

EDUCATION OF FORESTERS
IN AMERICA

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Preface

It is a privilege to join foresters throughout the world in commemorating Professor Eino Saari's 60th birthday. Professor Saari is well acquainted with forest conditions not only in his native Finland but in many other countries. He has become well known because of his contributions to forest economics, his travels, his service to forestry in the Food and Agriculture Organization, and especially through being the gracious and effective president of the Third World Forestry Congress.

Professor Saari is an educator noted for developing foresters as competent professional men and responsible citizens in modern society. Because of his world-wide interest in education, it is appropriate that an article on education of foresters in the United States appear in this issue of *Acta Forestalia Fennica*.

Employment of Foresters in the United States

Forestry has developed at a phenomenal rate in the United States since 1945. At that time the total number of foresters employed was estimated to be 6 000 — 700 of whom were working in private forestry. Estimates made in November 1953 indicated that the number in the profession had increased two and one-half times in eight years. The distribution by employing agencies is given in Table I.

Table 1. Estimated Employment of Foresters in the United States in 1953¹

Agency	Men Employed
Federal, all agencies.....	4 800
State, all agencies	1 500
County and municipal	200
Education	700
Private, including industrial	6 200
Unclassified and allied fields	1 600
Total	15 000

¹ Estimated employment of professional foresters in forestry and related fields in the United States. *Journal of Forestry* 52: 10. 1954.

From 1946 to 1953 American schools of forestry graduated 9 719 foresters. This rapid expansion was largely unforeseen. Neither in government nor in industry did foresters forecast more than a 20 to 30 percent increase in nation-wide forestry employment during the first postwar decade. In fact considerable pessimism was expressed about absorbing the foresters to be returned from military service. No planning agency either in government or outside directed young men into forestry. Rather the schools opened their doors wide to returning veterans desiring education. Choice of forestry was left to each individual with such guidance as vocational counselors could give. Several men in the profession urged the schools to restrict enrollment lest there be three foresters competing for every job. Their admonitions went unheeded because the educators felt that much remained to be done in forestry, that therefore the employment outlook for foresters was as bright as for men in many other professions, and that education in forestry is a good education whether the man follow forestry or some other activity. The rapid expansion of forestry both in intensity and scope of activities directed public attention to the profession. Consequently the professional foresters in their local communities rose in prestige to equal that accorded engineers, agriculturists, and many other professions.

Since 1945 young people from other countries have sought admission to United States forestry schools in growing numbers. Through the mutual aid and other programs American foresters have gone to many other lands to help establish or improve forestry programs. Recent developments in forestry and particularly in forestry education in America therefore are of widespread interest. Of special interest is the extent to which schools of forestry have led, or supported, the rapid growth of forestry and the plans that schools are making to sustain this growth in the future. These points will be developed by first examining the major factors influencing education in forestry by identifying significant trends in dealing with these factors and finally by evaluating the schools as a whole.

Factors influencing forestry schools

Schools of forestry are affected by and in turn react upon six major elements. These are — the students, the universities of which forestry schools are a part, the profession and its associated technical fields, research in forestry, foreign students, and the general education movement.

American students of forestry

The American educational system involves eight years of primary schooling, four years of high school, four years of undergraduate study in college leading to a bachelor's degree, and two to four post graduate years leading to the master's or doctor's degree.

American students of forestry are not an especially selected group but usually come from the upper half of their high school class. They enter at ages of 18 to 19 years. Many are immature. For some it is their first extended period away from home and parental guidance. They come from all classes of society, sons of farmers, skilled and unskilled laborers, teachers, clergymen, tradesmen, and professional people. The homes from which they come differ less widely in physical comfort than in cultural atmosphere. All are likely to have radios, television sets, and family motor cars. Most have newspapers, books, and magazines. Good books, classical music, and dramatized presentation of the important events of the day are available to most citizens. It is the discrimination displayed by the parents in selecting broadcasts to which they listen, news topics for family conversation, and books for family reading that set the cultural tone. There is growing evidence that in America interest in things of intellectual and cultural merit is increasing, albeit slowly. Many citizens still remain essentially indifferent.

A high percentage of American college men are partially or wholly self-supporting. Almost all work during summer vacations for experience and income. During the academic year it is not unusual to discover students, carrying a full curricular load requiring 40 or more study hours, who work 20 hours each week to help meet college expenses. Only a limited number of scholarships and fellowships are available in sufficient amounts to support students during four years of college. Acquiring a college education therefore entails hard work and sacrifice on the part of many students as well as parents. They persist against financial handicaps in the expectation that a college education will bring commensurate financial and other rewards in later life. In this they have the records of performance by others to support their hope.

