

FOREST INDUSTRY LECTURE NO.33

**"CHALLENGES TO THE FOREST PROFESSION:
PAST, PRESENT AND THE FUTURE"
"FORESTRY AND THE FAILURE OF TECHNOCRACY"**
By Lois Dellert - Class of 1979

**"BIOLOGICAL TRUTH
AND THE COURT OF PUBLIC OPINION"**
By Glen Dunsworth - Class of 1975

**"WHY MY NEXT FORESTRY WORK ASSOCIATES
WILL BE LESS LIKELY TO BE FORESTERS"**
By Barry Northey - Class of 1979

**"EDUCATING FOREST RESOURCES MANAGERS:
CHALLENGES AND OPPORTUNITIES"**
By Val LeMay - Class of 1981

Forest Industry Lecturers
Forest Industry Lecture Series
Forestry Program

Faculty of Agriculture, Forestry and Home Economics
University of Alberta
Edmonton, Alberta
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THE FOREST INDUSTRY LECTURE SERIES

The forest industry in western Canada cooperates with Alberta Environmental Protection to provide funds to sponsor noteworthy speakers. This initiative significantly enriches the Renewable Resources Program in the Faculty of Agriculture, Forestry and Home Economics at the University of Alberta.

The Forest Industry Lecture Series was started during the 1976-77 university term as a seminar course. The late Desmond I. Crossley and Maxwell T. MacLaggan presented the first series of lectures. The contributions 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. Visitors have come from throughout North America, Europe, Africa and Asia. Their talks have dealt with a wide range of topics, such as: forest ecology, forest science, silviculture, wildlife, forest management, ecosystem management, lumber and paper sales, labor, international trade, forest economics and forestry-related social issues. Speakers have been scientists, industry and business leaders, senior government officials, academics and forestry alumni. A complete list of the speakers and their topics is presented at the end of this pamphlet. Copies of most presentations are available from our Department Office upon request.

This paper contains presentations from four of our most distinguished alumni:

Lois Dellert	(Class of 1979)
Glen Dunsworth	(Class of 1975)
Barry Northey	(Class of 1979)
Val LeMay	(Class of 1981)

SPONSORS

We take this opportunity to thank again the sponsors of this 1994 program. We greatly appreciate their willing and sustained support, through which we have been able to provide the latest concepts and practices of forest management from around the world to the foresters and forestry students within Alberta. Also because of this Series, we have been able to showcase the excellent forest management practices in Alberta to foresters elsewhere. We are of course dedicated to the goal of understanding and teaching people about forestry in Alberta and elsewhere. This program allows us to do just that.

We identify with pleasure the following companies and organizations, who sponsored this Lecture:

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Lois Dellert

Class of 1979

Lois received a B.Sc. degree in Forestry from the University of Alberta in 1979. She was the recipient of the Canadian Institute of Forestry Gold Medal as the most outstanding graduate of her class. After working in Alberta for a year, she moved to Victoria and was employed by the B.C. Forest Service. During the period 1980 to 1992, Lois worked in such areas as: timber supply analyses, harvest design and scheduling, GIS and integrated resource planning. Also during this period, Lois held a number of management positions. Specifically, she managed the forest productivity research group, was the Deputy Director of Inventory for two years, and was appointed as the first Deputy Chief Forester, a position she held for almost a year. During her time in B.C., Lois served on several task forces and committees, most recently the National Forest Strategy Writing Team, the B. C. Forest Service Strategic Planning Task Force, and the Technical Review Team of the Model Forest Program

Lois recently completed (1994) a Masters in Environmental Studies Program at York University where she explored the complex patterns of forces influencing forest policy. The title of her thesis was: "Sustained Yield Forestry in British Columbia: The Making and Breaking of a Policy". She is currently a Ph.D. candidate in the Department of Forestry at the University of Toronto and will be continuing her research in the area of Forest Policy.



Glen Dunsworth

Class of 1975

Glen Dunsworth received his B.Sc. (Forest Science) in 1975 and his M.Sc. (Forest Genetics) in 1977. He was the first graduate student to graduate from the Department of Forest Science at the University of Alberta.

Glen Dunsworth has over 15 years of experience in forest regeneration and genetics research. Prior to moving to Vancouver Island, he worked for two years doing reclamation research in the oil sands region near Fort McMurray, Alberta. His exposure to a wide range of silvicultural problems related to stand establishment has enabled him to develop

innovative and site specific solutions to coastal regeneration problems, which is important to MacMillan Bloedel, his current employer. Glen has also organized, coordinated and facilitated a wide range of cooperative team ventures involving a variety of specialists and agencies. His exposure to computer modeling and GIS applications provide an added facet to landscape planning involving non-timber resources, which complements his operational experience.



Barry Northey

Class of 1979

Barry completed his BA (Zoology) degree from the University of Western Ontario in 1972. He went on to obtain a B.Sc. in Forestry from the University of Alberta in 1979. Since then, he has worked for the Alberta Forest Service in the field of watershed management in such places as: Edmonton, Rocky Mountain House and Calgary. Currently, he has been assigned the task of identifying the computing and GIS software that will satisfy the needs of the Alberta Forest Service. This has led to his short secondment to the Edson Forest starting September 1, 1994. Barry has actively served on the executive boards of the Alberta Registered Professional Foresters Association and the Rocky Mountain Section of the Canadian Institute of Forestry. His contributions to both of these associations are well known and widely appreciated.

He says the perspective for this talk came from his 15 years of government service. As he expressed it, working in watershed management, which is on the fringes of mainstream fire and fiber forestry, has given Barry a spectator's viewpoint of the changes happening in forestry today.



Val LeMay

Class of 1981

Valerie LeMay obtained a B.Sc. (Forestry) in 1981 and a M.Sc. (Forest Mensuration) in 1982 from the University of Alberta. Following graduate school, she worked in Edmonton as a professional forester in the Forest Measurements Section of the Alberta Forest Service. She worked primarily on the 1984 Alberta provincial inventory. In 1985, she took a leave of absence from the Alberta Forest Service to teach for one semester at the University of Alberta. She left the Alberta Forest Service in 1986 to study at the University of British Columbia, graduating with a Ph.D. in biometrics in 1989. She is currently an Associate Professor of quantitative methods in the Faculty of Forestry at the University of British Columbia, Vancouver. She is a registered professional forester in both Alberta and British Columbia, and serves on the Forest Measurements sub-committee for the Association of B.C. Professional Foresters. She also serves as a Director on the Coast Region Board of Directors for the B.C. Forestry Association. Dr. LeMay is widely published and respected for her work in forest biometrics.

