

**THE CANADIAN SCHOOLS OF FORESTRY -
RETROSPECT AND PROSPECT'**

V. J. NORDIN'

Forest Industry Lecturer

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THE FOREST INDUSTRY LECTURES

Forest industry in northwestern Canada is cooperating with Alberta Energy and Natural Resources to provide funds to enrich the Forestry Program of the Faculty of Agriculture and Forestry at the University of Alberta through sponsorship of noteworthy speakers.

The Forest Industry Lecture Series was started during the 1976-77 term as a seminar course. Desmond I. Crossley and Maxwell T. MacLaggan presented the first series of lectures. The contribution of these two noted Canadian foresters is greatly appreciated.

Subsequent speakers in the series have visited for periods of up to a week, with all visits highlighted by a major public address. It has indeed been a pleasure to host such individuals as C. Ross Silversides, W. Gerald Burch, Gustaf Siren, Kenneth F.S. King, F.L.C. Reed, Gene Namkoong, Roger Simmons, Kenneth A. Armson, John J. Munro, Peder Braathe, and Norman Johnson. The subjects of their talks are listed on the last page.

This paper contains Dr. Vidar J. Nordin's major public address given on 19 January 1984.

We would like to take this opportunity to express our thanks again to the sponsors of this program — we appreciate very much their willing and sustained support:

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DR. VIDAR J. NORDIN



Dr. Vidar Nordin has been Professor and Dean of the Faculty of Forestry, University of Toronto, since 1971.

Dr. Nordin obtained a B.A.(Hon.) in 1946 and a B.Sc. in Forestry in 1947, both at the University of British Columbia. He obtained a Ph.D. in Forest Pathology from the University of Toronto in 1951. He was Head of the Regional Forest Pathology Laboratory for the Maritime Provinces in Fredericton until 1952 when he took charge of the first regional Forest Pathology Laboratory in Alberta at Calgary, a position he held for five years. He served 12 years in Ottawa as Associate Director responsible for forest entomology and pathology, becoming Research Director for the Canadian Forestry Service for the five years before his appointment as Dean of Forestry. He has also served as Board Chairman of the Algonquin Forestry Authority Corporation from its founding in 1974 to 1982, and was President of the Association of University Forestry Schools of Canada from 1978-80 as well as a member of its Executive Committee from 1977 to the present.

Dr. Nordin has published extensively in the field of forest pathology, forest research and forest education, as well as speaking at many conferences and symposia. He is presently Executive Project Director of the Canada-Peru Forest Education Project at Lima, a CIDA project to establish a Masters Degree Program in Forestry at the National Agrarian University in Peru. He has also been involved in consultant studies in India, Brazil, Guyana, Mexico, Malaysia and Canada, and was Head of the delegation of Canadian Forestry Deans on a study tour to the People's Republic of China in 1980.

INTRODUCTION

The key to the effective management of Canada's forestry resources is skilled people. Without appropriately educated people, Canada will not have the expertise required to meet society's changing demands for the variety of products and uses provided by forests. The Canadian university forestry schools have a vital role to play in the development of this manpower and to contribute significantly to the solution of forestry problems through research.

The Canadian forestry schools have made important contributions by graduating professional foresters but even today, notwithstanding recent progress, the schools have not reached their full potential, especially in graduate study and research. The future for the schools, however, is promising because the 1980's, '90's, and beyond will be years of vigorous development as forest management practices intensify and as all levels of government and industry make commitments to ensure the increased productivity of our forest resources. The forestry schools will be challenged to meet requirements for quality foresters, forest engineers, and forest scientists, and to generate new knowledge and technology through research.

My presentation today is a timely opportunity to focus attention on the rapidly changing status of the six Canadian forestry schools. I will examine recent achievements and propose further required actions as we enter the new era of intensive forest management.

BACKGROUND PERSPECTIVE

Six Canadian university forestry schools serve the country's educational, research, and community needs in forestry. The four faculties at the Universities of New Brunswick, Laval, Toronto, and British Columbia were established more than sixty years ago. The Forestry Program at the University of Alberta was initiated in 1970 and the School of Forestry at Lakehead University was started in 1971.

Since their inception, the six schools have never had adequate staff, facilities, and operational and research funding. Improvements that have taken place over the years have been too little and, despite recent intensified support, the schools remain in unsatisfactory positions regarding the fulfillment of their responsibilities at levels consistent with the importance to society of Canada's forest resources.

The Science Council of Canada focused on the status of Canadian forestry schools in its 1970 (18) and 1971 (21) publications where it stated: "Notwithstanding a few excellent teachers, scientists and engineers working in these areas, and notwithstanding some research that has commanded international attention through its high quality, in general, the four faculties of forestry at Canadian universities are in trouble. Taken as a group, the accommodation for Forestry Faculties is inadequate, they are under-staffed and have been under-funded so long that the projects they choose for research are in some cases minor matters and products of poverty".

