SILVICULTURE STATISTICS FOR CANADA: AN 11-YEAR SUMMARY

D.H. Kuhnke

INFORMATION REPORT NOR-X-301

NORTHERN FORESTRY CENTRE
FORESTRY CANADA
1989

Catalogue No. Fo46-12/301E
ISBN 0-662-16719-8
ISSN 0704-7673

This publication is available at no charge from:
Northern Forestry Centre
Forestry Canada
5320 - 122 Street
Edmonton, Alberta
T6H 3S5

A microfiche edition of this publication may be purchased from:
Micromedia Ltd.
Place du Portage
165, Hôtel-de-Ville
Hull, Quebec
J8X 3X2

Printed in Canada

Cette publication est aussi disponible en français sous le titre:
Statistiques sylvicoles canadiennes: résumé couvrant une période de 11 ans

Kuhnke, D.H. 1989. *Silviculture statistics for Canada: an 11-year summary.* For. Can., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-301.

ABSTRACT

Silviculture activities, comprising site preparation, planting, direct seeding, stand tending, and pest control, are summarized for each province and territory and for Canada for 1975-76 to 1985-86. Silviculture activities have increased steadily relative to the area harvested. The basic area data on site preparation, planting, and direct seeding have been further refined with more complete information on site preparation application and silviculture success rates. Information on success rates indicates that approximately 68% of the area harvested is adequately reforested, with natural regeneration accounting for 74% of this reforestation. Stand tending has increased more than any other silviculture activity.

RÉSUMÉ

Le présent document résume les activités sylvicoles, qui comprennent la préparation de terrain, la plantation, l'ensemencement direct, l'entretien des peuplements et la lutte contre les ravageurs, pour chaque province et territoire et pour l'ensemble du Canada à l'égard des années 1975-1976 à 1985-1986. Du point de vue de la superficie récoltée, les activités sylvicoles ont connu une croissance régulière. Outre les données de base sur la préparation des sites, la plantation et l'ensemencement direct, on présente des statistiques plus complètes sur les opérations de préparation des sites et les taux de réussite. Les renseignements sur ces taux indiquent qu'environ 68 % de la superficie récoltée est bien reboisée, la régénération naturelle représentant 74 % de ce reboisement. L'entretien des peuplements a augmenté plus que toute autre activité sylvicole.

FOREWORD

Forestry Canada's Forest Resource Data (FORSTATS) Program is responsible for the compilation and interpretation of national data on the forest resource and on changes to it resulting from both natural and human activities. Major components of the FORSTATS Program include statistics on forest inventory, forest depletions, forest growth, regeneration, forest management activities, forest management expenditures, and forest industrial activity, which includes a broad range of economic indicators.

The six regional centers and two national institutes participate with the Headquarters of Forestry Canada in the FORSTATS Program. Provincial forest management agencies, other federal and provincial agencies, and forest industries cooperate by providing data to the program.

CONTENTS

	Page
INTRODUCTION	1
METHODS	1
Data Collection	1
Data Analysis	1
RESULTS AND DISCUSSION	2
Harvesting	2
Site Preparation	2
Planting, Direct Seeding, and Natural Regeneration	2
Stand Tending	12
Pest Control	18
SUMMARY AND CONCLUSIONS	18
ACKNOWLEDGMENTS	25
REFERENCES	27

APPENDIXES

1. Silviculture questionnaire, 1986 29
2. National silviculture data 43
3. Forest economic and regional development agreement data for Canada 53
4. Provincial and territorial data 65

FIGURES

1. Average area harvested, by period 3
2. Average area of site preparation, by period 4
3. Area of site preparation as a percentage of area harvested, by period 5
4. Site preparation methods in Canada, 1975-76 to 1985-86 9
5. Average area planted, by period 10
6. Area planted as a percentage of area harvested, by period 11
7. Average area of direct seeding, by period 14
8. Area of direct seeding as a percentage of area harvested, by period 15
9. Average area of all methods of stand tending, by period 17
10. Stand tending methods in Canada, 1975-76 to 1985-86 20
11. Average area of silviculture activity for Canada, by period 22
12. Percentage change in silviculture activity between period averages for Canada 23
13. Silviculture percentages relative to area harvested for Canada, by period 24
14. Area of successful regeneration relative to area harvested for Canada, 1975-76 to 1985-86 26

TABLES

Page

1. Percentage breakdown of site preparation area by regeneration method, 1983-84 to 1985-86 6
2. Percentage of areas planted with spruce or pine expected to become satisfactorily stocked to provincial standards without re-treatment, 1983-84 to 1985-86 7
3. Percentage of areas direct seeded with spruce or pine expected to become satisfactorily stocked to provincial standards without re-treatment, 1983-84 to 1985-86 8
4. Area planted by species, 1980-81 to 1985-86 13
5. Percentage of harvested lands estimated to become satisfactorily stocked to provincial standards through natural regeneration, 1983-84 to 1985-86 16
6. Percentage of stand treatments on natural and second-growth forests, 1983-84 to 1985-86 19
7. Area of pest control 21

NOTE

The exclusion of certain manufactured products does not necessarily imply disapproval nor does the mention of other products necessarily imply endorsement by Forestry Canada.

INTRODUCTION

The purpose of this report is to provide an overview of the operational scale and trends in Canadian silviculture, particularly reforestation and stand tending, which are seen as key components of forest management aimed at maintaining adequate timber supplies. This report is the third in a series of reports on national silviculture statistics published by the FORSTATS (FORestry STATisticS) program of Forestry Canada (formerly the Canadian Forestry Service). These reports are part of a national FORSTATS effort to provide current information on the status of Canada's forests. Brace and Golec (1982) reported on the 1975–76 to 1979–80 period, and Kuhnke and Brace (1986) covered 1975–76 to 1982–83. In this report, additional data for the 3 years 1983–84 to 1985–86 bring the total reporting period to 11 years. For discussion purposes, the 5–year period 1975–76 to 1979–80 will often be referred to as Period 1, the 3–year period 1980–81 to 1982–83 will be Period 2, and the 3–year period 1983–84 to 1985–86 will be Period 3.

The federal role in forestry comprises research, technology transfer, and funding assistance for reforestation, stand tending, and pest control programs under specific federal–provincial forest development agreements. The practice of silviculture is a provincial responsibility for the majority of publicly owned forest lands in Canada.

The statistics reported herein are by themselves insufficient to determine the adequacy or efficiency of silviculture efforts in the forest management programs of any particular province or territory. Silviculture must be viewed in the larger context of forest accruals and depletions and the overall policy framework of any jurisdiction. *A National Forest Sector Strategy for Canada*, July 1987, states, "Because of the time factor [the lengthy rotations of naturally regenerated stands], specific requirements of industries, and an ever-changing determination of the economic margin for profitable management, rational decisions on the intensity of silviculture necessary to meet management objectives require a systematic and comprehensive economic wood supply analysis for each region and forest area in Canada" (CCFM 1987).