Obligated daily to expend considerable energy to finance their education, it is not surprising to find that many students display slight interest in subjects of cultural as opposed to professional content. For them college life is a time of hard work and self denial rather than a glorious intellectual adventure. Their overpowering urge is to acquire professional knowledge

so that they can earn a living for themselves and the family they hope to raise.

Interest in the out of doors, in growing plants, and in the professional work of foresters cause many to have strong vocational interests. Rarely however are they able during their first two collegiate years to appreciate the scope and depth of the forester's job and the education it requires. Impatience with basic education in English, speech, economics, and natural science is the result.

University setting of forestry schools

Education in forestry is primarily a function of State Universities. The majority of students are enrolled in the 25 schools accredited¹ by the Society of American Foresters. All of these except Yale and Duke, both of which are graduate schools, are a part of State Universities. Professional programs are offered in 11 other institutions of which nine are State supported.

The admission policies of State Universities are generous. Most schools of forestry admit all qualified students who desire to enter irrespective of outlook for future employment in forestry. This policy is adhered to because no forecasts of future employment opportunities can be made with assurance of validity.

For men of varied talents and abilities there exist many attractive employment opportunities in fields related to forestry for which education in a college of forestry provides the best background. Furthermore, most educators feel that the opportunity to prepare for a profession should not be denied the student because the field may be crowded.

Within the State University or State College of Agriculture and Mechanical Arts, forestry education may be organized as a separate college, division, or department. During the first two years instruction is provided by general university departments and may be oriented toward agriculture or engineering rather than forestry. Professional subjects are concentrated in a summer camp program and the last two of the four-year undergraduate sequence.

The curriculums in forestry at all schools are demanding. From 135 to

¹ Accreditation is based on the qualifications of forestry faculty and supporting departments, and the laboratory and other resources devoted to instruction in forestry. Graduates of accredited schools are eligible for election to Society membership.

150 semester hours of work are required for graduation, in contrast to the usual 120 hours required in liberal arts colleges. Forestry students have limited time for athletics and other extra curricular activities.

Relations between faculty and students tend to be informal in all American universities, and are especially so in the forestry colleges. In summer camps faculty and students live, work, and play together. Foresters characteristically address each other by first names irrespective of employment status. The informality of the profession pervades the schools. Both faculty and students believe in it.

Forestry profession and associated fields

Forestry in the United States has seen three great periods of rapid development. During the first, 1898 to 1910, forestry was established as a definite obligation of federal and state government. Management of the national forests was the all-absorbing task. State forestry, too, was developing, and in 1911 was afforded an important stimulus through grants in aid from the federal government for extending fire control to all forest lands.

The second period occurred in the 1930's when public forests were seen to provide a huge reservoir of useful work not competitive with private industry. Emergency work programs furnished labor to develop forest improvements, plant deforested lands, and to carry out simple silvicultural measures. Perhaps the greatest permanent value, however, was in acquainting over three million young men and their families with forestry as a profession and its contribution to the national welfare.

The third period began in 1945 and has been characterized by the flowering of private forestry. Two major factors, the growing influence of industrial foresters and the economic value of second growth timber, spurred the development. During the difficult times of the early 1930's many forestry graduates, unable to find jobs in government, took whatever employment the forest industries could offer. These men today hold such positions as company forester, woodlands manager, and vice president in charge of raw material supply. It is to these men especially that Americans owe the rapid expansion of industrial forestry during the postwar period.

Federal Influence

The federal government exercised the dominant influence in forestry from 1898 until 1945. It controlled policies on federal lands, influenced

state programs through grants to aid State forestry, and provided employment for the majority of forestry graduates. Its agencies sought employees who were imbued with faith in public forestry, and who subscribed to the public objectives the employing agencies espoused. The prestige of the United States Forest Service attracted to it the ablest graduates. Forestry schools not only slanted their educational programs towards United States Forest Service needs but tended to judge the school's success on the basis of percentage of graduates that were offered Forest Service jobs.

Curriculums stressed public policy, surveying, mensuration, dendrology, forest management, fire control, entomology, pathology, range management, and silviculture with conditions on western National Forests chiefly in mind.

