Relationship between forest and wildlife.
- Possess knowledge of habitat requirements for fish and wildlife and what steps to take in logging to minimize damage to habitat.
- Conservation of natural resources.
- Identify wildlife terms such as carrying capacity, biotic potential, etc..
- Who controls wildlife and fish in the state.

+ Other Units Suggested:

- Watershed
- Ecology
- Forest Genetics
- Recreation
- People Management
- Land Use Planning
- Forest Engineering
- Office Machine Operations, including computers.