Concerned by the lack of action on the recommendations of the Science Council reports, Canadian forestry schools took the initiative, with the support of the Science Council, to meet together in Ottawa on November 8-10, 1972. That conference identified goals in the context of needs in Canada and the interests of the Canadian forest resources community and the general public. At a second conference hosted by the Science Council in Ottawa on January 18-19, 1973, two major developments occurred: a national statement to serve as the basis for ongoing discussions with forestry agencies was drafted, and a decision was made to form an "Association of University Forestry Schools of Canada" (the current President is Professor Peter Murphy, University of Alberta).

As the Deans stated (19), "Our goal is simple. We are determined to help Canadians enjoy the maximum economic, environmental and social advantage from their country's forests and forest lands. We are determined to ensure that the University forestry schools have the breadth and flexibility required to make their proper contributions to the achievement of this goal. To this end, it is essential that there be mutual understanding, cooperation and support for the schools from governments and the forest industries and associations, as well as from our university administrations".

On August 19, 1973, in Quebec City, the founding meeting of the Association of University Forestry Schools of Canada was held, an Executive Committee was appointed, and a constitution with the following objectives was approved: "to provide a forum for discussion of mutual problems and the exchange of forestry education and research information; to provide a means of presenting the views of the constituent schools on issues of forestry education and research to government and industrial agencies and organizations and national groups; and to provide a means of coordinating forestry education and research where feasible and desirable".

One Agency, the National Research Council, responded to the Science Council reports and the National Statement of the forestry schools (19) and, following meetings with the Heads of forestry schools, established an NRC Associate Committee on University Forestry Research in September, 1976, with the following mandate:

"to bring together specialists from various disciplines involved in the field of forestry, in order to formulate the requirements and priorities in university forestry research and advise the National Research Council, Federal Departments, and other organizations regarding these requirements.

to identify mechanisms for coordinating forestry research in the universities, government laboratories and industry, with the aim of establishing a strong, competitive Canadian-based expertise.

to carry out such other special activities as may be assigned by the National Research Council on occasion.

to constitute subcommittees or working groups for the study of specific problems as may be required.

to complete these tasks within two years, with the understanding that an extension to a third year is possible".

This committee established ad hoc visiting groups to forestry schools and dialogue over three years. This laid the foundation for several subsequent, valuable NSERC actions in support of research at forestry schools, including the establishment of 12 special postgraduate scholarships and 12 postdoctoral fellowships annually.

Between 1973 and 1979, regardless of persistent activity by the Association (AUFSC), there was little other visible progress in achieving support for forestry schools. In 1979, Solandt (22) noted: "--it is clear that all of the Canadian forestry schools are relatively small, seriously underfunded and not very research-minded in comparison with other professional schools". The Canadian Forestry Service in 1981, in its review of "Post Graduate Training in Forestry in Canada" (4) stated: "The forestry schools can probably meet the demand for foresters with an undergraduate degree, but without considerable help they will not be able to train the graduates needed at the master and Ph.D. levels". Other reports in 1983 continued to emphasize similar concerns (16, 20).

During this same period, attitudes were changing throughout the Canadian forestry sector and, most importantly, at political levels, reflecting a steadily intensifying awareness of the importance of forestry resources to Canada's economy and that shortages of economically accessible timber resources were already a shocking reality. During the past four years, 1980-83, encouraging events have occurred involving all levels of government, industry, and universities, recognizing the need for professional and scientific manpower to undertake the greater efforts required for intensive forest management (7, 8, 11, 14, 15, 20).

Examples of these accelerating activities are the Canadian Forestry Congress convened in Toronto in 1980 (3), the Banff National Resources Conference in 1981 (1), and submissions to the Macdonald Royal Commission (5, 6). The 1983 Science Council Report (20) entitled "Canada's Threatened Forests", which includes a review of the current situation in forestry schools, recognizes that some actions have finally been taken, but that further sustained support remains urgent.

Obviously, the past development of the forestry schools has been unsatisfactory. I am glad, however, to conclude this background perspective on an optimistic note, because the past two years have witnessed a turn-around for the forestry schools which will become apparent in this review.

THE EDUCATION OF PROFESSIONAL FORESTERS

The Undergraduate Curriculum

In considering how professional foresters should be educated, a fundamental question must be asked. Is it the function of the Canadian forestry schools to train students for specific jobs, or should they educate individuals who will be versatile and adaptable and able to evolve with the increasingly capricious demands of the future? Education in forestry should create attributes in foresters that distinguish them from other professionals, but clearly, forestry schools must graduate competent individuals who can adapt to change.

