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The Evolution and Status of Canadian Silviculture Practice

by

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Abstract

The development of Canadian silviculture practice is outlined. Five development stages are identified. Based on a 1980 survey, corporate silviculture activity is presented by province and by freehold ownership. The intensification of silviculture practice will be dependent on the success of provincial/federal/industrial mechanisms to put more than one nickel of every dollar generated back into the forest.

Résumé

En identifiant cinq périodes du développement, l'auteur fait l'esquisse de la pratique sylvicole au Canada. Sur la base d'un relevé de 1980, il présente par province et par mode de tenure les apports sylvicoles. L'intensification de la pratique sylvicole dépend d'un effort supérieur de réinvestissement des argents que génère la forêt de la part du provincial, du fédéral et de l'industrie.

Introduction

Historically the major challenges to Canadian foresters have been the inventory of the vast forest resources, the initiation of forest protection programmes to hold down catastrophic losses, the construction of roads for access and the logging of mature and overmature growing stock in a cost effective manner. During the period from 1920 to 1970 these activities dominated Canadian forestry practice. From 1920 onwards implementation of large scale silviculture practices, particularly regeneration and protection practices, have been the focus of much discussion, debate and revised policy and legislation. (Canadian Forestry Association 1977, Reed 1978, Can. Pulp Paper Assn. 1981).

The driving forces for this change have been the rising demand for forest products, declines in accessible, high value virgin forest available for logging, growing concern over inadequate regeneration on cutover land and continued large

growing stock losses to insects, fire and disease.

The responses of the provincial crown land management agencies have varied in speed and detail of legislative and regulatory actions, but they have shown a common trend towards assigning increasing responsibility to industrial licencees for on the ground silviculture practices. The driving forces for this change in policy have been:

1. Difficulties in funding and implementing programmes within civil service budgeting and manpower constraints.
2. Recognition of the value of incentives for silviculture under which silvicultural performance is tied to the renewal of the industrial crown land lease (Evergreen tenure).

These changes in policy are new and still developing. Most of the strategic analyses of wood supply and consequences of silvicultural activities have been done by the provinces. Presently many major companies find themselves in a new position of:

1. Being responsible for silviculture practices, but lacking expertise in their implementation.
2. Being faced with constrained allowable cuts, and the need to re-examine the effect of improved silviculture methods upon their cut without having the same capability as the provincial landowner.

Public and professional opinion on the status of silviculture practice in Canada appear to vary widely. Professional foresters' opinion ranges from the doom and gloom "There is no hope for the industry" attitude, to the other extreme of "Dawn of a new golden era of silviculture"; the latter viewpoint usually emanating from senior public or corporate officials. Corporate advertising, both US and Canadian, appears to have strongly influenced public opinion. I am unaware of any polls of public opinion but the press clippings do reveal a wide range of viewpoint.

There is no federal or national mechanism to collect statistics on the size, cost and effectiveness of Canadian silviculture programs. The annual reports of provincial government have traditionally not been very illuminating. The national assessment of the status of forest management in Canada by F.L.C. Reed and Associates (1978) and the 1979 Forestry Congress sponsored by The Canadian Pulp and Paper Association have indicated that silviculture

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Table 1. The development of Canadian crown land silviculture

Date	Problem Silviculture	Policy	Application		Research
			Strategic concept	Tactical emphasis	
1910-1930	Inventory of forest cover types	Seeding and planting trials	"Get the wood out"	Forest inventory	Silviculture as logging
1931-1949	Unknown silvics of species	Unassisted natural regeneration	Replace old growth by vigorous young stands	Regeneration surveys	— stand development — plantation trials
1950-1970	Inadequate regeneration following unregulated logging	Assisted natural regeneration	Cut modification	Scarification Large scale planting	Silviculture as regeneration — stocking standards — ecologically based regeneration prescriptions
1971-1978	"NSR" plus accumulating "backlog"	Expanded government planting	Site and stand specific prescriptions	Quality planting	Silviculture as plantations — cutover response — forest tree improvement — site/species matching
1978-present	Unknown falldown and ACE benefits and risks	All site "basic silv." by industry plus optional tending	Designing	Biological & economic efficiency of regeneration and tending	Silviculture as biological basis for sustained yield — managed yield curves — modelling benefits — efficiency of technique — risk assessment

practices, while often well understood and well researched, are in a primitive state of implementation. A Canadian Institute of Forestry survey in 1974 (Weetman 1977) indicated the expenditures and decision making. The Canadian Forestry Association surveyed forest regeneration in Canada for the National Regeneration Conference and the status of regeneration was assessed (Weetman 1977). Most recently The Pulp and Paper Research Institute of Canada sponsored a survey of industrial silviculture activity (Weetman 1981). All these survey data were used for this report.