FORESTRY AND THE FAILURE OF TECHNOCRACY

ABSTRACT

In 1947, when a form of European sustained yield was implemented, the Province of B.C. embarked on a long-term technocratic project to re-order the forest from its then "imbalanced" and over-mature forest structure to a so-called "normal" forest of equally proportioned ages -- one where harvest, growth and employment would be in perpetual equilibrium at the maximum rate possible. The promise of forestry was a stable forest economy, maximum social benefits, and efficient timber production. The management of B.C.'s forests was handed to foresters -- experts with the skills needed to achieve the great results possible. However, the technocratic nature of forestry assumed a certain degree of order and control -- over nature, the economy, and policy making -- which was not possible. In the 1980's and 90's, as forestry failed to deliver as promised, and as it failed to respond to environmental and social concerns, those with other views of conservation -- such as Muir's notion of wilderness preservation or Leopold's ecocentric land ethic -- acquired political power and successfully lobbied government to consider perspectives other than timber production. As a result of this pressure, and increased ecological awareness, the idea of conservation shifted from sustained yield towards sustainable forests -- from a focus on economy to a focus on ecology. But, is this the direction forest policy should take? Will forestry take another technocratic approach, assuming sustainable ecosystems is the desired goal and replace economists with ecologists? The underlying issue for forestry, in my opinion, is not one of ecosystem management versus timber production, but one of technocracy -- the domination of policy by an elite group of experts and the assumption that forests and forest policy can be controlled. Forestry needs to take a different approach, one which uses technology to assist, but which does not assume a policy choice, either economic or ecological. The interpretation of "sustained" is a social decision -- a matter for public debate and not a matter of fact. Forestry needs to tune into the world around it, to re-define its role in the political process of policy making, and to use expertise to clarify rather than to dominate. Otherwise, it is bound to fail, yet again.

"Whether you take 1558 or this year of grace 1958, the problem for anyone tackling the world scene is to define a hierarchy of forces, of currents, of particular movements, and then tackle them as an entire constellation." Fernand Braudel (1969: 34).

* * * * *

The main premise of forestry, and its central policy of sustained yield, was "wise-use" conservation -- forests could be developed for short-term economic gain and, if managed wisely, could also yield maximum social benefits over the long term -- it embodied both development and conservation. Forestry promised much. Bernard Fernow, the founding Dean of the Faculty of Forestry at the University of Toronto, explained how foresters "showed the way out" of the timber famine in eighteenth and nineteenth century Germany by using "common sense and scientific knowledge". (Fernow 1910: 33) The goal of sustained yield was to achieve a stable forest economy by regulating the forest to produce a perpetual supply of wood at the most efficient rate possible.

Unfortunately, questions can be raised as to the success of sustained yield in achieving its goal of

¹ The material in this paper is extracted from the author's Master's Thesis: Sustained Yield in British Columbia: The Making and Breaking of a Policy (1900 - 1993), Faculty of Environmental Studies, York University, North York, Ontario. September 1994.

conservation and a stable economy. In British Columbia, forest-related jobs are being lost, the rate of harvest is declining, there is increasing concern for environmental degradation, and forest land use is hotly contested. I ask the question: "Why it has been so difficult for forestry to achieve conservation in British Columbia?"

To answer the question, I explored forest policy, focusing on sustained yield, and the role of forestry in policy making in British Columbia. By "forestry" I mean the collection of values, norms, beliefs, concepts, and practices of the profession of forestry, as represented by the Provincial Chief Foresters, the professional forester assigned the responsibility of implementing sustained yield. By "sustained yield" I mean the concept of a perpetual supply of wood -- forestry's central philosophy for achieving conservation. By "policy" I mean the political process of policy making, as different from the technical analysis of forest policy options.

I believe forestry is part of a complex mix of forces which have interacted over time in a dynamic way to influence forest management and forest policy: it is not independent from the ideological, political, economic, or ecological context. I conducted a historical analysis of forestry, and its central concept of sustained yield, in relation to other groups in the forest sector, and its historical context, believing this type of investigation was essential to understanding its role in forest policy and its success in achieving conservation. My investigation of forestry's success, or lack of success, in achieving conservation, went far beyond defining the technical concepts of forestry - it explored its role in forest policy: how had forestry influenced, and been influenced by, policy.

The answer to my question depended, in part, on what was meant by "conservation". Some would argue that forestry has achieved conservation while others would argue just the opposite -- the underlying issue not being whether forestry had achieved conservation or not, but whether the type of conservation it set out to achieve was one which was acceptable to

society. The second, and inter-related, part of my inquiry focused on the process of forest policy making and the role of forestry in that process -- to explore forestry's success or lack of success in implementing conservation. I asked three questions in my analysis: why was forestry, and its central policy of sustained yield, adopted as policy in the first place; why did sustained yield persist for so long; and why was it being challenged in the 1990's to change?

There were several streams within the conservation movement, each characterized by the views of three of its prominent leaders. To John Muir, conservation meant the preservation of wilderness from the destructive forces of human development -- forests were places of awe-inspiring beauty and sources of spiritual renewal which should be preserved, protected, and revered, similar to great works of art and human monuments. (Nash 1967: Chapter 6). Aldo Leopold expressed an ecocentric view of conservation; it meant extending ethical boundaries to all living things, viewing nature as a community of inter-connected parts -- including human beings, and preserving the integrity, stability and beauty of the land. (Nash 1967: Chapter 11). Gifford Pinchot promoted a utilitarian view of conservation: "wise-use" management. By applying scientific management and economic principles, the production of natural resources, such as timber, could be optimized by minimizing waste and maximizing growth -- resources would be "conserved" by using them to their fullest potential for the long-term benefit of society. (Nash 1967: Chapter 8).

These three interpretations of conservation -- wilderness preservation, ecocentrism, and wise-use management - were fundamentally different, had different policy implications, and held different levels of prominence in resource policy. It was wise-use management, the view of forestry and its central concept of sustained yield, which dominated forest policy in British Columbia throughout most of the twentieth century -- although this view is now being challenged.

Sustained yield, as implemented in British Columbia, had its origins in seventeenth and eighteenth century western Europe where it evolved, as part of the scientific revolution, to overcome the scarcity of naval timber, a strategically important resource. As Fernow explained, "forestry was an art born of necessity" (Fernow 1913: 2): the "necessity" was scarcity; and the "art" was a long-term program to efficiently and rationally manage forests in order to overcome this scarcity and prevent future timber famines -- to never run out of wood, an important economic commodity. The goal of sustained yield was to support a stable forest economy and its means were scientific management to maximize yield: regulation to re-order the forest on a crop rotation basis, growing and harvesting wood in perpetual equilibrium; and public ownership to protect the long-term interest of society.

According to ecologist Daniel Botkin, many resource managers believed that it was possible to "tinker with nature and improve it, replacing nature's equivalent of an overshot wheel with a turbine engine". (Botkin 1990: 105) Foresters, like Pinchot and Fernow, saw nature as badly in need of managing in order to make its processes more efficient and its yields

greater. (Worster 1977: 267). Through scientific management, unmanaged forests could be perfected to increase production and through regulation, the "imbalanced" old forest of coastal British Columbia would be re-structured to produce a "normal" forest of graduated ages continuously growing and supplying wood for harvest in perpetual equilibrium. (Sloan 1945: 22-24). The retention of public ownership would provide the government with the authority needed to regulate the harvest to ensure the implementation of sustained yield and forest conservation.

Sustained yield was implemented in British Columbia, not as the "natural" consequence of scarcity, as Fernow believed it would be (Fernow 1913: 2), but as part of a political process of policy making -- through a process of negotiation among policy actors, each with varying degrees of power, embedded in, and influenced by a particular historical and geographical context.