The need for increased silviculture effort in Canada has nonetheless been recognized. Expenditure on silviculture through federal–provincial forestry agreements has increased substantially in recent years; 8064 hectares were treated in 1982–83 and 277 229 ha in 1985–86. Industrial expenditures on silviculture have also risen, from $36.6 million in 1983 to $63.3 million in 1985[1].

METHODS

Data Collection

Data was collected using a questionnaire completed by provincial forestry personnel. Forestry Canada FORSTATS personnel acted in a liaison and coordination role in many regions. The questionnaire (Appendix 1) included an additional section, slightly modified from the one used for the previous report, that made refinement of the basic areal data possible. Collection or estimation of missing data was done in consultation with individual forest management agencies when required. Three provinces (Alberta, Saskatchewan, and Newfoundland) have altered portions of their data sets for the 11–year reporting period as a result of updates and improvements to their data bases. Small discrepancies with data published in provincial reports may occur due to different placements of data by management agencies and the Northern Forestry Centre under the treatment categories used in this report. All data were transferred to a computer data base at the Northern Forestry Centre.

Data Analysis

Canada-wide summary figures of the average areas of harvesting and silviculture treatments for the three reporting periods show the magnitudes and trends in Canadian silviculture. Detailed provincial data are provided in appendixes. Government and industry data were combined for analysis, as were data from public and private lands.

---

[1] Unpublished data provided by G.P. Lapointe, Coordinator, Forest Management Group, Canadian Pulp and Paper Association, Montreal, Quebec.

For each reporting period, site preparation, planting, and direct seeding are given as percentages of current cutover area to provide approximate measures of the magnitude of silviculture relative to that of harvesting. The percentages do not truly reflect the distribution of these treatments, because the treatments were not applied solely within current cutover areas. Division of these silviculture activities among current cutovers, areas requiring repeated treatment, and inadequately restocked backlog areas is not possible. Tables show the breakdown of site preparation area by regeneration method and the regeneration success rates applied to the basic areal data.

RESULTS AND DISCUSSION

Harvesting

Harvesting has increased an average of 61 000 ha (7.5%) between periods 2 and 3 and by 51 000 ha (6.7%) between periods 1 and 2 (Fig. 1). Comparisons between period averages obscure the general decline in area harvested that occurred nationally from 1980–81 to 1983–84 relative to the several years preceding 1980–81 (Appendix 2). British Columbia and Quebec displayed large increases in area harvested (Fig. 1) in Period 3. A 32.1% increase in area harvested occurred nationally over the 11 years covered in this report. In the last 3–year period, clear–cut harvesting accounted for 89.6% of all harvesting, followed by selection harvesting with 6.7%.

Site Preparation

Site preparation has increased a substantial 61 000 ha (30.8%) on average between periods 2 and 3, compared to a 38 500 ha (24.1%) average increase between periods 1 and 2 (Fig. 2). A generally steady increase in the area of site preparation as a percentage of area harvested since 1980–81 is evident (Fig. 3). British Columbia, Ontario, and Quebec displayed large increases in the area of site preparation. In the latter two provinces this has been largely a result of federal–provincial forest development agreements (Appendix 3).

Over the last several years, an increasing percentage of site preparation has been used to increase the survival and growth of planted seedlings rather than seedlings established by direct seeding or natural regeneration. Over 71% of all site preparation performed from 1983–84 to 1985–86 was followed by planting (Table 1) compared to 63.8% from 1980–81 to 1982–83 (Kuhnke and Brace 1986). Almost all planting in Canada received site preparation (Table 1). These figures reflect a growing commitment toward silviculture in Canada as a means of achieving management goals.

The percentage breakdown of site preparation by regeneration methods varies widely across Canada (Table 1). The amount of site preparation used to retreat failure areas is unknown but may be quite high. Data for spruce and pine species for Period 3 (Tables 2 and 3) suggest that roughly 30% of planted areas and 41% of direct seeded areas required re-treatment; many of these areas would require site preparation.

Scarification continues to be the most commonly used form of site preparation (Fig. 4). Data under scarification include a number of mechanical site treatments (principally in British Columbia and Ontario) in which little or no scarification occurs. The use of chemical site preparation to control competing vegetation before or concurrent with planting to ensure adequate survival of planted stock increased 92% between periods 2 and 3 (Fig. 4). Large increases occurred in British Columbia, Ontario, Quebec, and Nova Scotia (Appendix 4). A 55% increase in prescribed burning occurred nationally between these two latest periods.

Planting, Direct Seeding, and Natural Regeneration

Area planted in the latest 3–year period continues the upward trend displayed since 1975–76. Planted area has increased an average of 70 000 ha (41.3%) between periods 2 and 3 compared to a 41 000 ha (31.8%) average increase between periods 1 and 2 (Fig. 5). Large increases have occurred in British Columbia, Ontario, and Quebec. Area planted nationally has more than doubled from 1975–76 to 1985–86.

The area planted as a percentage of the area harvested rose to 27.2% in Period 3, up from 20.7% in Period 2 and 16.8% in Period 1 (Fig. 6). This suggests a trend away from the reliance on natural regeneration that has characterized much of Canadian forestry. Area planted as a percentage of area harvested for the entire 11–year period was 21.0%.