President John F. Kennedy once said: "Change is the law of life. And those who look only to the past are certain to miss the future". Since change is the dominant certainty of the future (25, 26) we must design educational programs that will prepare our students to cope with change.

Not long ago the shelf-life of information was measured in years. Recent experience however, forces us to think in months rather than years regarding the perishability of some knowledge. A challenge for the forestry schools, therefore, is to determine how much data should be transmitted to students to provide a foundation for the practice of forestry and how to prepare them to respond to changes in technology and the requirements of society. Psychologist Herbert Gerjuoy, quoted by Toiler (25), stated: "The new education must teach the individual how to classify and reclassify information, how to evaluate its veracity, how to change categories when necessary, how to move from the concrete to the abstract and back, how to look at problems from a new direction--how to teach himself. Tomorrow's illiterate will not be the man who can't read; he will be the man who has not learned how to learn".

Over the years I have listened to our alumni and students tell me what the undergraduate curriculum should be or do. Some of the more frequent comments include:

- the curriculum should be general, specialization should be reserved for graduate studies, leaving all options open upon graduation for both traditional and non-traditional employment;
- there should be increased emphasis on people relations and on the fundamentals of business, commerce, and marketing;
- the curriculum should emphasize social implications; the forester should become an active member of the community and society;
- there should be emphasis on how to speak, write, and listen; communicating effectively; understanding what motivates people;
- the curriculum should teach students how to think, analyze facts, and be adaptable to changing technology and societal demands;
- high technology instrumentation and computer techniques need immediate increased emphasis in all facets of the curriculum;
- we should know more about forestry matters abroad so that we can work more effectively at home and be competitive in world markets.

The foregoing suggestions have merit and pose continuing concerns for curriculum committees. All six forestry schools provide a general undergraduate curriculum in integrated forestry resources management but differ by offering electives or optional streaming to nurture the special talents or interests of individual students. Specialized education of any consequence is, for the most part, reserved for postgraduate studies.

In addition to the forestry resources undergraduate curriculum, some schools have discrete undergraduate programs in forest engineering (U.N.B.) and wood science (Laval, Toronto, U.B.C.). These programs prepare graduates for special fields of forest industry activities.

Forestry schools face the imposing task to educate graduates to be forest managers and integrated resource land managers and administrators. and to contribute a sound foundation for research scientists and specialists. The challenge for the forestry schools is to educate the forestry student to be both technically and socially competent, prepared to cope with change, to teach the student to analyze and integrate ideas and develop alternatives in decision-making, to utilize high technology-computer techniques in the educational process, and to instill motivation. How to do this job will vary from school to school, but many of the needed actions are common to all.

Curriculum development is so important that the six schools should pool their talents in on-going liaison and in periodic meetings of their respective curriculum chairmen.

Student Quality and Numbers

A professional forestry education demands a rigorous curriculum. I do not believe, therefore, that a professional degree program in forestry is necessarily for just anyone who meets the minimum requirements of a 60% average' from high school and who has taken the pre-requisite courses.

Until two years ago, the Faculty of Forestry at the University of Toronto accepted all students who met these minimum requirements. At the same time, the registration cut-off averages for the Faculty of Arts and Science and the Faculty of Applied Science and Engineering were 73% and 83% respectively. Forestry was regarded as second-choice for some students who could not meet admission standards in other faculties.

With the University's approval, the Faculty raised its entrance requirement from 60% to 70%. An immediate result was a modest decrease in student enrollment. The beneficial effects, however, have included a general increase in the level of student scholarship, improved retention levels, a better esprit-de-corps amongst students, and enhanced academic prestige for the Faculty both within and outside the University. Interestingly, students have strongly supported the higher entrance standards. A few students continue to be weak in certain pre-requisite courses (e.g., mathematics). In addition to a 70% minimum average, therefore, first year applicants will require marks of 60% or better in pre-requisite subjects.

The current and projected enrollments of undergraduate students appear inadequate to meet manpower requirements for 6,000 professional foresters over the next 10 years as estimated by the Canadian Forestry Service (7). As indicated in Table 1, 398 foresters were graduated in 1983, a total that falls short of the C.F.S. projection.

The availability of sufficient numbers of quality students is a problem that must be addressed by the schools with the cooperation of provincial, federal, and industrial agencies as well as professional associations. An adequate pool of quality students for forestry is an important problem that will intensify as high school enrollments decrease during the 1980's. There will be keen competition with other professions in attracting sufficient numbers of the better high school students.