The context in the first half of the twentieth century British Columbia, when sustained yield was implemented, was very different from seventeenth and eighteenth century western Europe. First, timber was not scarce even though rough terrain, difficult operating conditions, and the large size of the trees restricted access. Second, there was virtually no domestic demand for timber and British Columbia's remoteness and relatively late development of its forests --compared to other regions in the United States and Canada -- made entry into a volatile export market problematic. The harsh physical and economic environment made logging a risky venture: the forest economy of British Columbia in the early years was "boom and bust" with many more failures than successes. As such, the main preoccupation of the British Columbia government was the building of a stable economy and the development of the forest sector -- not the management and regulation to ensure a continuous supply of timber as was the originating motivation for sustained yield.

It was assumed that timber supply could meet demand, in part because of the abundance of British Columbia's forests and in part, because of the promise of fantastic yield gains from scientific management. Technological advancement and higher prices permitted the industry to overcome physical and economic barriers, progressively expanding operations and improving utilization of the mature forest. In the 1980's, as options to expand operations diminished and the transition to harvesting lower-volume second-growth timber approached, attention turned to intensive silviculture and its promise to capture the unrealized potential of an inefficient nature, to double yield -- all that was required to maintain, or even increase the rate of harvest, was funding. Even though harvest regulation was introduced in 1947, the annual harvest for British Columbia progressively increased into the 1980's and the rate of harvest kept pace with demand: sustained yield regulation was not restricting -- timber was not perceived to be scarce, at least not scarce enough to warrant a reduction in the allowable annual cut (AAC).

With an adequate timber supply assumed, forest policy focused on the "demand side" of the economic equation. The sustained yield policy was demand-driven, aimed at encouraging industrial development. The government did this through several means: by granting long-term secure access to crown timber -- assigning property rights without requiring the private sector to risk capital investment; by not imposing restrictive and costly regulations on the industry; by absorbing management costs; and by favouring large, integrated companies.

While ostensibly promoted as a conservation measure, the retention of public ownership was actually an industrial development policy -- the forest tenure system permitted the industry to acquire long-term property rights to trees without having to purchase land or invest in forest management. The government absorbed the investment risk and bore the cost of reforestation in order to attract investment to British Columbia. It was only later, after the 1909 Royal Commission, that public ownership was regarded as a conservation policy, and even then, it was no guarantee of conservation. The government was reluctant to impose "costly" regulation on a fledgling industry, afraid it might impact its competitive advantage in the highly volatile export market. Logging proceeded, in an unregulated manner, until 1947, when sustained yield was finally implemented.

Sustained yield was accepted by the policy community because it supported economic development: in

exchange for agreeing to regulation, the industry was able to acquire long-term rights to additional Crown timber through the Tree Farm License (TFL) program (formerly called Forest Management License), allowing it to expand, consolidate, and secure financing to build manufacturing facilities; and supply still exceeded demand so regulation was not restricting. Existing, large companies were favoured as they had the economies of scale required to make the substantial capital investment required, had a vested interest in staying in British Columbia by way of their investment, and were thought to be more stable. The policy introduced in 1947, under the umbrella of "sustained yield" was, in reality, an economic development policy which encouraged expansion, corporate concentration, and private sector capital investment.

Sustained yield seemed like a good deal for all: foresters finally succeeded in implementing conservation, the government furthered its objective of developing a stable forest economy, and the industry was able to expand and consolidate its operations. Three key policies, promoted as conservation measures -- public ownership, sustained yield, and TFL's -- were accepted because they either supported or did not restrict industrial development and were consistent with the over-arching policy agenda to establish a stable and prosperous forest economy. It appeared that conservation and development were compatible -- the values of sustained yield forestry were shared by the members of the policy community, albeit for different reasons.

With the adoption of sustained yield, the Province embarked on a long-term technocratic project to re-structure the forest to produce wood more efficiently -- a massive undertaking that required forests to distance themselves from the short-term influence of politics. The Office of the Chief Foresters was given a high degree of autonomy and significant discretionary power by way of its legislated authority to approve an AAC -- the determination of the rate of harvest became a technical decision.

Social interest was presented by the forest industry: the large corporations, in particular, who participated directly in the policy process by way of their dominant position in the economically-important forest sector and the government's reliance on private sector management. The Province granted long-term rights to the private sector, turning trees into capital. The private sector, in turn, built up manufacturing capacity and invested heavily, based on the understanding that the AAC would be "sustainable". And, once it had done so, exerted its significant political power to secure and protect its investment.

Forestry's technocratic approach and the government's reliance on private sector investment and management, supported a closed policy network controlled by expertise and dominated by industry. The "glue" holding it all together was the shared values, norms and beliefs of forestry: the efficient production of timber through the orderly re-structuring of the forest and application of science management.

The main policy actors -- the Forest Service and the forest industry -- within the closed sustained yield policy network imposed forestry's view of conservation on the forests of British Columbia: it used technical arguments to dominate, obscuring underlying values and wielding knowledge as power. Forestry's interpretation of conservation -- wise-use management to maximize timber production -- was not open for debate, it was taken as given. Alternate views, such as Muir's idea of wilderness preservation, were excluded and dismissed as a threat to the goal of efficient timber production and the realization of maximum social economic benefits. Within the network, the economic importance of the forest sector, the so-called "superior" knowledge of industrial foresters, and the optimistic belief in technological advancement and scientific management to overcome scarcity, were used to justify higher rates of harvest -- for example, in 1955 during the Sloan Royal Commission (Sloan 1956: 231 - 244) and again in 1992 in the MacMillan Bloedel Appeal of the Chief Forester's decision to reduce the AAC in TFL 44 (Appeal Board 1992: Part 7). Conservation was interpreted with the bounds of supply and demand economies. Sustained yield -- a policy to prevent or overcome scarcity by carefully managing timber supply -- was, in practice, never seriously implemented.

The technocratic approach of sustained yield contributed to the domination of forest policy by those sharing timber production values, but in the end, it may have also been its undoing. Sustained yield assumed a certain degree of order and control was possible, and the policy network intentionally isolated itself from the influence of an ever-changing political, economic, ecological, and ideological context. According to Alston, sustained yield "did not make sense in a rapidly changing world": scarcity drove technological change, making so-called weed species valuable, rather than intensifying forest management; forest productivity was not maintained by emphasizing timber production to the exclusion of other values; and community stability was not

assured in a dynamic global economy by simply providing a continuous supply of timber (Alston 1991).

In British Columbia, sustained yield was not able to deliver on several of its promises. Scarcity did not lead to intensive management and the huge increases in yield predicted for the second-growth forest did not materialize, even though they were used to justify higher rates of harvest. MacMillan Bloedel, for example, all but abandoned its intensive silviculture program because it was not "practical or economic" (Appeal Board 1992: 37) -- in other words, the return on investment was not sufficient. Instead, in TFL 44 for example, MacMillan Bloedel proposed to expand its operations into presently economically inaccessible timber to overcome its timber supply problem (MacMillan Bloedel MWP 1991) -- an option that simply required it to wait until the price of wood increased to a point where those areas would be economic to harvest. The incentive of long-term property rights and economics of scarcity have not stimulated investment in forestry.