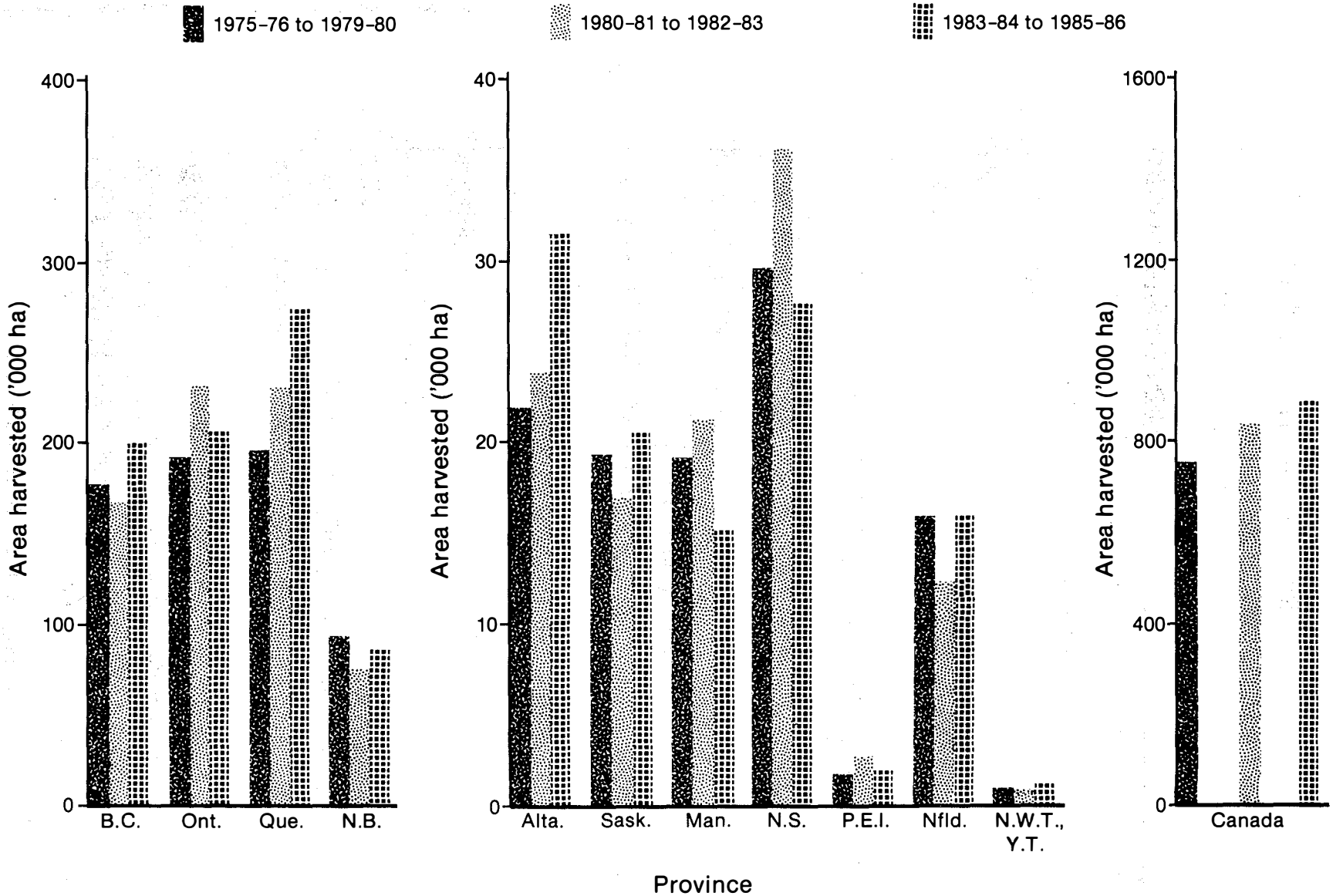

Figure 1. Average area harvested, by period.

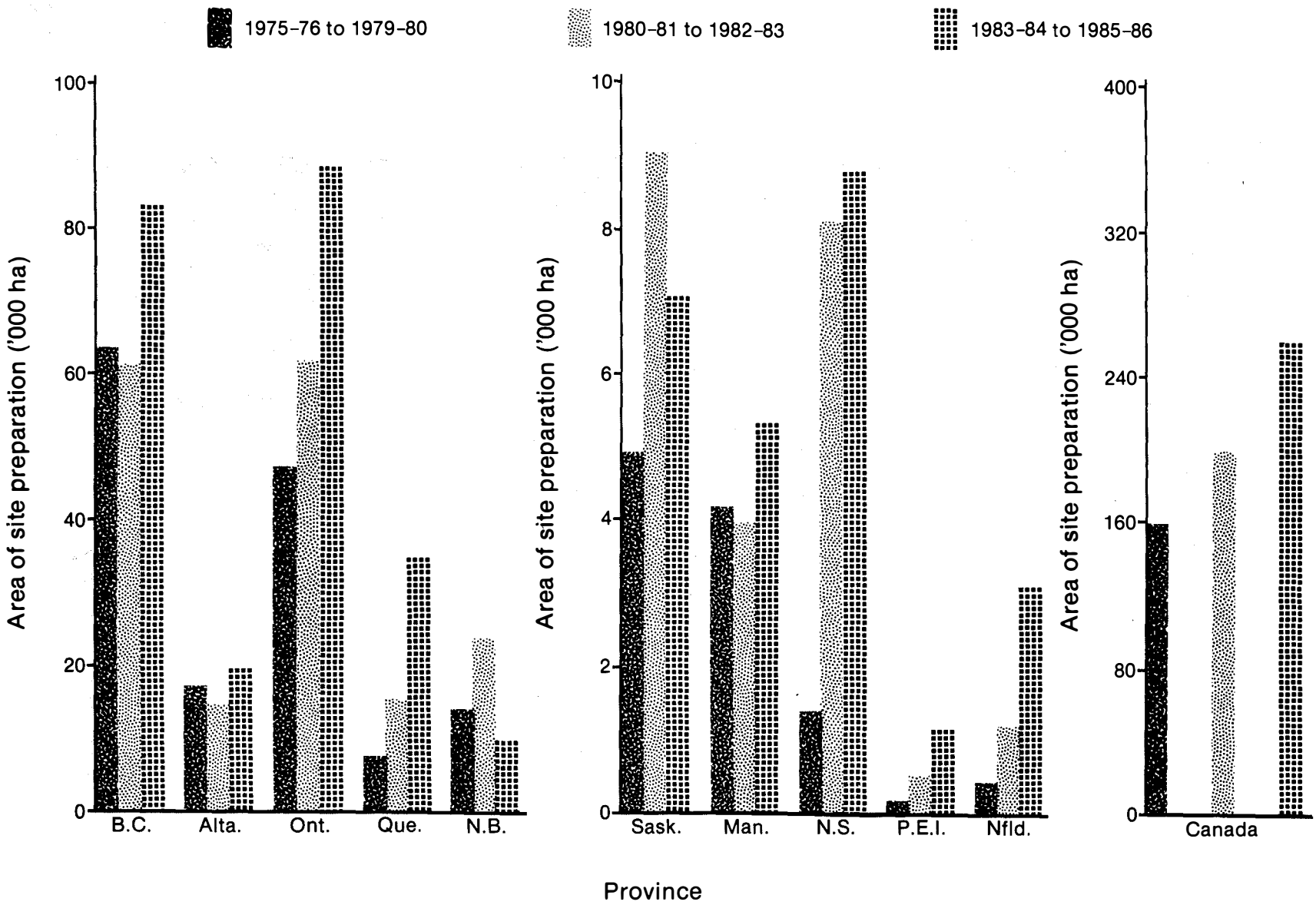

Figure 2. Average area of site preparation, by period.