Chronological Development

Table 1. attempts to outline the development of silviculture on crown lands following a format used by Pyne (1981) for wildland fire protection by the United States Forest Service. Noteworthy are the long periods of relative inactivity in silviculture until 1970. Since then policy and implementation have moved quickly as managerial problems associated with allowable cut problems and protection losses have been identified. The mechanism for this identification has been strategic analyses of timber supply using whole forest models, particularly in Quebec (Mercier 1980), New Brunswick (Hall 1981, Baskerville 1978, Ontario, and British Columbia (BC Ministry of Forests 1980).

While the tradition of silvicultural research goes back to 1910, the expansion in the 1960's was followed by a major setback in the 1970's when the Canadian Forestry Service was cut back.

Now a slow rebuilding process is developing both provincially and federally with new emphasis on application. The period of 1950-1970 was dominated by the pioneering work of the Canadian forest ecologists (Rowe, Hills, Jurdant, Linteau, Loucks, Krajina and other as they attempted to uncover the ecological bases for silviculture practice in the relatively unknown vastness of our virgin forests (University of BC 1977). This work continues, but on a more regional

basis as ecosystems are identified and corresponding management interpretations are developed.

Similarly, implementation of silviculture has become decentralized as local expertise is developed and bureaucratic structure reorganized. The 1970's saw the provincial initiation and development of species working group guides and the refinement manuals of silvicultural technique. (Quebec Ministère des Terres et Forêts 1972, Ontario Ministry Natural Resources 1974, 1980; Robinson 1974, Vezina *et al.* 1976, Weingartner and Basham 1979, British Columbia Ministry of Forests 1976).

In the 1980's it appears that the industrial role in silviculture will be greatly expanded and industrial guides and manuals of techniques will be developed following the leadership of pioneering companies like Irving, Nova Scotia Forest Industries, St. Regis, MacMillan Bloedel and BC Forest Products (Johnson 1980).

Developmental Stages and Current Status

An attempt has been made to classify the development of silviculture into stages (Table 2.) It is clear that the provinces, regions or districts within provinces, and companies are at widely different stages of development.

At the provincial level, the development of silviculture is related to perceived need for it, revenues to pay for it and the policies and legislation in place to permit it to occur. With most of the commercial timber in public ownership in Canada, public forest-land-use policy is the primary control on silviculture practice, not the initiative of private timber growers. There are very few major blocks of privately held forest land in Canada. They total about 4 million ha out of 55 million ha of lease to pulp and paper companies; if all forest companies are included the leasehold area is probably 30% greater. Table 3. assigns a developmental stage of silviculture practice to the major freehold ownership in Canada. Only 5 companies are classed as IV-V intensive. All

Table 2. Development stages in silviculture

Stage	Activities initiated
I Pioneering	Protection Inventory No planning
II Extensive	Growth and yield studies Regeneration surveys Modified logging Annual planning
III Basic	Regeneration current cutover Strategic analyses Tree improvement cooperation Tending trials 5 year planning
IV Intensive	Backlog regeneration Stand prescriptions for management objectives Stand tending Silviculture research Integrated pest management Growth and yield feedback 20 year planning
V Integrated	Land use planning Public input into all planning Systems approach to all forest management Stand and forest level cost control Work sociology and technique research

Table 3. Stage of development of silviculture on major private forest land ownerships in Canada (Greater than 15 000 ha)

Province	Company	Area of freehold (1000's ha)	Stage of Silviculture development
BC	Pacific Forest Products	74	III-IV
	Crowns Nest Forest Ind.		II
	MacMillan Bloedel	300	IV
	Crown Zellerbach	130	III
	B.C. Forest Products	92	III-IV
	West. Forest Products	45	III
Ont.	Crestbrook	15	II-III
	Abitibi	265	II
	Spruce Falls	75	II-III
	Domtar	165	II
Que.	Can. Int. Paper	465	II
	Consol. Paper Corp.	132	II
	Abitibi	47	II
	Quebec North Shore	68	II
NB	Fraser	310	III-IV
	Valley Forest Prod.	35	III
	J.D. Irving Ltd.	526	IV
	MacMillan Rothsay	63	II
	NB Internat. Paper Co.	85	III-IV
	Acadia	64	III
NS	Georgia Pacific	74	II-III
	Scott Maritimes	413	II-III
	Bowater Mersey	295	II
Nfld.	Bowater Nfld.	645	II
	Abitibi	113	II

companies practice Stage III, basic silviculture, on their freehold areas. On leasehold areas most corporations in Manitoba, Ontario and Quebec are at Stage II — extensive silviculture; Table 4. gives corporate silviculture activity indexes (areas treated divided by areas cut) of 0.3 or less for these provinces.

The statistics support the view point that the most intensive silviculture is often found on freehold lands, followed by leaseholds with long term tenures (tree farm licences or forest management agreements). The lowest level of crown land silviculture is found on other leaseholds or on vacant crown land. Although statistics are not available, the level of silviculture practice on most small private woodlots and freeholds is very primitive indeed. The total net corporate expenditure after refunds from the provinces was about \$30 million in 1980, a large portion of this money is for freehold silviculture.