Forestry schools should work individually and collectively and with forestry resources agencies to publicize the value of a professional forestry education. This must be a continuing activity. Further, and most important, forestry schools will have to provide a provocative and stimulating educational experience to justify student commitments. And to ensure this level of experience, forestry schools will need to establish review mechanisms that demand high quality teaching.

Future Requirements For Professional Foresters

There have been several forecasts regarding future requirements for professional foresters in Canada (3, 4, 7, 9, 11, 14, 16, 20). These predictions vary from 4,500 to 8,000 depending upon the time scale and basis for estimates.

While such estimates are always debatable, I have used the C.F.S. figure of 6,000 foresters over the next 10 years, while recognizing that the

In an article in the Toronto Globe and Mail, January 7, 1984, the Honourable Bette Stephenson, Ontario Minister of Colleges and Universities said; "Ontario can no longer guarantee a university education to every qualified high school graduate". The distribution formula of funds for Ontario universities provides for a portion of the money to be divided according to new criteria that diminish the significance of enrollment growth. Under the old formula, a university could increase its share of government money by increasing its enrollment.

TABLE 1: UNDERGRADUATE ENROLLMENT
AND BACCALAUREATE DEGREES AWARDED IN
FORESTRY PROGRAMS, 1983-84

UNIVERSITY	ENROLLMENT (4-YEAR PROGRAM)	NUMBER OF DEGREES AWARDED*
British Columbia	410	92
Alberta	194	40
Lakehead	272	55
Toronto	263	51
Laval	311	99
New Brunswick	382	61
TOTALS	1,832	398

* Spring and fall, 1983

demand for new professionals will be influenced by several factors, including: the state of Canadian and world economies; the variability between provinces on the urgency to implement intensive forest management; the varying and tenuous nature of financial commitments for intensive forest management by provincial and federal governments and industry; and the "lean and tough" policies being adopted by employers that strive to meet their responsibilities with fewer people and lower expenditures.

The current job market for foresters is lean. In the longer term, however, employment prospects are bright, and I envy the young foresters who will participate in the new era of intensive forest management that will characterize the years to 2000 and beyond.

GRADUATE EDUCATION AND RESEARCH

Canadian forestry schools did not begin to develop programs of graduate study and research until the 1950's, and serious activity and funding support did not emerge until the mid '60's. Earlier development was hindered by a preoccupation with undergraduate instruction to meet industrial and government demands for professional foresters. There was also a limited interest in research and few employment options. In recent years, demand for forest scientists has exceeded supply, and recruitment of faculty for forestry schools and scientists for research agencies has been difficult, particularly for disciplines such as silviculture, forest harvesting, fire management, and forest economics.

Graduate Education

There were only 75 students enrolled in forestry graduate programs in Canada in 1965-66, 134 in 1969-70 and 249 in 1981-82. Since 1978, an average of only 55 master's degrees and 11 doctoral degrees have been granted each year (20). Of these, about 40% are foreign students that usually return to their native countries following graduation.

The number of graduate students increased from 249 in 1981-82 to 383 this year (Table 2) but the number of degrees granted (34 master's and 11 doctorates) is below the average figure mentioned above.

I expect this average will be exceeded in future years as a result of the relatively new master's program at Lakehead (1977) and doctoral programs at Alberta (1981) and New Brunswick (1980). These developments, coupled with increased research funding, suggest that the number of degrees awarded will increase, but not at the rate required if forecasts are realistic.

Canadian graduate programs are a long way from meeting projected demands. These programs would have to more than triple their present output of graduates in order to meet the need for some 1,500 forest scientists over the next 10 years (7, 20). This total does not include the specialists that will be trained by other university departments (e.g., biochemistry, genetics, zoology, physics, and engineering).

TABLE 2. MASTERS AND DOCTORATE ENROLLMENTS AND DEGREES AWARDED in POSTGRADUATE FORESTRY PROGRAMS, 1983-84.

UNIVERSITY	ENROLLMENTS			DEGREES AWARDED*		
	M.Sc	Ph.D	Tota	M.Sc	Ph.D	Tota
British Columbia	78	34	112	14	7	21
Alberta	42	9	51	2	1	3
Lakehead **	26		26	1		
Toronto	37	15	52	5	0	5
Laval	71	22	93	9	3	12
New Brunswick	41	8	49	3	0	3
TOTALS	295	88	383	34	11	45

* Spring and Fall, 1983 •* Ph.D. not offered

Despite the recent infusion of funding for graduate studies, the forestry schools still suffer from lack of space; sufficient funds to replace obsolete equipment and obtain new instrumentation; insufficient faculty depth to undertake more quality research and absorb greater numbers of students; insufficient funding for students, technicians, post-doctoral fellows, and visiting scientists; and flexible long-term research funding.