As the multiple use principle was developed increasing attention was paid to watershed management, wildlife, public recreation and other tasks that confronted the public land administrator. To meet these expanding concepts schools offered new courses and even curriculums in range, wildlife, and park management. Forest economics was developed primarily in terms of the role of forests in the national economy.

Industrial Forestry

The forest industries have tasks of their own. These include purchasing land for timber growing, and organizing and managing this land so that company requirements can be conveniently met at reasonable costs. For them, emphasis must constantly be placed on keeping over-all costs low. They need as employees men who are sympathetic to the private enterprise system and who know how to apply business principles to forest operations. Basically this difference in objectives between industry and government is mainly one of emphasis rather than kind as both are interested in long term timber production and protection of the other resources of the forest. The methods by which each seeks to achieve these objectives obviously are not the same.

The typical woodlands manager for a large lumber or pulp company may be responsible for a variety of activities. He may purchase land, standing timber and logs at the mill. He may operate a nursery, plant trees, thin plantations, and harvest crop trees. He may direct company extension foresters who provide services to farmers and other small woodland owners. He may have charge of logging operations on the company

lands with all this entails in terms of building camps, hiring loggers, purchasing heavy machinery, and running an integrated logging operation from the tree to the pulpmill or sawmill. He may spend from 10 to 20 percent of his company's entire budget and must keep appropriate accounts. He needs to understand the skills of the forester, the mechanical engineer, the civil engineer, and the business executive. Foresters have not risen to positions of executive responsibility in industry unless they accepted the responsibility of performing a definite role in the day to day production operations.

Faculties of forestry schools naturally are interested in seeing their alumni rise to positions of executive leadership. Consequently they have modified courses and curriculums to include the subject matter useful to young men entering industrial work with a view towards managerial responsibilities. Offerings now include courses in logging, lumber manufacture, economy of the forest products industries, commercial timbers of the world, the international timber trade, salesmanship, personnel management, business law, and related subjects valuable to the business manager.

In the field of forest products, courses include timber physics, timber mechanics, wood preservation, veneers and plywood, glues and finishes, machining of wood, lumber seasoning, and other subjects of interest to the wood processing industries.

At State University of New York a student may elect any one of six separate undergraduate curriculums: General Forestry, Landscape and Recreation Management, Wood Technology, Retail Merchandising and Light Construction, Conversion and Distribution of Forest Products, and Pulp and Paper Technology. At Michigan State College the student has the following choices: Fisheries and Wildlife; Forestry; Forest Products, with options in light construction and lumber merchandising, wood utilization, packaging technology, and wood technology; and Land and Water Conservation, with options in rural land and water conservation, and park management and municipal forestry.

Individual educators in forestry have debated the wisdom of such expanded curriculums on many occasions. The debate, however, has been academic. The schools with specialized curriculums have found their classes full and their graduates in good demand. They have therefore continued with their expanded offerings.

Research

The rapid expansion in industrial forestry of the last eight years has reflected the vigor of the forest industries. Among these the pulp and paper industry has lead in expansion of business, in research, and in forest practice. Yet good markets and prosperous operation has not been universal. The wood distillation industry has been unable to meet the competition of the synthetic chemical manufacturers and the cooperage and wooden box industries have lost markets to fiber board and metal containers.

The lumber industry has fared somewhat better, but lags far behind industry in general. Lumber production in the United States reached a peak of some 44 billion board feet in 1908. It declined to 15 billion feet in 1932 and expanded during the Second World War to between 35 and 40 billion board feet annually where it remains today.

The decline in use of lumber has been due in part to the fact that lumber has increased in cost far more rapidly than other building materials. These increased costs reflect growing scarcity of high quality virgin timber and increased labor costs without increased productivity in logging, manufacturing, transporting and using lumber.

Basically, increased costs and declining use reflect failure of the industry to take full advantage of research and applied technology by which other industries have been able to increase output per worker, improve quality of product, and lower production costs.

The situation in the wood processing industries is similar. Neglected by engineers and architects, wood has failed to keep its place in modern industry. The furniture, millwork, and other wood processing plants have been prone to depend on 19th century craftsmanship rather than 20th century production methods. As a consequence, steel, aluminum, and other materials have displaced wood in the factory, store, office, and home.

The lumber and wood processing industries have always been highly competitive in the United States. No one company controls a high percentage of total production. The number of small operators is in the thousands. Few companies in the forest industries aside from paper manufacture have the financial resources and stability to support research programs. Even fewer appreciate that research can make a tangible contribution to operations.