The assumption that community stability would be the outcome of ensuring a continuous supply of wood, was no longer valid in the 1980's. Sustained yield did not consider the influence of a dynamic political economy nor British Columbia's position in a global context. British Columbia's forest economy was based, primarily, on the export of low-priced commodities -- manufacturing lumber and pulp and paper -- into a competitive world market. Driven by competition in the 1980's, the forest sector mechanized its operations to improve efficiency, and in doing so, reduced the ratio of employment to wood harvested. Even though harvest rates increased or remained the same, direct employment in the forest sector decreased in the 1970's and 80's -- from about 1.7 jobs per cubic metre of wood harvested in 1965 to about 1.0 in 1990. (B.C. Forest Renewal Plan 1994: 4). In 1992, MacMillan Bloedel employed fewer than fifty per cent of the workers it did in 1970. (MacMillan Bloedel Annual Reports 1980: 26-27, 1992: 18). The forest sector may have unintentionally undermined one of its most powerful economic arguments -- the promise of employment and community stability --and weakened its alliance with the other members of the policy community.

Sustained yield also assumed it was both possible and desirable to re-order British Columbia's forest to produce wood more efficiently. The exclusive focus on timber, and on economic efficiency, blinded foresters to the policy's impact on the forest ecosystem and on other values, such as wildlife or wilderness. These factors were not even considered, until the 1970's, when multiple use was implemented. But even then, the focus was economic -- to maximize the overall benefit from all resources -- and the harvest rate continued to increase. Despite environmental concerns and the warnings of future scarcity heard by the 1975 Royal Commission, the annual harvest actually increased by forty to fifty per cent -- from 54 million cubic meters in 1975² to cover 70 million cubic metres in the 1990's. (B.C. M of F Annual Reports 1975, 1989/90, 1990/91, 1991/92, 1992/93).

Other interpretations of conservation were consistently dismissed, and the path of sustained yield pursued with a single-minded focus -- to maximize timber production. However, as operations expanded, environmental impacts increased: more and more of the old-growth forest was converted to second-growth and large clear cuts covered a significant portion of British Columbia. Those with other views of conservation, such as Muir's view of wilderness or Leopold's view of a land ethic, were handed all the ammunition they needed to successfully wage a way of public opinion.

The environmental movement used powerful ecological arguments, such as the threat of extinction and elimination of the temperate rain forest old-growth ecosystem, and visual images of magnificent moss-covered giant trees in stark contrast to clear cut and slash-burned landscapes, to gain political power through advocacy and protest. It was successful in increasing ecological awareness and in exerting pressure on forestry to shift its interpretation of conservation to a view which was closer to Leopold's ecocentric view -- from sustained yield to sustainable forests.

The Chief Forester, effective January 1, 1992, reduced the AAC for MacMillan Bloedel's TFL 44³ by

² Based on a ten year average, 1965-1975.

³ TFL 44 is held by MacMillan Bloedel. It covers approximately 450,000 hectares on west central Vancouver Island, stretching from Walbran Valley in the south to Flores Island in the north. It is bounded by the communities of Port Alberni, Ucluelet, Tofino and Bamfield.

fourteen per cent, citing concern for other resources and skepticism in the promise of technology and scarcity to overcome the timber supply fall down. He was no longer prepared to accept a promise of future performance nor the exclusivity of timber production. The Chief Forester altered the traditional interpretation of sustained yield, and in doing so, broke rank with industrial foresters. The new values of forestry were not shared by the industry and the closed policy network fell apart.

The Chief Forester's decision to reduce the AAC, for non-timber reasons, was not acceptable to MacMillan Bloedel, an important member of the policy community. The demand-driven focus of the policy had encouraged the expansion of the industry, turned trees into private property, and supported corporate concentration and vertical integration. The industry viewed timber rights as a capital asset, had built mill capacity based on the assumption that timber supply would not be limiting. It dominated forest policy by virtue of its economic importance and control over the sector. A change in the interpretation of conservation, to one which was not consistent with the industrial agenda, was not welcomed with open arms.

MacMillan Bloedel appealed the decision to reduce the AAC for IFL 44, not because it was "incorrect", but because it had a lot at stake financially and it disagreed with the Chief Forester's new interpretation of sustained yield. MacMillan Bloedel won the appeal, not because its interpretation of sustained yield was "correct", but because it successfully used technical arguments and emphasized the efficient production of timber as forestry's central goal. The company had tradition as well as the majority of members of the Appeal Board -- a forester and an economist - on its side.

It has been difficult for forestry to achieve conservation because first, it assumed its view of conservation was the correct one, and second, it assumed a degree of order and control which was not possible. The technocratic approach of forestry was used successfully to exclude other viewpoints and wield knowledge as power to control the policy agenda. However, the same technocratic approach was also its undoing: neither the forest nor the decision making process could be controlled. As forestry failed to deliver as promised, and as it failed to respond an environmental and social impacts, those with other views of conservation successfully acquired political power. This pressure, along with increased ecological awareness, shifted forestry's view of conservation from sustained yield towards sustainable forests. The closed policy network, once held together by the shared values of wise-use conservation, fell apart.

Where does forest policy go from here? A shift from sustained yield to sustainable forests will entail a different approach to policy -- one which places the forest, and not timber production, first. Will the economic and political cost be too great? British Columbia is dependent on a forest sector which wields a significant amount of power in the policy community. In my opinion, the heart of the sustained yield policy, is not harvest regulation, but the tenure system and the government's reliance on the private sector to manage British Columbia's forests -- as long as industry controls the rights to British Columbia's forests, it will be difficult to shift the focus from timber production. A corporation's goal is financial and is legally responsible to its shareholders to manage as efficiently as possible. Since the protection of non-timber values impacts operating costs with little or no financial benefit to the company, it is unrealistic to expect the private sector to do so voluntarily. With the existing tenure system, the implementation of sustainable forestry will require the use of coercive regulation, an approach which governments have been reluctant to take or enforce. The issue of tenure, property rights, and the role of private sector in forest management is an area that requires additional investigation.

A second challenge concerns the process of policy making. If forest policy shifts to a focus on sustainable forests, as it appears to be doing, will today's foresters make the same mistake as their predecessors and take yet another technocratic approach? Will ecologists and the concept of "ecosystem" dominate just as economists and the concept of "normal forest" have previously? The underlying issue for forestry, in my opinion, is not one of ecosystem management versus timber production, but one of technocracy -- the domination of policy by an elite group of experts and the assumption that the forest and decision-making processes can be controlled.

A different approach to policy-making is required. Sociologists, Gale and Cordray believe a policy discussion of sustainability should start with the question: "What should forests sustain?" In answering this question, they argue that policy options should not be limited to ecological considerations -- or to timber production considerations, as was the case previously -- since the entire dimension of sustainability may not be

considered by taking one perspective. Instead, they suggest policy makers put forward, for public debate, several options, each answering the question differently and each resulting in distinct policy outcomes. They believe this approach will bring the additional analytical, conceptual and political clarity needed to reach a new social consensus on how forests should be managed (Gale and Cordray 1991: 31-36). This approach combines both technical and political considerations: technical options assist to clarify but do not preclude or assume a policy choice — that is a social decision and a matter of political debate.

Policy is a process of negotiation among members of a policy community who are embedded in an ever-changing political, economic, ecological and cultural context, and who exert power in different ways, and to varying degrees, to influence policy outcomes. A key challenge for forestry will be to tune into the political process of policy making, to re-define its role in that process, and to use expertise to clarify rather than to dominate.

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SECTION II. GLEN DUNSWORTH (CLASS OF 1975)

BIOLOGICAL TRUTH AND THE COURT OF PUBLIC OPINION

The greatest challenge facing foresters today is to act on what they know and not on what they or others fear. From a business standpoint, the challenge remains the same...how to make a buck?