The most serious problems are inadequate space and too few quality academic staff with both research and teaching skills which prevents the development of excellence in many disciplines and limits the numbers of students that can be attracted. Some schools are using external funds (e.g., C.F.S. Block Grant) to employ faculty on contract. Career opportunities are difficult with limited contractual arrangements, however, and continuity is essential if graduate and research programs are to be sustained.

Without considerable help, therefore, the forestry schools will be unable to satisfy the projected demands for forest scientists. Obviously, this situation requires extraordinary consideration through the coordinated support of the broad spectrum of Canadian funding agencies.

What is urgently needed is leadership from a national agency such as the Science Council of Canada to bring together the senior administrators of the forestry schools, their parent universities, governments, and industry to review, identify, and schedule the implementation of actions in a comprehensive way that will allow forestry schools a reasonable chance to fulfill their respective mandates.

Research

Graduate studies and research are closely linked. Not surprisingly, the past record of research by the forestry schools parallels the slow development of graduate studies, and meaningful research programs are of recent origin.

No operational funds for research of any consequence are directed to forestry schools by parent universities, although staff salaries and facilities are significant contributions. The schools, therefore, must rely on funding agencies, particularly those of the governments, for funds to cover direct costs of research including supplies, equipment, travel, and salaries for technicians and student assistants.

Although research funding has increased impressively over the past few years (Table 3), there are difficulties inherent in the short term nature (1 to 3 years) of much of the funding, in the necessity to adhere to research priorities of sponsoring agencies, and in meeting overhead costs. In general, the schools have adapted well to these constraints but the main problem persists of generating more of the unrestricted funding that permits continuity and freedom to pursue ideas that are not subject to priorities of funding agencies.

The NSERC Forestry Research Development Grants of 1983 and the newly increased Canadian Forestry Service Block Grant are excellent examples of flexible funding that allows additional staffing, discretion in research direction, the development of a sound balance of applied and fundamental research, as well as an appropriate proportion of involvement regionally, nationally, and internationally.

Table 3 compares the external financial support from all sources. These data reveal remarkable increases in research funding in all the schools, although inflation has eroded purchasing power. Before 1977-78, notwithstanding some international level scholarly accomplishments, the forestry schools had not developed strong research reputations.

Research funding did not reach respectable levels until after 1981 (Table 3). Based on a total of 161 academic staff at the six schools, the 1983-84 funding averages about \$53,000 per staff member. Assuming about 75% or less of staff are active in research, this average is more than \$70,000 per researcher. To obtain the real value of research being done by the forestry schools, these

figures should be doubled if the university contributions of staff salaries, equipment, and facilities are included.

While the trends outlined above are encouraging, there is no room for complacency, especially when one considers the purchasing value of the 1983 dollar. The forestry schools are just beginning to gain momentum in research. Their status in research remains unsatisfactory. The schools urgently require:

additional research-oriented quality academic staff and support

TABLE 3. EXTERNAL FOREST RESEARCH SUPPORT FUNDING FOR THE CANADIAN SCHOOLS OF FORESTRY, OF FORESTRY, 1977-78, 1980-81, AND 1983-84.

UNIVERSITY	1977-78*	YEAR 1980- 81**	1983-84**
British Columbia	\$505,000	\$718,383	\$1,635,84
Alberta	284,000	451,728	934,765 ³
Lakehead	126,000	245,300	817,310
Toronto	135,000	541,433	2,592,677
Laval	384,000	1,1	1,720,000
New Brunswick	201,000	220,000	822,840
TOTALS	\$1,635,00	\$3,286,84	\$8,523,43
	0	4	5

* From Solandt (21).

** Statistics provided by heads of forestry schools

technicians to provide disciplinary depth and breadth.

more quality space for graduate studies and research (facilities are being improved at several schools, but at Toronto, for example, the new Natural Resources Centre complex will not be ready for another 3 to 5 years. Present facilities are poor).

more long-term, flexible funding.

special infusions of funds to replace obsolete equipment and to acquire new scientific and high technology instrumentation.

Further, forestry schools must "deliver", without exception, on their contractual commitments in research and justify the confidence of sponsoring agencies.

CONTINUING EDUCATION

A forestry degree represents only a beginning framework and, if the graduate forester is to continue to grow professionally and adapt to rapid changes in technology and social demands, there must be unceasing study and learning. Forestry schools have an important contribution to make by providing continuing education programs that will prevent professional obsolescence and help their clients deal effectively with the increasing complexity of industry problems, to cope with the pressures of population, urbanization, and the mounting number of conflict of interest uses for the forests, and to use new technology. Forestry schools need to take initiatives in extension education for the public generally, and to provide access to credit programs through part-time studies and new teaching technology (e.g., cassette, video, television, computer techniques).