Both the schools of forestry and the U. S. Forest Service have recognized the need for improved technology in the forest industries. They have

enlarged their research programs to include forest products and sought support from the industries in guiding these programs along lines deemed to be most helpful in improving the use of wood.

The U. S. Forest Service has been the major agency engaged in forest research. The pulp and paper and cellulose industries have spent considerable amounts on research in manufacturing processes but relatively little on silviculture forest economics or forest management.

Since 1945 outside financial sponsorship has lead to rapid expansion of research in colleges and universities. Government plays a dominant role through the huge research appropriations administered by the Department of Defense and the Atomic Energy Commission. Industries likewise have been financing research in educational institutions in lieu of or in addition to research programs administered directly by individual companies or associations. Rising costs of education have caused schools of forestry as well as other educational institutions in the country today to look largely to foundations, industry, and the federal government for financial sponsorship of research. Such sponsorship has yielded results of value to industry, brought the industrialist and educator closer together but has not always developed those fields most useful to education.

Forestry research has enriched our knowledge, added new subjects to college curriculums and contributed to useful literature. It provides an exciting and gratifying experience to teachers. The enthusiastic research worker can usually infect his students with the same enthusiasm for learning, thereby adding vitality to his teaching.

The need for research workers, more than anything else, has caused increased emphasis on graduate work in the forestry schools. The number of graduate degrees awarded from 1946 to 1953 was 1456 masters and 112 doctors. The highest for a comparable period, 1936—1942, was 647 masters and 63 doctors.

Research and educating men for research has become a major activity of many schools of forestry. Moreover, research emphasis has been shifted from concentration on silviculture and forest management to concentration on forest products. Alarm is being expressed lest this trend go too far.

Students from other lands

Since 1945 men from all free countries have been coming to American colleges and universities for education. To one college of forestry alone students have come from Canada, Mexico, Paraguay, Chile, Brazil, the

Philippines, Japan, Korea, China, India, Pakistan, Burma, Turkey, Iran, Italy, Spain, France, Belgium, Germany, Czechoslovakia, Poland, Lithuania, Estonia, Israel, England, Norway, Sweden, Finland, South Africa. These students are mostly a highly selected group with rich backgrounds of experience and culture. Many are men of high intellectual powers that have offered a real challenge to native students.

Students from other lands come to study all branches of forestry. The majority are interested not so much in general forestry as in new developments in management and utilization. They wish to know how to apply aerial photos in forest surveying and timber estimating, to learn modern logging methods, to study dry kiln operation, wood preservation, use of synthetic adhesives, pulp and paper technology, and the cellulose plastics industries. Only a few are interested in forest botany, silviculture, economics, and policy. The forces that lead to diversification of curriculums in American schools are active in other lands as well.

The exchange program for students in forestry is largely in one direction. Only a few United States foresters study abroad on Fulbright or other grants. A few schools of forestry have established special programs for students from specific countries but most have accepted qualified students regardless of country of origin. Adjustments thus far have been mainly on the part of the foreign student, though individual faculty members have gone to much pains to be helpful. The influence of foreign students is expected to increase in the future, at least in a few schools.

General Education

Beneath the surface of American education has long smoldered distrust of heavy emphasis on natural science and technology. It is felt that liberal education has been neglected to the detriment of students as individuals and as citizens.

America has accepted its world responsibilities with considerable reluctance and with much self examination. Many citizens feel that the nation is unprepared to play a dominant role in world politics. Means for upgrading the general intellectual stature of our entire populace, and particularly of our college graduates, are needed. Graduates need to assume leadership in acquainting others with actions our nation must take if its role in world affairs is to be satisfying at home and helpful to others.

The popularity of the general education movement has given rise to

a plethora of programs, some hastily conceived and of questionable intellectual merit. All stress adjustment to life, living harmoniously with one's fellow men, communication skills, and philosophy. The basic difficulty has been to find time in the crowded professional curriculums that can be devoted to these purposes. However slow the progress, efforts to achieve general education goals are not forgotten.

Current developments and trends

The colleges of forestry in the United States feel obligated to prepare men to work effectively in the various types of positions that exist in government and industry. Specialization in logging engineering, wood technology, wildlife management, and recreational use of land are today no more of an innovation than was specialization in forestry in 1900.

The colleges of forestry have been quick to respond to new requirements of the profession. They may not be the leading element in today's advance in forestry but they certainly are not far from the front. Otherwise the advance would falter from lack of competent personnel to carry it on.