We are on the cusp of a transition from extensive land management for sustained fibre production to islands of intensive fibre production in a sea of extensive ecosystem management. Many of the resources we will be asked to sustain will generate little revenue for the land manager. Under ecosystem management, fibre production will be the residual after management of other resource values. The transition from past practices to the "new direction" creates a climate of uncertainty and is a scary time for the forest industry and forest investors. However, for foresters it is an exciting time with renewed interest in questions many of us have been asking for years.

The "new direction" is being driven by public opinion (as reflected in public policy) and a belief that sustained fibre yield does not insure sustained ecosystems. The immediate challenge for foresters is to provide the ditches along this new road, based on sound science and a better understanding of how our forest ecosystems work. Although public policy is fueling the car, foresters will build the road. Through concerted public involvement revolved around sound biology and good communication, we can all ensure a smooth ride.

INTRODUCTION

During the 1990s, forestry in western North America will be characterized by rapid changes in approaches to forest values and forest land management. A new land ethic has been developing over the last twenty years as characterized by the following quotes:

"What we need and somehow must find in this latter part of the twentieth century is an ethic of land, air and water. It is perfectly possible to have settlement, industrial development and reasonable exploitation of primary resources without condemning our children to generations of poverty and deprivation...All ideas have their time

and the time for this one is well in sight." R. Haig-Brown (1975)

"We have tried to show how human survival and well-being could depend on success in elevating sustainable development to a global ethic... The time has come to break out of past patterns. Attempts to maintain social and ecological stability through old approaches to development and environmental protection will increase instability. Security must be sought through change." Brundtland (1987)

CHALLENGE IN TRANSITION

The challenge for foresters in the near future is finding an effective role in assisting society (industry, government and local communities) to manage the transition. The land ethic is changing (Devall and Sessions 1985). Under the banner of sustainable development, it is changing forest land management. Three important examples of this change are:

1. Transition from commodity management to ecosystem management.

The common practice of large, progressive clearcutting with rapid stand establishment has led to extensive areas of relatively uniform seral stages. Alternatively, other regions have reduced clearcut size and constrained adjacency creating patchworks of early seral stages with extensive edges and fragmented mature forests (Franklin 1990, Harris 1984). In both cases, the emphasis has been on fibre production. Recently, concerns over ecosystem complexity, biological legacies and landscape ecology have led to a re-

evaluation of the sustainability of past land management alternatives. This has spawned the "kinder, gentler" forestry in the Pacific Northwest known as New Forestry or Ecosystem Management (FEMAT 1993).

2. Transition from large forest tenures to small, community-based tenures.

Canadian forestry policy has led to a conspicuous trend toward larger and fewer companies and a consolidation of forest land management responsibility. This is in deference to the more diversified approaches used in Scandinavia and the U.S. southeast. In British Columbia, this trend has been criticized by local communities and two Royal Commissions (Pearse 1975, Peel 1991) as limiting resource management flexibility and competition, restricting management of non-timber resources, and disregarding community stability. Tenure system revisions with emphasis on a large proportion of small, community-based tenures are being considered throughout Canada. British Columbia has recently seen a significant increase in AAC allocated to the small business component through the advent of the Small Business Program and the Peel Commission (1991) has recommended that the AAC assigned to companies with manufacturing facilities be no more than 50%.

3. Transition from primary emphasis on timber values to timber as a residual.

The large contribution of the forest industry to the Canadian economy is unmistakable. The Canadian forest industry employed 966,000 people, directly or indirectly, in 1991. The industry generated \$35.4 billion in manufactured products contributing in the same year. In British Columbia, the forest industry accounted for 46.3 percent of the Provincial gross domestic product in 1991 (COFI 1993). This has perpetuated a strong emphasis on maintaining timber values in forest land management into the 1990s.

Studies on the ecology of late successional forests in the Pacific Northwest during the late 1970s and 1980s indicated that high-yield, short-rotation forestry had not adequately protected biodiversity in late-successional forests and their associated ecosystems (FhMAT 1993). Subsequently, the recent developments in New

Forestry and the emphasis on forest conservation. The US National Forests, as an example, has adopted a new forest land ethic that will:

provide goods and services at a sustainable level for all resources including timber... the underlying first objective of the National Forests is the preservation of biodiversity (Jack Ward Thomas).

Under this policy they will not use clearcutting and fibre production will be a residual and not a goal.

FEAR FUELING CHANGE

One significant role foresters can play in the future is to help to ensure that we act on what we know and not on what we fear. We must be and be seen to be honest brokers of forest biology. This does not mean spreading a gospel of "all is well in the woods" nor does it mean we should mimic the PNW experience everywhere. We need to focus public and professional concern about forest practices by having the humility to recognize the

things we don't know, acting on what we do know and working to fill the gap. Intellectual honesty is key to informed decision-making.

Fear founded on misinformation or a limited understanding of the biological realities can strongly influence public sentiment and policy. Some examples of instances where fear may lead to bad policy are:

- **Fear of plantation forestry leading to widespread "monocultures", therefore use only natural regeneration.**

The evidence is clear that forestry plantations in Canada are neither single species nor single genotypes (Kimmins 1992). In many cases, they are not even single aged. Natural regeneration is a common occurrence and an integral element of all forest plantations. However, plantations resulting from clearcutting are structurally simple and that simplification may reduce biological diversity at the stand and landscape level (Franklin 1990). That in turn may lead to a reduced capacity to provide ecological service (clean air, clean water and productive soils). Foresters must resolve this issue and not get into theological debates about nature versus the hand of man.

. Fear of clearcuts being biological wastelands, therefore abolish clearcutting.

It has been well established that clearcuts are not biological deserts and are ecologically and silviculturally appropriate in many forest ecosystems (Kimmins 1992, Johnson *et al.* 1971). The larger question is: does the structural simplification of clearcutting persist for a sufficiently long period to reduce ecosystem function? In order to determine this, foresters need to look closely at past practices and conduct future harvesting as an

adaptive process testing a wide range of alternatives with mechanisms for monitoring and feedback (Walters and Holling 1990).

• Fear that seed orchard seedlings are reducing genetic diversity, therefore use only wild seedlings.

When selecting for desirable traits, a high proportion of genetic diversity is maintained (Carlson and Yanchuk 1990). Genetic diversity can be increased when unrelated parents from different areas are brought together in seed orchards (Ledig 1988). Although a cone collection from 10 to 20 trees can capture a large proportion of the genetic diversity in the stand, widely planting that seedlot will reduce genetic diversity at the landscape level. Foresters need to understand this issue and be prepared to speak in public forums on the biological rationale for the use of seed orchard seed.

COSTS OF TRANSITION

From a business standpoint the challenge in transition remains the same...how to make a buck? If the landbase is shrinking, how do we maintain the cut? What intensive silvicultural activities can fill the fibre gap and can we do them efficiently? What are the cost implications of alternatives to clearcutting and what are innovative solutions? If the fibre supply cannot be met, what conversion facility mix is most appropriate and how do local communities maintain their integrity?