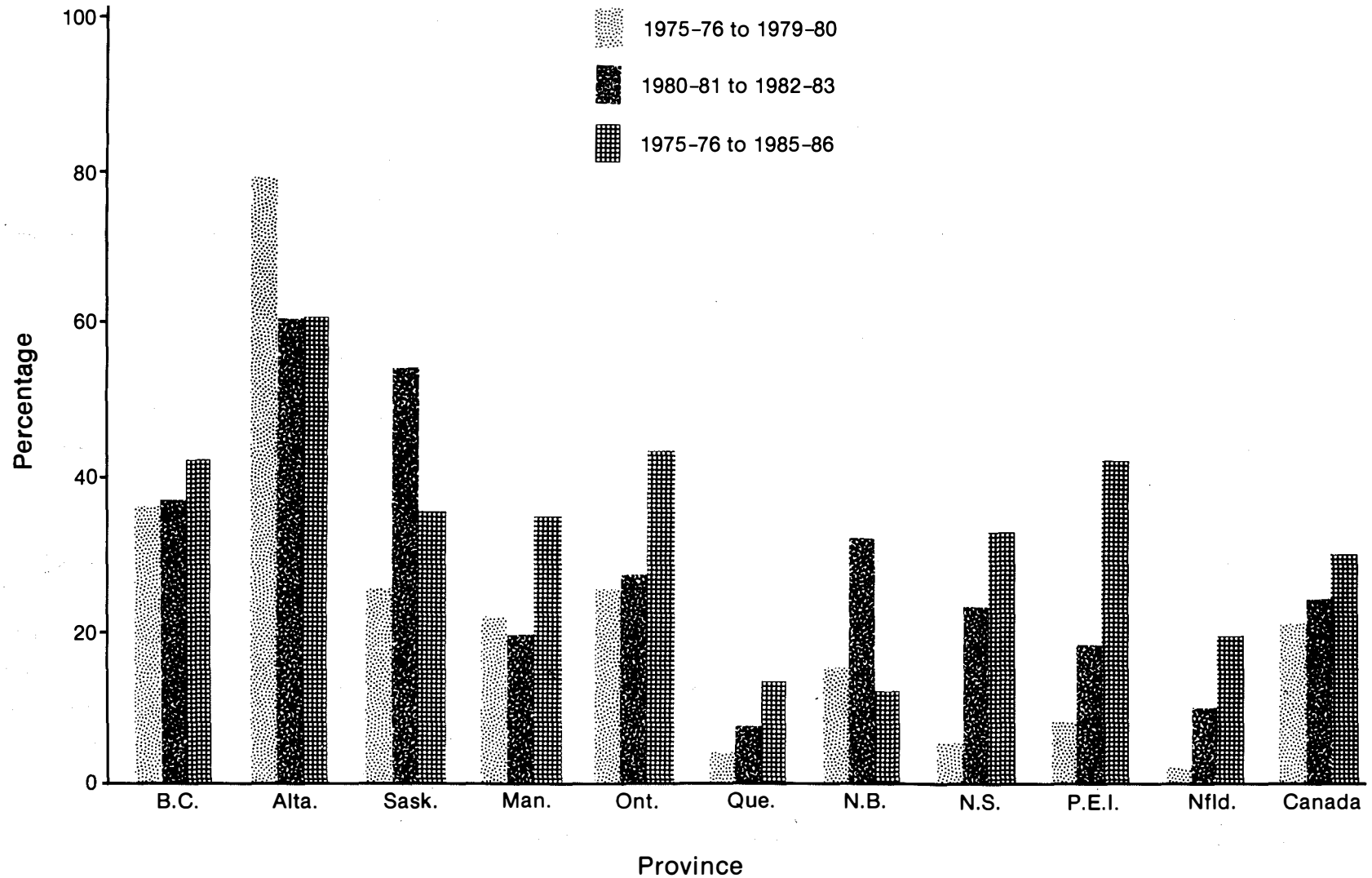

Figure 3. Area of site preparation as a percentage of area harvested, by period.

Table 1. Percentage breakdown of site preparation area by regeneration method, 1983–84 to 1985–86

Province or territory	Total area of site preparation (ha)	Regeneration method used (%)			% area planted that received site preparation	% area direct seeded that received site preparation
		Natural regeneration	Direct seeding	Planting		
British Columbia	249 273	19.0	0.0	81.0	60.0	N/A [a]
Alberta	57 093	20.0	30.0	50.0	75.0	95.0
Saskatchewan	21 213	43.0	0.0	57.0	97.0	N/A
Manitoba	15 851	50.0	0.0	50.0	93.0	– [b]
Ontario	264 027	6.0	43.0	51.0	–	–
Quebec	102 748	0.0	2.0	98.0	100.0	13.0
New Brunswick	29 287	0.0	0.0	100.0	100.0	N/A
Nova Scotia	26 272	0.0	0.0	100.0	100.0	N/A
Prince Edward Island	3 435	0.0	0.0	100.0	95.0	N/A
Newfoundland	9 063	0.0	0.0	100.0	80.0	N/A
Yukon Territory	0	0.0	0.0	0.0	0.0	N/A
Northwest Territories	0	0.0	0.0	0.0	0.0	N/A
Canada	778 262	11.8	17.0	71.2	–	–

[a] Not applicable.
[b] Not available.

Table 2. Percentage of areas planted with spruce or pine expected to become satisfactorily stocked to provincial standards without re-treatment, 1983–84 to 1985–86

Province	Area planted (ha)			Planting success rates (%)		Planted area expected to become satisfactorily stocked (ha)			% total planted area expected to become satisfactorily stocked without re-treatment
	Spruce	Pine	Total spruce and pine	Spruce	Pine	Spruce	Pine	Total spruce and pine	
British Columbia[a]	110 133	62 285	172 418	50.0[b]	80.0	55 067	49 828	104 895	60.8
Alberta[c]	29 954	5 394	35 348	86.9	80.0	26 030	4 315	30 345	85.8
Saskatchewan	12 875	3 629	16 504	66.0	57.0	8 498	2 069	10 567	64.0
Manitoba	4 945	2 752	7 697	70.0	70.0	3 462	1 926	5 388	70.0
Ontario[c]	104 284	68 571	172 855	58.0	78.0	60 484	53 485	113 969	65.9
Quebec	56 223	23 555	79 778	78.0	78.0	43 854	18 373	62 227	78.0
New Brunswick	35 029	22 034	57 063	95.0	95.0	33 278	20 932	54 210	95.0
Nova Scotia	13 014	1 914	14 928	40.0	40.0	5 206	766	5 972	40.0
Prince Edward Island	1 093	486	1 579	88.0	88.0	962	428	1 390	88.0
Newfoundland	6 942	N/A[d]	6 942	100.0	N/A	6 942	N/A	6 942	100.0
Canada	374 492	190 620	565 112	65.1	79.8	243 783	152 122	395 905	70.1

[a] Interior spruce and pine account for 58% of all planting. Other species (Douglas-fir, hemlock, western red cedar, western larch) are not included.
[b] Brushing and weeding required to maintain plantation.
[c] Spruce and pine planting figures derived from nursery shipping figures.
[d] Not applicable; 13 ha of red pine planted in 1984–85.

Table 3. Percentage of areas direct seeded with spruce or pine expected to become satisfactorily stocked to provincial standards without re-treatment, 1983–84 to 1985–86

Province	Area direct seeded (ha)			Direct seeding success rates (%)		Direct seeded area expected to become satisfactorily stocked (ha)			% total direct seeded area expected to become satisfactorily stocked without re-treatment
	Spruce	Pine	Total spruce and pine	Spruce	Pine	Spruce	Pine	Total spruce and pine	
British Columbia[a]	54	313	367	–[b]	–	N/A[c]	N/A	N/A	N/A
Alberta[d]	–	–	23 703	80.0	80.0	–	–	18 962	80.0
Manitoba[e]	433	409	842	–	–	N/A	N/A	N/A	N/A
Ontario	0	56 369	56 369	N/A	48.0	N/A	27 057	27 057	48.0
Quebec	543	15 223	15 767	–	75.0	–	11 417	11 417	75.0[f]
Canada	1 030	72 314	97 048	–	–	–	38 474	57 436	59.2

[a] Direct seeding is currently experimental.
[b] Not available.
[c] Not applicable.
[d] Breakdown into spruce and pine species groups is not available. Direct seeding is often performed with mixtures of lodgepole pine and white spruce.
[e] Insufficient information to provide success rate estimates on direct seeding.
[f] Pine accounts for 96.6% of total direct seeding.