All the forestry schools undertake some continuing education activities, usually in cooperation with public and private sector agencies and associations. Offerings, however, are generally fragmentary and constitute part-time initiatives of a few interested staff.

Continuing education should be an area of special sustained effort under the leadership of the forestry schools with the cooperation of the universities and the forestry profession. As indicated elsewhere in this presentation, the shelf life of some knowledge is short and it is essential that foresters be updated periodically through seminars, in-service study sessions, correspondence-cassette-video-computer designed courses, workshops, and conferences.

Continuing education should be structured into the forestry school system with the participation and assistance of public and private sector forestry agencies and associations and is an action of priority for the forestry schools.

INTERNATIONAL RESPONSIBILITIES

Canadian foresters are becoming increasingly persuaded of the importance of keeping aware of forestry developments beyond the borders of Canada.

Apart from benefiting from advanced technology and management techniques in both developed and third-world countries, there are significant domestic aspects to international forestry. The forest industry and governments need current information and analyses of forest resources, industries, and trade practices in other countries, in order to develop intelligent policy strategies and to compete successfully in world markets.

Canada has contributed forestry assistance to third-world countries for many years through its aid agencies, the Canadian International Development Agency and the International Development Research Centre, and with affiliated agencies such as the Canadian University Services Overseas (CUSO), the Canadian Executive Services Overseas (CESO), and the World Bank. Canadian consulting foresters have earned international reputations as a result of involvement with aid programs.

It is only natural that the Canadian forestry schools have become involved in activities of international scope. These activities include undergraduate and graduate course offerings in world forestry, diploma and graduate degree programs in international forestry, staff and students participating in international conferences, the acceptance of foreign students at both undergraduate and graduate levels, staff participation as consultants on international forestry problems, and the formal and informal collaboration of forestry schools with foreign universities and agencies. These activities have been detailed in a recent analysis (15).

This involvement in international activities is expected to grow in the future because universities, as a police, are giving priority to international programs. In the forestry sector, the responsibilities of forestry schools include expert assistance to third-world countries to help them manage and utilize their forest resources, to create new forests, and to establish forestry education and research programs.

In working towards world-class stature, forests schools should enhance their involvement internationally at every opportunity.

SUPPORT AND COLLABORATIVE ACTIVITIES

In this time of economic difficulties and university budget constraints, it is essential that schools collaborate with colleagues and agencies inside and external to their respective universities.

Internal

Forestry schools enrich their programs by collaboration with cognate university divisions. These associations are manifested in service courses, cross-appointments at both undergraduate and graduate levels, and joint programs of education and research that add depth and breadth to both forestry and cognate programs.

Regarding support for budget and facilities, parent universities need to give priority to the problems faced by their forestry schools, commensurate with the importance of the forestry industry to the Canadian economy. In the 1975 Report of the Commission of Canadian Studies for the Association of Universities and Colleges of Canada, Symons (24) stated: "... within the universities themselves, the importance of forestry education needs to be better appreciated and the forestry schools need to receive greater support. Briefs from a number of forestry schools, and the Commission's own inquiries, revealed that these schools are sometimes still treated as second-class entities by the administration of the universities in which they are located and by some of the other departments and faculties. Such attitudes appear to be derived in part from an out-moded and naive concept of what a "forester" is. It is also a matter of academic snobbery. Given the importance of forestry to Canada, in social and economic terms, and given the scope and need for teaching and research in this field, there is no place for such snobbery, which reflects more upon the shortcomings of those who indulge in it than upon the important profession against which it is directed."

Happily, past limited support to forestry schools by parent university administrations is being replaced, to some degree, by more positive attitudes. Undoubtedly, forestry schools have assisted this response by generating substantial external funding for research (Table 3).

External

Natural Sciences and Engineering Research Council of Canada (NSERC)

This federal agency has responded effectively in many ways to improve the scholarly status of forestry schools. In addition to their regular programs of operating grants, graduate student scholarships, and post-doctoral fellowships, NSERC has established special forestry postgraduate scholarships and postdoctoral fellowships that have greatly enhanced the programs of graduate study and research. In 1983, each of the forestry schools was, for the first time, awarded a major Forestry Research Development Grant of projected three years or more duration and designed to improve research capacity and the scientific capabilities of staff. The latter grants are extremely valuable. In some cases, however, the sums allocated are too small and border on being liberal operating grants rather than of developmental levels.

NSERC is to be complimented and encouraged to maintain and enlarge on these initiatives. I believe NSERC already sees substantial results from all the schools in the form of improved scholarly research, increased quality publication productivity, and the qualitative expansion of programs of graduate study, and is being reassured by these results to maintain and increase its support to the forestry schools.