The transition from past practices to the "new direction" has created a climate of uncertainty and is a scary time for the forest industry and forest investors. Under ecosystem management, fibre production will be the residual after management of other resource values (FEMAT 1993). Many of the resources we will be asked to sustain will generate little revenue for the land manager and there is uncertainty about society's willingness to pay. Three examples of the costs of transition and willingness to pay are:

1. Increased cost of alternative harvesting methods.

In experiments conducted at Oregon State University with two-story and group selection systems compared to clearcutting in 100 to 125-year Douglas-fir, second-growth New Forestry alternatives had 2% to 25% higher costs depending on terrain and initial stand conditions (Kellog *et al.* 1991). In the Willamette National Forest and elsewhere in the PNW, snag creation, green tree retention and management of coarse woody debris have increased costs over clearcutting by 35% to 40% (Hicks 1991). In

conjunction with the Canadian Forest Service, MacMillan Bloedel has conducted one of the few alternative harvesting study in coastal temperate rainforests has been conducted by MacMillan Bloedel in montane forests on the east side of Vancouver Island. Cost for patch cuts, green tree retention and shelterwood systems ranged from 25% to 40% greater than clearcutting (Beese and Dunsworth 1994).

2. Increased costs of managing for biodiversity and other resource values at the landscape level.

Recent changes in forest management policy for British Columbia have been embodied in Forest Practices Code legislation due to be passed into law this winter. A recent review of the costs of one of the suggested changes in forest practices, management for biodiversity, indicated that beyond the stand level costs, mentioned above, harvest levels would be reduced by 3% to 30% (Nelson and Shannon 1993). Additional spatial harvest constraints, needed to meet visual quality objectives, could increase the maximum AAC reduction to as high as 50%. Another study, conducted by MacMillan Bloedel and UBC on the Tsitika landscape unit, looked at the cumulative effect of spatial constraints for old-growth reserves, corridors, opening size and adjacency, visual quality and harvest uniformity (Nelson and Hackett 1990). They found that spatial constraints reduced total conversion return by 20% to 37%. The net effect of the regulations was to disperse the harvest and increase road building costs, which subsequently increased delivered wood costs in the short term.

3. Economics of management for ecological objectives.

Van Kooten (1994) has recently assessed the economics of managing for biodiversity on forest lands in British Columbia. He uses an old-growth forest comparison on the coast and the interior to illustrate how the costs to society should be assessed. In his example, he determines that society places a maximum value (willingness to pay) for protection of old growth on the coast at \$10,000 per hectare and in the interior at \$8,000 per hectare. The average timber values on the coast are estimated at \$23,178 per hectare and the

interior at \$9,199 per hectare. From this he concludes that not all old growth should be preserved nor all harvested.

However, when willingness to pay is tested through actions like tax increases for public services, willingness to pay is more constrained. In the recent Victoria sewage debate, sewage treatment was put to plebiscite. Arguments were presented for and against the attainment of a number of objectives including protecting marine ecological values. The public decided that they were not willing to accept a several hundred dollar annual increase in property taxes to achieve even secondary treatment of their sewage.

Although the transition in forest land management is paved with higher costs and uncertainty as to who will pay, it remains an exciting time for foresters. There is a renewed interest in questions many of us have been asking for years. There is also a renewed call for creativity and innovation in putting the answers to those questions into practice. Forest ecology and silviculture will be the bridge to the "new direction". Although land managers may continue to be evaluated on the basis of dollars per cubic meter, realization of ecological objectives will have an increasing influence on the bottom line.

SKILLS TO MANAGE TRANSITION

The immediate challenge for foresters is to provide the ditches along the "new road", based on sound science and a better understanding of how our forest ecosystems work. Foresters will require a new set of technical skills to meet the management constraints outlined above. A much different set than we needed twenty years ago. More importantly, foresters will require training in three key aspects of communication:

1. clear and concise writing,
2. powerful public speaking, and

3. team leadership.

Walters and Holling (1990) put it well:

*"Policy is politics...decisions are not made because of well proofed arguments in the **tradition of experimental science, but because of the accumulation of credible evidence supporting a simple, widely perceived explanation in a political environment that demands action.**"*

Although the public policy is fueling the car, foresters will build the road. Through concerted public involvement revolved around sound biology, credible evidence and good communication, we can all ensure a smooth ride.

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SECTION III. BARRY NORTHEY (CLASS OF 1979)

WHY MY NEXT FORESTRY WORK ASSOCIATES WILL BE LESS LIKELY TO BE FORESTERS

OR

WHY THE CHIEF FORESTER FOR THE U.S. FOREST SERVICE IS A BIOLOGIST

1. MY LIFE AS A GOVERNMENT FORESTER

I have worked for the Alberta Forest Service (AFS) since graduating in 1979 with a B.Sc. from the University of Alberta (U of A) Forest Science program. My work has mainly been in environmental protection, specifically watershed management, integrated resource planning and recently in computing. There is much discussion in the AFS about what foresters should be doing. Many AFS foresters want to be *field oriented*, operational foresters. Others spend their time in public meetings or manipulating data on computers. The world is moving on while we fight over whether to buy quads or computers.

I have observed that the speakers list at Canadian Institute of Forestry technical sessions and other forestry education sessions are often dominated by non foresters. Biologists, engineers, lawyers, archaeologists, accountants, botanists, ecologists, GIS experts, public relations specialists etc., are finding employment in what used to be the forester's bailiwick. My opinion about why this has happened is based on my experiences and here are a few that have shaped my thinking and attitudes:

Shortly after completing a talk in which I encouraged our staff to get their *legal ducks in a row*, a Forest Superintendent emphatically told me "Albertans don't go to court."

In a meeting with a Fish and Wildlife Services biologist, one AFS forester pounded

his fist on the table and confidently proclaimed "all our harvesting is good for wildlife." When asked why so, he replied "you could see more animals."

In a recent Land Use Conference, one AFS Superintendent said "I don't need any Integrated Resource Management Plan to do my job."

"That public relations and public involvement stuff only happens down south in the Bow Crow Forest. It will never happen here."

"Environmentalism is a fad, just wait for hard economic times and it will go away."

We didn't prepare for the obvious because we denied that it was happening.

A Policy for Resource Management of the Eastern Slopes ranks watershed management as the top priority in the Eastern Slopes. In 1986, water yield modeling was relegated to near the last of about 60 priorities for GIS development by the AFS. When I asked why, one AFS Director responded "what's it got to do with forestry?"

"What's it got to do with forestry?" That's a very good question and perhaps it says it all.

2. THE CHANGING PARADIGM

In theory, governments try to manage the lands under their jurisdiction for the collective good of the people that elect them and should respond to changing demands. In practice, many government foresters have resisted change by hiding behind a wall of bureaucracy and clinging to old loyalties to the forest, petroleum and ranching industries. Only strong, external forces create significant changes in forestry practice, whether for better or worse. Those forces are challenging our perceptions of what the practice of forestry is, and our traditions. Not only forestry is being challenged. The following quotation appeared in the Financial Post on September 14, 1994: "As the shock subsides over Amoco Canada Ltd's. failure to win approval for a \$1.2 billion natural gas project because of environmental concerns, Calgary's oil patch is starting to ask itself what went wrong."

2.1 What is Forestry?

Forestry is defined in many ways such as in Section 1 h of the Forestry Profession Act. Each of us must decide if forestry is just the cutting, growing, processing and marketing of fibre (trees), or if it is something greater than that, that being the management of the forest and all of its components. Those that adapt to the broader definition will probably enjoy more employment opportunities as the practice of forestry evolves and matures.