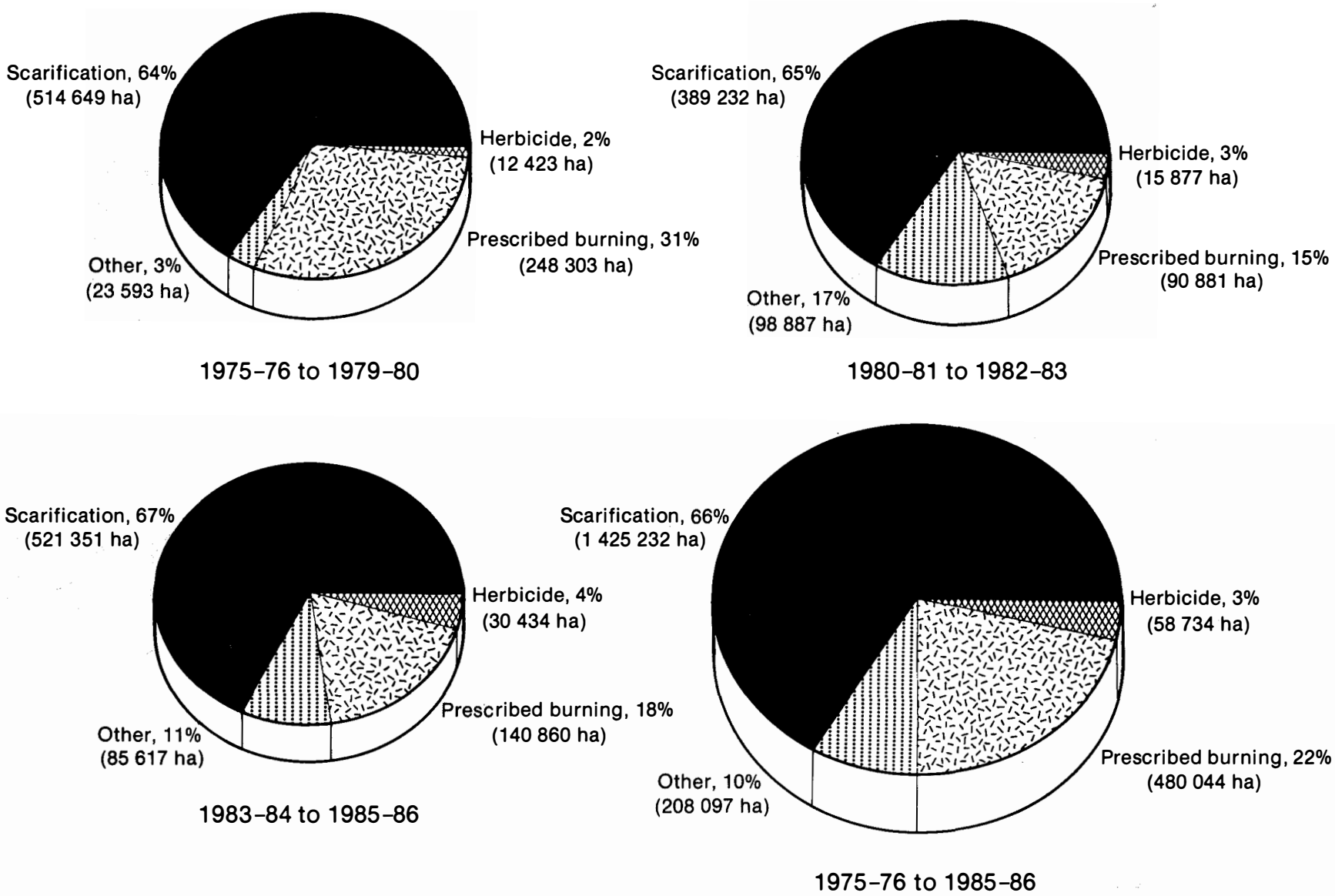

Figure 4. Site preparation methods in Canada, 1975-76 to 1985-86.

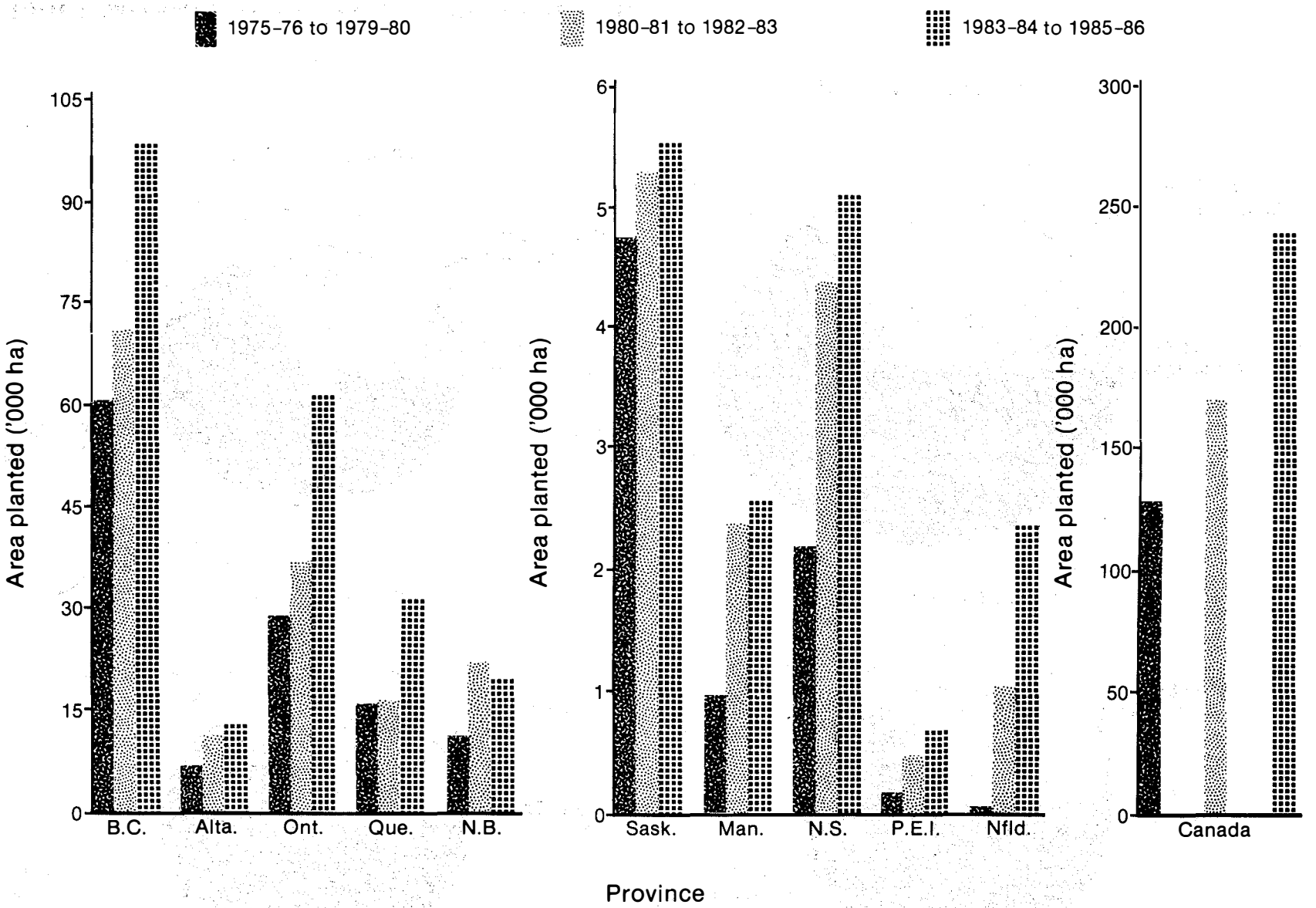

Figure 5. Average area planted, by period.