The schools have, for some time, been urging NSERC to reinforce the existing grant selection structure by forming a renewable natural resources management grant selection committee. This action, suggested by the Science Council of Canada in 1970 (18) and recommended again in 1983 (20), would enhance the research capacity of forestry schools by expanding the opportunities for grants related to research into the management of renewable natural resources. Existing committees, which are generally organized along traditional disciplinary lines, do not provide an adequate spectrum of choice and, unless a distinct committee is established, forestry schools will not be able to sustain the long-term research that will generate the scientific and management expertise needed for the intensive management of Canada's forestry resources. This action would also permit the effective participation of forestry research peers which are now virtually non-existent in the present committee structure (13).

Another possible NSERC initiative that deserves further examination is the idea of declaring forestry a strategic area of research and reserving substantial funds for this purpose. This is a viable proposal if the total forestry school and university research community is considered.

The Canadian Forestry Service

The Canadian Forestry Service has assisted the forestry schools in many ways. From 1967-68 to 1969-70 the four faculties of forestry in existence at that time each received an annual Block Grant of \$40,000. These grants supported new initiatives in graduate studies and research in forestry and forest products and helped to attract graduate students and to stimulate new research. In addition, during 1968-70, Extramural Research Grants totalling \$82,200 were awarded to staff at the four faculties of forestry (21).

During the past few years, the Block Grant has totalled \$292,000 so that each of the six schools of forestry was awarded about \$48,000 annually. While this grant has been valuable for the schools, inflation since 1967-68 has greatly eroded its impact.

In 1982-83, the Block Grant was increased by one million dollars. This increase has been repeated for 1983-84 and will go to \$1.5 million in 1984-85 and \$2.0 million in 1985-86. The Block Grant at these new levels will greatly assist the forestry schools in improving their programs of graduate study and research.

Additionally, the Canada Forestry Scholarship Program provides postgraduate scholarships each of \$10,500 value and totalling \$210,000 in 1983-84, \$390,000 in 1984-85, and \$580,000 in 1985-86. Additional funds for forest research open to the six forestry schools and other university departments total \$920,000 in 1983-84, \$1,476,000 in 1984-85, and \$1,613,000 in 1985-86. Although not of direct assistance to the programs of graduate study and research, the Summer Student Employment Program provided some 300 jobs for undergraduate forestry students in 1982-83 and 1983-84. This program will be continued to 1985-86 and provides relevant work experience for forestry students (8).

The Canadian Forestry Service has given considerable help to the forestry schools by permitting their scientists to give lectures and courses and helping direct the research of graduate students, and by making its laboratory facilities available to both academic staff and students. In some cases, there are agreements between C.F.S. centres and forestry schools that formalize this cooperation. Several C.F.S. research scientists hold university appointments as Adjunct Professors.

The Canadian Forestry Service's support of the forestry schools is substantial and highly valued. This collaboration should be maintained and enhanced as follows:

there should be assurance that the Block Grant will be continued and increased to off-set inflation, subject to satisfactory results in the use of the funds by forestry schools. This is extremely important where funds are utilized for staffing purposes so that career opportunities can be provided.

the C.F.S. could help resolve the staffing problems of the forestry schools by a more generous policy of making its scientists available for teaching, for the direction of graduate research, and to replace faculty on sabbatical or research leave. Exchanges of staff would also be beneficial.

research cooperation should also be expanded to include other industry and government agencies.

in cases where C.F.S. centres are not located on university campuses, special efforts should be made to ensure effective liaison (e.g., periodic visits to the campus by C.F.S. Program Managers to review research activities and collaborative efforts; academic staff and student visits to C.F.S. centres for special seminars and reviews).

Provincial Government

Provincial governments also provide research assistance to forestry schools, mainly through contracts. Provinces are also generous in making their staff and facilities available for the programs of teaching and research at forestry schools.

Many provincial staff scientists have appointments as Adjunct Professors at the forestry schools and, in some cases, hold appointments as full members of Schools of Graduate Studies, acting as supervisors of graduate

students. Research collaboration also occurs. All of these activities are mutually advantageous and should be encouraged at every opportunity. In addition to short term contractual research, the provinces should aid their forestry schools by providing long-range funding similar to the C.F.S. Block Grant. Further, provinces must support universities so that, in turn, forestry schools can be provided with urgently needed space, staff, and operational funding.

The Forest Industry

The forest industry provides scholarships and prizes at forestry schools, supports special annual lecture series, and permits personnel to give course lectures and participate on undergraduate and graduate student committees. Some industry staff also hold academic appointments as Adjunct Professors.

The forest industry, however, has not been prominent in financial support for the forestry schools. The forest industry considers it is a government responsibility to aid forestry schools and to fund forestry research. Industry feels that it makes adequate contributions indirectly through taxation.