The state of silviculture development varies widely between provinces. Table 5. compares timber royalty revenues and silviculture expenditures. Noteworthy is the fact that most of the provincial revenue is generated in BC, which in turn spends the most on silviculture absolutely, but the least as a percentage of revenue. Silviculture in BC is constrained by perceived higher priorities for timber revenue. In other provinces the level of silviculture practice is constrained by lack of revenues. The high quality, original, virgin forest estate has been severely depleted for many decades in the Maritimes. The statistics lend support to the old observation that on public lands it takes high quality timber to pay for silviculture; once it has gone a declining spiral of lower timber quality, produces proportionally less revenue, yielding less money for silviculture. This declining spiral has bottomed-out in the Maritimes, where public land silviculture now requires massive federal subsidy. Department of Regional Economic Expansion (DREE) payments to the provinces are important features in increasing the level of silviculture practice.

Nationally, F.L.C. Reed (CPPA 1981) has pointed out that only about 5¢ of every dollar generated by the industry goes back into silviculture. Most provinces are struggling with budget and manpower problems to switch from extensive (level II) to basic level silviculture (level III). Intensive silviculture (level IV) is largely restricted to the large corporate freehold except in BC. Over the next 20 years whether or not Canadian silviculture on crown lands will move from level II (extensive) towards level IV (intensive) will largely depend on the success of provincial/federal/industrial mechanisms to put more than one nickel of every dollar generated back into the forest.

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Table 4. Provincial and national corporate silviculture activity 1980:2 (from Weetman 1981)

Company	BC	ALBERTA	MANITOBA	ONTARIO	QUEBEC	NB	NS	NFLD	TOTAL
Freehold area (ha)	550 000	0	0	580 000	840 000	1 040 000	430 000	620 000	4 060 000
Leasehold or equiv. area (ha)	13 900 000	3 300 000	6 800 000	18 400 000	15 700 000	2 300 000	700 000	3 600 000	64 700 000
Annual cutover (ha)	93 000	9 000	9 000	82 000	173 000	47 000	13 000	12 000	438 000
Silviculture funds from province (\$)	17 520 000	0	340 000	2 200 000	40 000	550 000	2 500 000	390 000	23 540 000
Does company want to increase allowable cut?	all do	all do	all do	all do	most do	all do	all do	all do	nearly all
Company responsibility for crown land silviculture	all have for "Basic" silviculture	all have	some	Forest Manag. Agreements only	none	no, expected in 1982	yes	tax incentive	some
Company forest research capacity	4 companies positive	1 person	no	1 person	1 company	some	no	no	very small
Company listings of silviculture priorities-top three	Regeneration strategic protection	Protection regeneration thinning	Protection regeneration strategic	Protection regeneration strategic	Protection strategic regeneration	Protection regeneration thinning	Protection regeneration thinning	Protection strategic regeneration	
Annual regeneration work by companies (ha)	78 000	9 000	2 000	18 000	5 000	13 000	6 000	2 000	133 000
Annual stand tending work by companies (ha)	29 000	400	800	8 000	300	12 000	4 000	3 000	57 500
Annual company silviculture budget (\$)	35 100 000	1 300 000	600 000	3 600 000	2 300 000	6 900 000	5 900 000	2 100 000	57 800 000
Company silviculture activity index (Areas treated divided by ares cut)	1.1	1.0	0.3	0.3	0.03	0.5	0.8	0.4	0.4

¹Figures not entirely complete, especially for British Columbia and Alberta, due to lack of data from saw-mills not integrated with pulp and paper mills.

²Figures not available for Saskatchewan, Prince Edward Island, Yukon and Northwest Territories.

Table 5. Silviculture expenditures compared with stumpage revenue (from Weetman 1981)

	Stumpage and royalty revenue ¹	Provincial ¹ 1979/80	Federal ¹ 1979/80	Silvicultural expenditures Industrial ²		Rounded Total	Silvicultural expenditure as portion of timber revenue %
				Gross ³ 1980	Net ³ 1980		
	'000 \$	'000 \$	'000 \$	'000 \$	'000 \$	'000 \$	
British Columbia	542 732	54 611	5 700	35 100	17 580	77 890	14
Alberta	5 605	6 211	—	1 300	1 300	7 510	134
Saskatchewan	3 800	2 064	495	n.a.	n.a.	2 560	67
Manitoba	1 629	500	700	600	260	1 460	90
Ontario	42 700	28 776	716	3 600	1 400	30 900	72
Quebec	29 094	17 256	10 772	2 300	2 260	30 290	104
New Brunswick	6 781	2 667	5 806	6 900	6 350	14 830	218
Nova Scotia	757	5 193	5 071	5 900	3 400	13 660	1800
Newfoundland	276	1 435	1 604	2 100	1 710	4 740	1700
Total	633 324	118 713	30 864	57 800	34 260	183 840	29

¹F.L.C. Reed & Associates Ltd., Proc. Canadian Forest Congress 1980.

²This survey — excludes contributions to protection by companies.

³Gross — before provincial payments to industry for silviculture.

Net — after provincial payments to industry for silviculture.

n.a. = not available.

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