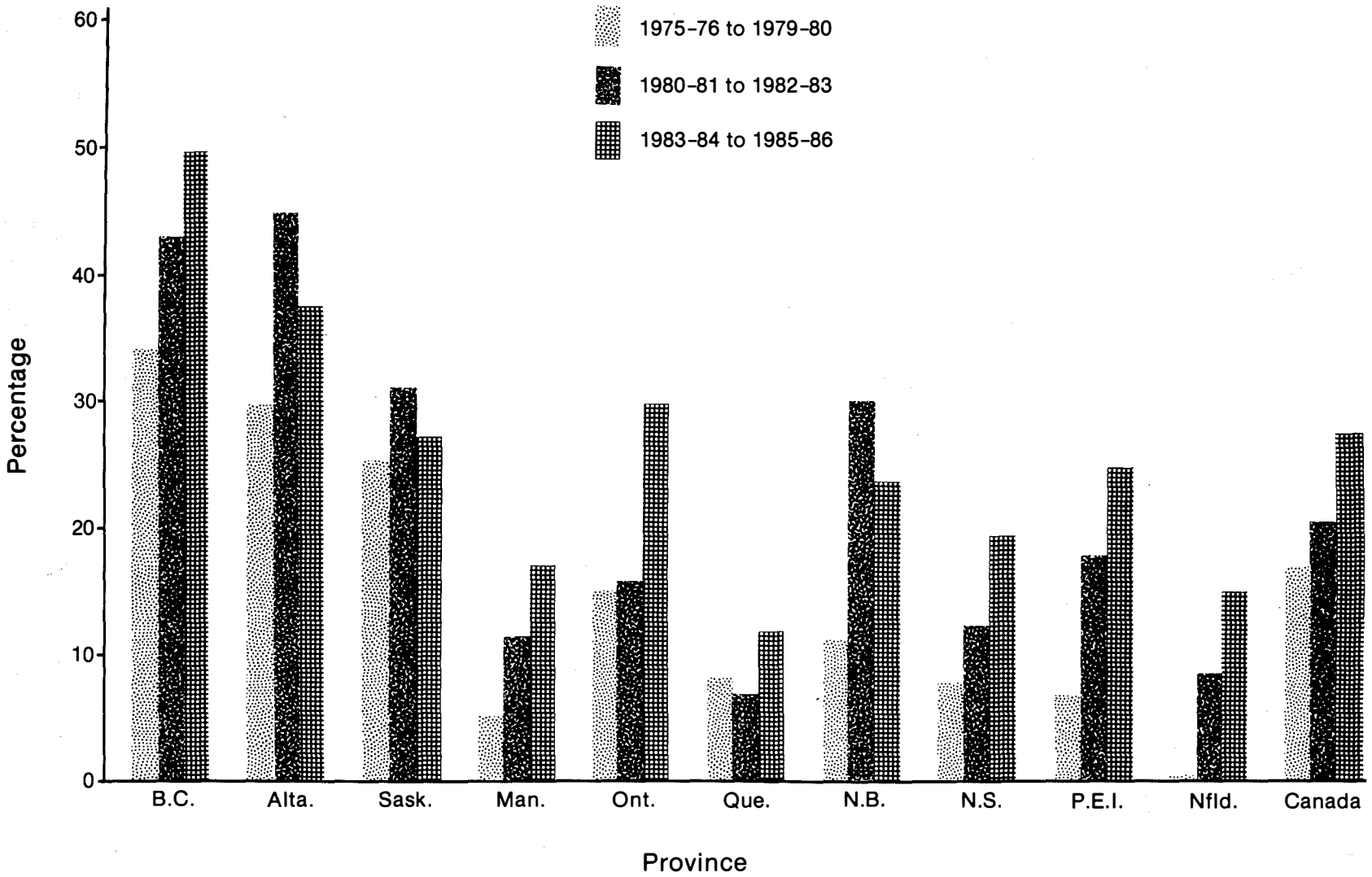

Figure 6. Area planted as a percentage of area harvested, by period.

The proportion of total area planted using container stock rather than bare–root stock has increased relative to the 1980–81 to 1982–83 period. Container stock was used for 53% of the area planted from 1983–84 to 1985–86, an increase of 12% over the previous 3 years.

White spruce is the most commonly planted species in Canada (35.2%), followed by black spruce (21.8%) and jack pine (12.6%); together these species constituted 69.6% of the area planted from 1980–81 to 1985–86 (Table 4). Lodgepole pine is the fourth most planted species in Canada but is prominent only in British Columbia and Alberta.

Direct seeding continues to be practiced mainly in Alberta, Ontario, and Quebec. Nationally, the area direct seeded declined an average of 20 200 ha (38.4%) between 1980–81 to 1982–83 and the latest period (Fig. 7). The area of direct seeding as a percentage of area harvested declined from 6.4% in Period 2 to 3.7% in Period 3 (Fig. 8). When compared to the area harvested in the three provinces that practice large–scale direct seeding, these percentages are 10.7% and 6.3%, respectively.

The relative successes of planting and direct seeding from 1983–84 to 1985–86 are shown in Tables 2 and 3, based on data from pine (*Pinus* spp.) and spruce (*Picea* spp.) with and without site preparation. Most planted areas in Canada received site preparation (Table 1); Alberta was able to provide regeneration success estimates for planting and direct seeding with and without site preparation. Several provinces have adjusted success rates since the last report (Kuhnke and Brace 1986).

Success rates for planting spruce and pine averaged 65.1% and 79.8%, respectively, for an overall success rate of 70.1%. These figures are very similar to earlier figures (Kuhnke and Brace 1986).

The direct–seeding success rate for combined spruce and pine species averages 59.2% (Table 3). This overall success rate exceeds an earlier figure by 6.2% (Kuhnke and Brace 1986) as a result of a more complete set of estimates on direct seeding success.

Relative planting and seeding success rates have considerable impact on the interpretation of planting and direct seeding statistics. Assuming that the above figures represent all species, the application of a 70.1% success rate to Period 3 data reduces area planted as a percentage of area harvested from 27.2% to 19.1%. Similar application of direct seeding success rates lowers the 3.7% of area harvested figure to 2.2%. Such refinements of the silvicultural data base require further confirmation for all species concerned but point out the inadequacy of basic areal data to plan and evaluate the progress of silvicultural programs. It is assumed that none of the current reforestation efforts are applied to past failure areas.