This attitude appears to be changing as industry takes on more responsibility for intensive forest management. As examples, the industry undertakes funding for building projects and a consortium of eight companies has made available to the Faculty of Forestry at the University of New Brunswick sufficient funds to support a professorship and a program in forest genetics over a five-year period. Establishment of professorships at the six schools of forestry would be an excellent contribution by the forest industry.

SUMMARY CONCLUSIONS

The key to the effective management of Canada's forestry resources is skilled people. Without appropriately educated people, Canada will not have the operational and research expertise required to meet the dynamic demands of society as we enter into a new challenging era of intensive forest management.

Forestry schools have **24** an imposing task to educate the forestry student to be both technically and socially competent. This task is so important that the six schools must pool their talents in on-going liaison and periodic meetings of their respective curriculum chairmen.

Forestry schools, given adequate resources, can develop the capacities to graduate the projected demand for professional foresters during the next decade, but the intense competition with other professions for quality students will be a problem as high school enrollments decrease in the years ahead. Forestry schools, in cooperation with all sectors of the forestry resources community, will have to mount unceasing campaigns to publicize the value of a professional forestry education in order to attract sufficient numbers of the best high school students.

Forestry schools will have to provide a stimulating educational experience to justify student commitments and, to ensure this level of teaching, forestry schools will need to establish meaningful review mechanisms that will maintain a high quality of teaching by individual staff.

Postgraduate programs at the six forestry schools would have to more than triple their present output of graduates in order to meet the predicted need for some 1,500 forest scientists over the next 10 years. Without considerable help, the schools will not be able to meet the demand for forest scientists and maintain research momentum. The status of the programs of graduate studies and research remains unsatisfactory, and forestry schools urgently need additional research-oriented academic staff and support technicians to provide disciplinary depth and breadth and to support more students; much better space and facilities for graduate studies and research; much greater long-term, flexible funding to permit planned, channelled thrusts of research; and special infusions of funds to replace obsolete equipment and to acquire new scientific and high technology instrumentation.

Continuing education should be structured into the forestry school educational system as an area of special sustained effort and as an action of priority, with the participation, assistance, and understanding of public and private sector forestry agencies and associations.

In working towards world-class stature, forestry schools should enhance their involvement internationally at every opportunity.

The Natural Sciences and Engineering Research Council of Canada (NSERC) is contributing substantially to support and improve the scholarly status of forestry schools. In addition to maintaining and increasing current initiatives, and to expand the opportunities for research grants not accessible in the present structures, NSERC should establish a renewable natural resources management grant selection committee and declare forestry as a strategic area for research.

Recent increases of financial support by the Canadian Forestry Service in the forms of a Block Grant and funds for postgraduate scholarships and research will greatly assist the forestry schools in improving their programs of graduate study and research. In addition to augmenting valuable associations with the personnel of regional C.F.S. laboratory centres, assurance of continuity of funding with inflationary increases would enable the forestry schools to develop long-term planning and implementation of programs of graduate study and research.

Provincial governments should improve their current useful support activities in research and education by providing long-range funding similar to the C.F.S. Block Grant, in matching dollars. First and foremost, however, provinces must support universities so that, in turn, forestry schools can be provided with urgently needed space, staff, and operational funding.

The forest industry presently supports a professorship at one forestry school and provides financing for scholarships, lectures, and associated activities. The forest industry could make substantial contributions

by supporting additional professorships at all the forestry schools.

Forestry schools must become more visible to the public and take leadership roles in forestry problems and issues of regional, national, and international concern. To realize this initiative on a sustained basis, forestry schools should establish a well-funded permanent secretariat, located strategically in Ottawa.

Finally, there is an urgent need for leadership from a national agency such as the Science Council of Canada to bring together the senior administrators of the forestry schools, their parent universities, governments, and industry to review, identify, and schedule the implementation of comprehensive actions in a coordinated way that will allow forestry schools a reasonable chance of fulfilling their mandates.

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EPILOGUE

The Canadian forestry schools have worked together energetically over some 15 years to upgrade their capacities for education, research, and public service. Substantial actions have become apparent only in the past two years. Why has it taken so long to achieve progress?

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Jack Munro, in his lecture in this series of March 25, 1982 (12), made a cogent observation. In the last sentence of his presentation, he stated: "*If you remain politically inert, all the professional competence in the world will avail you nothing*". The forestry resources community historically has not been politically alert and that is one of the major reasons why progress towards intensive forest management has been slow and why it has taken the present degenerated state of our forests to precipitate help at "Treasury Board" levels.

Let us not perpetuate this weakness and let us make sure that our forestry schools graduate professionals who are technically and socially competent AND WHO ARE POLITICALLY ASTUTE.

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