The colleges are going much beyond mere adding of courses and curriculums. A considerable number have established short courses concerned with specific subjects for men in industry or government. These cover such varied topics as use of carbide-tipped cutting tools, grading and seasoning of lumber, quality control in the furniture industry, photogrammetry, and public administration as applied to natural resources. Men in all levels of responsibility from the newly appointed employee in a lumber yard to presidents of corporations and administrators of important governmental offices are attending such short courses.

Colleges have sought also to establish research programs that are of interest to men in industry. In this way the research worker has the opportunity to collaborate with men in industry on his research and to see new results put promptly into practice.

Colleges have added new courses and adjusted curriculums so as to meet the requirements of new developments in government and in industry. New programs are not undertaken lightly. They are given careful study and many are rejected as being unsuited to the program of the particular college. The trend generally is toward increased specialization but there is a counter trend in evidence. Graduates in forestry who have been polled by recent questionnaires have repeatedly emphasized that facility in speak-

ing and writing outranks in importance all other skills even including silviculture. They also include high in their list, courses in human relations and understanding of the economic environment in which forestry operates.

Both the colleges and the employers generally recognize the need for well educated men rather than merely highly trained technicians. The problem is how to develop men with the technical competence demanded in entering forestry positions and still include in their college curriculum those subjects which give broad understanding of human affairs. Methods of teaching are being recognized to be just as important as course content in the development of the individual. Less emphasis is being placed on presenting facts to students and much more on how to acquire facts through reading, observation, organized thinking, and inquiry.

The colleges must take students as they come and seek to awaken in them a desire to learn and also a desire to become workers in society. The way in which some schools are seeking to combine technical education with development of the individual is illustrated by the curriculum in landscape and recreation management as taught at State University, College of Forestry at Syracuse. The curriculum is largely prescribed. Students have a minimum of opportunity to pursue courses of their own choosing. Each course, however, is flexible. Instead of being taught by individual instructors, many courses are presented by the departmental staff. Much individual instruction is presented over the drawing board or in conferences. Teamwork by students is encouraged. They are taught that each one must individually become a creative designer himself, that he cannot learn to design parks simply by following the prescription of his professor. It is up to him as an individual to put his own creative thought and imagination into his work, fortified by the knowledge he has acquired by studying examples of good art throughout the ages. When he comes up with something new or different he is offered not the judgment of a single instructor, but criticism from each member of the faculty. Criticism is openly given so that every student may realize the reaction of different individuals to a particular design.

The student, therefore, learns that there is no single solution to a design problem. Such methods are especially challenging to the students of superior talent. Students from this curriculum are able to compete successfully and confidently with the graduates of the best schools of landscape architecture in the country. They are not educated primarily as landscape architects but as designers of parks and park managers. They have learned to think in terms of modifying land for human use. Their education has

acquainted them with masterworks in art and of how art can enrich the lives of people.

Schools of forestry can serve their profession best if while teaching technical forestry they also teach students to observe accurately, read critically, think logically, and express their conclusions with clarity and imagination. The conviction is growing that education for professional work need not, in fact must not, neglect to develop the student's understanding of himself and his role in modern society.

Summary and concusions

Forestry has developed at an extremely rapid pace in the United States during the past eight years. This development has influenced practice not only in America but in other lands as well. The schools of forestry in the United States are keeping abreast of the times and educating the young men who can keep this movement alive and growing. The schools must take the students as they come from the high schools and seek to prepare them for the obligations of professional forestry.

The schools of forestry themselves are gradually being emancipated from control by colleges of agriculture and mechanic art. Professional demands are growing at a rapid pace, and the schools are expanding their programs to meet these needs. Curriculums are already overcrowded, yet new research is adding at a growing rate to the technology that must be mastered. Students from other lands are attracted to schools of forestry in the United States because of these new developments of research and the new fields of technology that American schools now cover in their offerings. The schools have the difficult task of refining courses and curriculums so as to incorporate important new information and still maintain a broad background of general science and humanities without which a forester's education has no foundation. Faculties have responded to these new needs by adding new courses and curriculums. They are realizing that how they teach is as important in developing the individual, especially the gifted student, as what they teach.

Colleges can perform their task best through improving the faculty and organizing courses in which the student becomes an active learner rather than a passive recipient of information. Informal discussions, individual instruction, team assignments and criticism of work by two or more men with different backgrounds and opinion will arouse interest in learning

and challenge reasoning ability. Such teaching also tends to develop skills in communication, respect for others' points of view, and confidence of the student in his own developing intellectual powers.