Non–satisfactory regeneration of an area is generally reflected in lowered stocking levels rather than complete failure. It is assumed that success rates were assessed after allowances were made for ingress. Planting is performed an average of 1–5 years after harvest across Canada, and provincial regulations and site–species characteristics are major determinants in the length of time between reforestation and success assessment. A high percentage of reforestation conducted under the federal–provincial forest development agreements is directed at non-satisfactorily reforested, or backlog, lands. The importance of these unproductive lands as a factor in future wood supplies became apparent through dynamic wood supply modeling at the forest level that indicates shortfalls in future wood supplies (Weetman 1987).

Regeneration success rates are separate again from the question of how many plantations, even if successfully established, reach a free–to–grow state without tending. An awareness that regeneration success rates based on stocking or density are inadequate to assess regeneration performance is developing in Canada; mounting evidence casts doubt on the premise that yields of second growth stands will at least equal the yields of the natural stands they replace (Drew 1987; Frisque et al. 1978).

More complete information on the success rates of natural regeneration has raised the overall success rate from the 46.3% estimate made in an earlier report (Kuhnke and Brace 1986) to 50.1% (Table 5). The data in Table 5 are broad averages encompassing natural regeneration with and without site preparation and several species of spruce and pine within each group. Balsam fir largely replaces the pine species group in several provinces.

Stand Tending

Stand tending has increased dramatically over the 11–year reporting period (Fig. 9). Stand tending increased an average of 55 000 ha (46.6%) between periods 2 and 3 and 55 000 ha (82%) between periods 1 and 2. Ontario and the Maritimes show the largest

Table 4. Area planted by species, 1980–81 to 1985–86

Species	Area planted (ha)										
	British Columbia	Alberta[a]	Saskatchewan	Manitoba[b]	Ontario[a]	Quebec	New Brunswick	Nova Scotia	Prince Edward Island	Newfoundland	Canada
Western red cedar	11 978	0	0	0	0	0	0	0	0	0	11 978
Eastern white cedar	0	0	0	0	7 980	0	0	0	0	0	7 980
Douglas-fir	78 454[c]	0	0	0	0	0	0	0	0	0	78 454
Balsam fir	0	0	0	0	0	6 254	0	319	203	0	6 776
Other fir	13 502[d]	0	0	0	0	0	0	0	0	0	13 502
Hemlock	19 187[e]	0	0	0	0	0	0	0	0	0	19 187
Tamarack	0	0	0	0	0	1 792	0	136	0	0	1 928
Other larch	1 883[f]	0	0	57	816[g]	475[h]	1 147	468[i]	298	70	5 214
Austrian pine	0	0	0	0	0	120	0	0	39	0	159
Jack pine	0	0	11 329	4 318	68 190	30 228	39 075	447	187	0	153 774
Lodgepole pine	97 915	9 584	0	0	0	282	0	0	0	0	107 781
Red pine	0	0	0	1 990	13 280	4 225	1 169	3 960	426	13	25063
Scots pine	0	0	0	368	2 270	850	0	0	0	0	3 488
Eastern white pine	0	0	0	0	23 040	1 698	0	413	44	0	25 195
Black spruce	0	0	0	4 816	126 795	42 505	70 508	11 129	1 562	9 662	266 977
Norway spruce	0	0	0	0	845	14 901	0	2 264	0	0	18 010
Red spruce	0	0	0	0	0	5 848	0	6 089	0	0	11 937
Sitka spruce	11 424	0	0	0	0	0	0	0	0	0	11 424
White spruce	272 813[j]	57 864	20 890	3 247	37 342	22 081	11 781	3 385	545	288	430 236
Other conifers	514[k]	0	0	0	3 990	0	0	0	4[l]	0	4 508
Misc. species[m]	1 605	0	131	0	6 730	9 794	1 781	5	81	7	20 134
Total	509 275	67 448	32 350	14 796	291 278	141 053	125 461	28 615	3 389	10 040	1 223 705

[a] Planting by species figures derived from nursery shipping figures.
[b] Planting by species figures for 1980–81 to 1982–83 derived from nursery shipping figures.
[c] Interior and coastal.
[d] Amabilis and grand fir.
[e] Western and mountain hemlock.
[f] Western larch.
[g] Tamarack and exotic larch species.
[h] European larch (281 ha) and Japanese larch (194 ha).
[i] Includes 46 ha of European larch and 152 ha of Japanese larch.
[j] Includes Engelmann spruce.
[k] Yellow cypress.
[l] Eastern red cedar.
[m] Includes hardwoods.