2.2 Tradition

Many foresters traditionally worked, or hoped to work out in a rural setting and out of the public eye. We did a good job of getting the wood to the mill. We created jobs and wealth from the hinterland. We were taught and usually shared the ancient beliefs in the rightness of sustained yield and the regulated forest. The rates of change in forests and in forestry practices could sometimes be measured in centuries. The recent green assault caught us off guard. We *circled the wagons*, shot back with the old platitudes, wishing that the changes were only fads and would soon go the way of the Hula Hoop. We were on the forefront of resistance, not the leading edge of change. The failure to differentiate between *a trend* and *a fad* left some foresters unprepared and generally unwilling to deal with the changes. Employers are looking elsewhere.

2.3 Urbanization, Technology and the Changing Power Base

The social and demographic structure of Western nations has changed. Increasing wealth, leisure time and urbanization have created a new generation of voters with little contact with the hinterland. Most Canadian citizens, including foresters, now earn their incomes from providing services. Many people have little understanding of how wealth is built and fail to understand that the base of wealth in Canada and elsewhere, still comes from the extraction and use of natural resources. (Even the ecotourist consumes resources to earn income to afford the trip and to provide the transportation). Their main understanding of the natural world often comes through media types like the populist David Suzuki or anthropomorphized misrepresentation of reality like the movie *The Bear* or Disney's, *The Lion King* or *Bambi*. These people vote, they are the majority and they are forcing change. There are tremendous needs and opportunities for providing education and public relations. Yet many foresters want to be operational and hang out in the hinterland out of the public eye. Employers are looking elsewhere.

2.4 A Changing Marketplace

Historically, foresters have found direct and indirect employment within the traditional business model that is simply described as: **build the roads, cut the trees, process and sell the wood, reforest and tend the forest.** Recent changes in the marketplace are driving the changes in forest management practices on public lands in Canada. Public pressure is also being applied through the media, courts and political arenas and that pressure is influencing the financial situation of forestry corporations and of governments that rely on resource revenues. For

example, consider the new range of potential fines against the forest industry and individuals working in the industry in B.C., or the recent loss of historically secure contracts for paper.

The business model is being expanded at the sell the wood stage. To be successful in the marketplace, forestry companies may need to show that their products are produced using sustainable practices applying the principles of ecosystem management. B.C.'s Premier Harcourt recently toured Europe, trying to convince Europeans that such was the case in B.C. Green endorsement may be needed to sell your product, or to create a competitive edge, or to retain market share. The Canadian Standards Association is preparing guidelines for this type of endorsement. The following quotation is from the September 26, 1994 edition of the Financial Post and I assume that it applies to forestry: "The study (by Ernst & Young) indicates that Canadian Senior executives have failed to embrace the concept of environmental management and generally don't do enough to reward employees for good environmental records or put monitoring systems in place." Perhaps one result of this failure is that in B.C., the very punitive Forest Practices Code is about to be made law.

How does one convince the public, the consumer, or the Judge, that your product is produced using ecologically sound methods? I don't think that untrained, often unknowledgeable politicians are the answer. You send the people managing the forests. Unfortunately, foresters are too often little more informed than their political masters about the flora and fauna in the ecosystems they manage. Foresters are content to leave the fauna and flora to the biologists, botanists and ecologists. We only deal with trees and skidders and talk of rotation ages, fibre production and economic growth. However, we proclaim our love for the forest appeal to the public to "trust us, we are professionally managing your forests" even though we are ignorant about the forests' components: Our words have an empty ring and employers are looking elsewhere.

3. WHERE TO NEXT

The future will be what we make it. The world is changing and the job will get done with or without foresters. For some, change is unlikely, for others it comes only by external force and some will lead the way. What about the future? To get some answers we need only look at what is happening in B.C. and the U.S. On page 50 of the September 1994 edition of the Journal of Forestry, there is a list of topics for next year's publications that may give some hints about what is coming. I expect that we will see more legal and environmental challenges, particularly regarding clearcutting. Third party environmental audits, more legislation with bigger penalties, environmental risk assessment etc., will be part of the Canadian forester's world.

Today's forester must be prepared to be front and center, managing the flow of complex resource information and negotiating through public involvement processes. To that end, I believe that universities should teach the forestry basics with a very strong emphasis on the following:

public speaking (grammar, delivery)

dispute resolution - consensus building (the underlying principle of the Alberta Forest Conservation Strategy)

ecology - identification of flora and fauna and their interactions with forest harvesting

the legal system - how to give evidence in court, how to be an expert witness, how to meet and exceed the provisions and intent of the law

use of computer systems for land management planning, particularly GIS

environmental auditing/consulting - developing appropriate skills (report writing, contract management - preparation and bidding)

environmental protection/watershed management - stated as the number one priority for the Eastern Slopes, but not a mandatory course for University of Alberta forestry students.

- post graduate work - academics seem to carry much weight in public debates and in courts. Tomorrow's technologists may have a 4-year B.Sc..

Formal courses at the start of one's career are only part of the answer. They create the opportunity but not the willingness to learn and adapt. Over the years I have watched as some forestry schools in North America flourished while others have faded and disappeared. One factor may be the school's ability to adapt and to prepare the graduate for the new world of forestry practice. My guess is that those that produce graduates only to serve the forest industry and the traditional business models will suffer, while others that focus on forest management, not just fibre, will fare better at attracting new students and the associated funding.

I am thankful that I came to the University of Alberta and was exposed to the broad world of forestry. Legitimate criticism persists as to the abilities of the University of Alberta forestry graduate to jump directly from school into managing operational logging operations, but there is more to forestry than logging. It is time for employers to rethink their expectations of new graduates and reassess their own responsibilities to further the training of new foresters. Employers should also think about the value of these new graduates in participating in the new business model. If buyers aren't satisfied that your products are produced using sustainable practices, the best logging manager in the world could be out of a job.

If we don't get on the ball as foresters, my next forestry work associates will be less likely to be foresters and as in the U.S., my next Director may be a biologist. Jack Ward Thomas was hired as the Chief Forester of the U.S.F.S. for his abilities. I suspect that his hiring was also an attempt to break the chain of traditional forestry thinking and loyalties and to inject some new ideas. Well "it will never happen here." Perhaps not, but my Deputy Minister is an engineer.

The world hales change, but it is the only thing that has brought progress

Charles F. Kettering

SECTION IV. VAL LEMAY (CLASS OF 1981)

"EDUCATING FOREST RESOURCES MANAGERS: CHALLENGES & OPPORTUNITIES"

INTRODUCTION

In 1979, I attended a conference sponsored by the Canadian Pulp and Paper Association. A representative from the Globe and Mail was asked why the Globe and Mail did not cover forest management issues. He replied that this was simply not news.

A few years later, forest management issues became news as issues of land conflict were presented. Public demands for greater accountability in forest land management decisions have increased. Forest resources managers must base decisions soundly on scientific evidence, as well as the implications to the public. Consideration must be given to both present and future, and local and regional impacts. A broad breadth and deeper depth of knowledge is needed, in order for foresters to have the confidence in prescribing management activities. One of the results of this attention to forest land management decisions is the challenge to provide well trained forest resources managers.

Model Of The "New" Forest Land Manager

Based on my perception of the needs of public, forest land managers must be able to reliably manage:

1. Timber resources so that:
 - a. the price of timber products is reasonable.
 - b. jobs in the timber industry are maintained or increases.
 - c. exports are maintained or increased.
2. Water resources so that:
 - a. Water is safe and in abundant supply for human consumption.
 - b. Fish stocks are maintained or increased.
 - c. Other water animals do not decline in numbers.
3. Forests so that diversity is maintained at current levels.
4. Wildlife so that populations are maintained at current levels.
5. Forests such that recreational opportunities are increased.

Some of these items in my list could be debated, wording could be changed, and more items added, but the important point is that there is much pressure on forestry professionals to produce all of these resources on the same land area. Clearly, these cannot all be provided at all times. However, the forest land manager must indicate that all resources have been considered and provide evidence that good management is being practiced. Also, the manager must be able to communicate to a broad range of publics who have interest in various aspects of forest lands, from trappers in remote areas, to visitors from Europe.

Current Models for Training Forest Land Mangers

Can we educate one person who will become able to provide good management and communication of this management in all areas? Training to become a professional forester has typically involved four or five years to obtain a university undergraduate degree, followed by two to four years of relevant experience. In addition to the traditional forestry schools, new schools in the area of land management have been appearing across Canada, under the titles of Natural Resources Management, Environmental Sciences, and Conservation Management, as well as new programs in Forestry.

For all training programs, there is a necessary trade-off between breadth and depth of subjects. Technical programs usually emphasize field measurements and operations, in the disciplines of timber, water, wildlife, or recreation. Forestry degree programs attempt to cover a broad base of resource management issues, with an emphasis on timber. Natural resources management and conservation management programs often emphasize resources other than timber.

Because of the amount of knowledge required and the need for solid justification for all management activities, it is my opinion that it is not possible to produce a forestry professional who can meet the demands of land management in only the four years of university education plus two years of relevant experience. Also, there is no advantage in changing the emphasis to management of non-timber resources, in that the graduates of these programs will be no better equipped to provide good management.

Having said that, it is my observation that many practicing forestry professionals have more than this amount of formal education and training before becoming registered professionals. Many have other degrees, such as allied science degrees, or diplomas and much more experience.

Also, because of the pressures on forest land managers to produce reasonable and justifiable decisions, many professional organizations have been in the process of implementing compulsory continuing education programs for forestry professionals. This will allow the professional to upgrade knowledge and keep current with procedures, much like other professionals, including doctors, nurses, and teachers.

The question then remains, is there a need to alter existing training programs to produce new professionals, and if the prevailing answer is "yes", how should it be changed?

Alternative Models for Formal Training of Forest Land Managers

If a change in the way that we train professionals is pursued, there are several alternative models that could be followed. However, the models should be evaluated on the basis of meeting the following criteria:

1. broader breadth of knowledge;
2. deeper depth of knowledge; and
3. improved communication to publics.

The central idea is that improved knowledge, both in terms of the wider array of subjects and in the coverage of any subject will produce a professional that is more confident in obtaining and using relevant information to make management decisions. Confidence and knowledge would also contribute to better communication to all publics.

Models for training could be based on existing models used to train other professionals.

Model 1.

Undergraduate Specializations: Engineers Prototype

One alternative is to follow the model used by engineers; that is, to train persons only in one specialty. A forest land manager would then be replaced by a team of managers, each providing input on their own specialty. This would limit the breadth of knowledge for any one person, but increase the depth.

This would increase costs, however, in that several persons would have to be hired in the place of one practicing generalist.

Alternative 2.

Graduate Specializations: MBA and Librarians prototype

For this alternative, an undergraduate degree would be followed by a graduate specialization. This would provide longer time in a formal education institute. To improve the experience of the person, a compulsory period of work between the two degrees could be added. The model could include either forest resources management followed by specialization (e.g., wildlife, silviculture, etc.) or allied science (e.g., zoology, botany, etc.) followed by forest resources management. This would be similar to the model used for MBA programs, and also recently adopted for Library Science.

In order to pursue this model, students would have to be willing to study for a longer time period. Employers would have to wait longer for professionals to be trained.

Alternative 3.

Second Undergraduate Degree: Teachers/Lawyers/G.P. in Medicine Prototype

The model used to train many professionals is to provide a second undergraduate degree specializing in the professional area after an initial degree is completed. For forest land managers, this would mean an initial degree in applied science, followed by an undergraduate degree in forest land management.

As with Alternative 2, this would result in more time in university with formal education. The difference is that both degrees would be three to four years, resulting in a longer training time.

Alternative 4.

Status Quo plus Post-Graduate Compulsory Apprenticeship Program

Following a formal undergraduate education in forest land management, a compulsory apprenticeship program could be initiated. Many technical and professional training programs use this model.

Apprenticeship programs do provide extensive experience in professional work. However, with the number of forest land managers that is needed, there would be some difficulty in finding professionals with which to apprentice.

These four alternatives are not exclusive. Items could be mixed and various modifications made to incorporate previous training and experience of the student, and to allow for different levels of professionals.

A graduated program could also be adopted. As an example, a person completing a degree in forest resources management would be considered an apprentice forester. Following an apprenticeship period, the person would be a professional forester. A specialist forester would continue and complete a graduate degree in a specialty as per

Alternative 2. For someone with an allied science degree, following an undergraduate degree in forest resources management, and an apprenticeship period, they could become a specialist forester in the area of their first undergraduate degree.

In order to choose an alternative to the existing method of training forest resources managers, input from traditional employers of land managers is needed. Representatives of Provincial and Federal government agencies that manage forest lands, forest products industries, and universities, colleges, and trade schools would need to be consulted in order to develop a new model for training.

Continuing Education

In addition to selecting an alternative and designing programs to match the selected alternative, continuing education of forestry professionals must be instituted. Existing land managers must be encouraged by employers and professional organizations to improve the breadth and depth of their knowledge. Incentives such as payment of tuition for formal courses, leave and expenses for informal courses, and time to study literature and journals must be encouraged by employers. Professional associations must advertise courses that are available and lobby employers to support employees in continuing education endeavors. Without support and knowledge of education activities, continuing education will rarely be pursued by professionals.

Impediments to New Training and Continuing Education

There are several impediments to change in training forestry professionals. These include:

1. Increased funding if longer formal training periods are needed.
2. Longer time before becoming a professional in the workplace.
3. Ability to choose an alternative training method that would in all probability result in a better trained professional.
4. Increases in the numbers of schools offering programs in land management.
5. Continuing education is expensive and time consuming. Employers may not be willing to support the professional in continuing studies.

Because of the costs of change, the benefits of change (or the costs of no change) must be perceived as being substantial. Otherwise, the existing model will continue to be used in training.

The Challenge and the Opportunity

So where is the challenge and opportunity in educating forest land managers? The challenge is trying to choose and design a formal training program that will address the breadth and depth of knowledge needed by forest land managers today and that can be delivered in a reasonable time frame. The opportunity is that we now are in the news as land managers, and public support exists. Now is the time to change our education and to encourage continuing education of professionals. Government support would be needed to aid in these endeavors. Without these changes, professionals will have difficulty in making decisions confidently and well. The challenge is there for educators and professionals and the opportunity is ripe for this to occur.

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