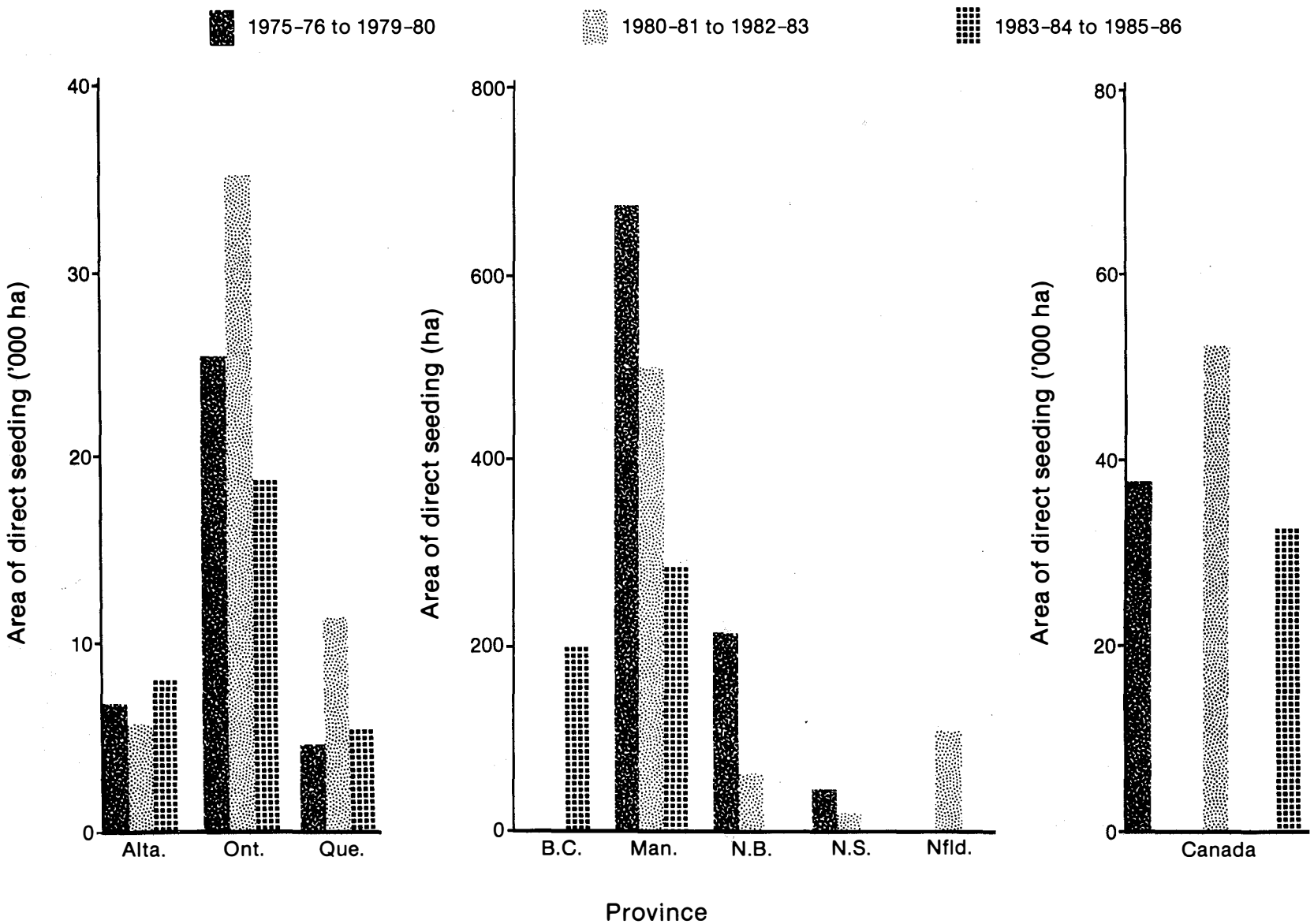

Figure 7. Average area of direct seeding, by period.

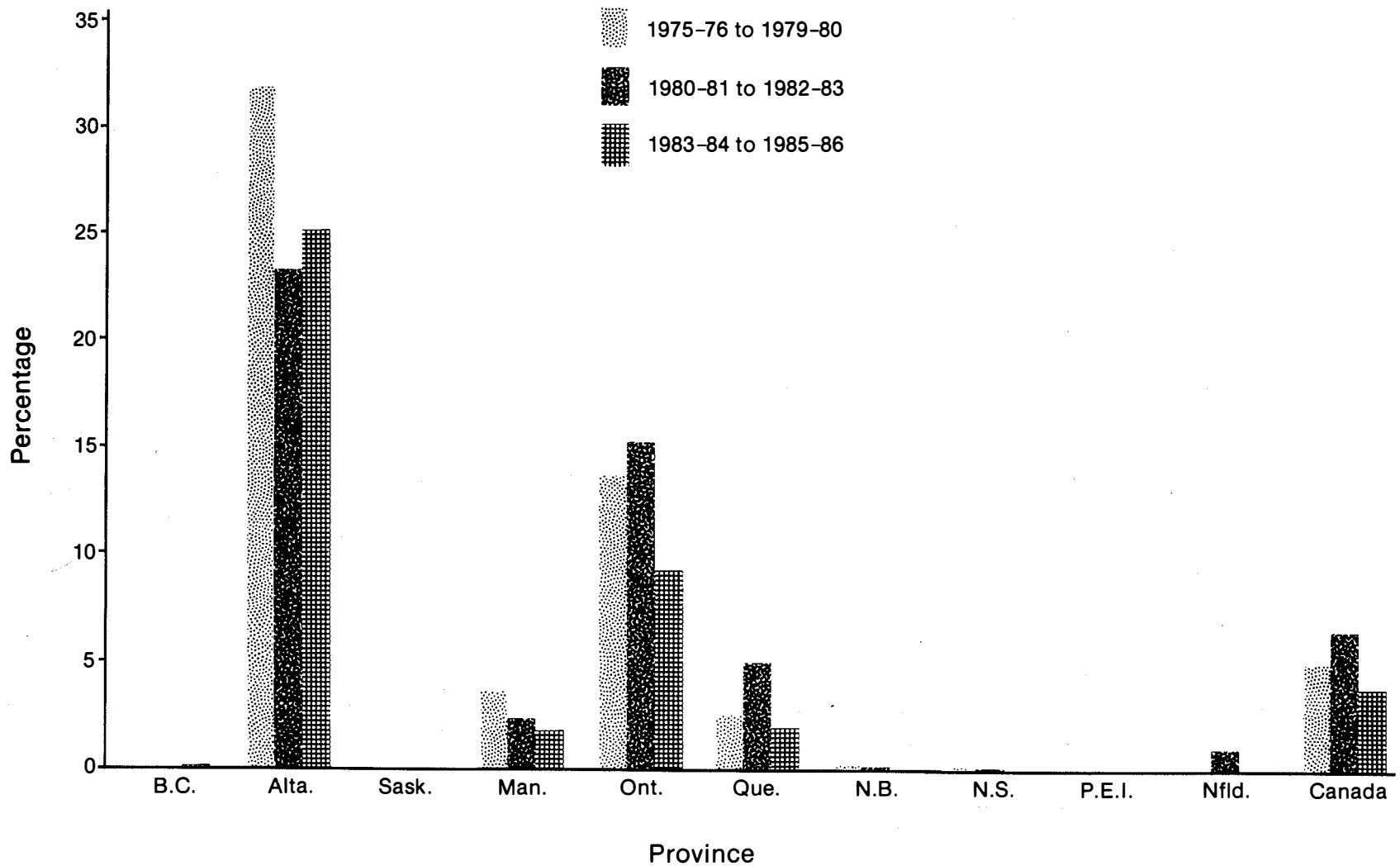

Figure 8. Area of direct seeding as a percentage of area harvested, by period. Note: Area of direct seeding in B.C., Sask., N.B., N.S., P.E.I., and Nfld. is less than 1% of area harvested.

Table 5. Percentage of harvested lands estimated to become satisfactorily stocked to provincial standards through natural regeneration, 1983–84 to 1985–86

Province	Harvested area by species group (ha)			Success rates (%)		Area of successful regeneration (ha)			Average natural regeneration success rate (%)
	Spruce	Pine	Spruce and pine	Spruce	Pine	Spruce	Pine	Spruce and pine	
British Columbia[a]	171 550	167 192	338 742	20.0	70.0	34 310	117 034	151 344	44.7
Alberta[b]	45 040	37 560	82 600	23.0	54.7	10 359	20 545	30 904	37.4
Saskatchewan	36 822	19 353	56 175	10.0[c]	65.6	3 682	12 703	16 385	29.2
Manitoba[b]	24 400	19 920	44 320	5.9	7.7	1 438	1 530	2 968	6.7
Ontario[d]	275 975	177 316	453 291	50.0	46.0	137 988	81 565	219 553	48.4
Quebec[b]	394 850	267 315[e]	662 165	50.0	66.7[f]	197 425	178 348	375 773	56.7
New Brunswick	113 922	95 493[g]	209 415	50.0	50.0[h]	56 961	47 746	104 707	50.0
Nova Scotia[b]	40 665	26 914[i]	67 579	67.0	67.0	27 245	18 033	45 278	67.0
Prince Edward Island	2 594	572[j]	3 166	27.0	58.0[k]	700	332	1 032	32.6
Newfoundland	16 765	31 135[j]	47 900	65.0	85.0[j]	10 897	26 465	37 362	78.0
Canada	1 122 583	842 770	1 965 353	42.8	59.8	481 005	504 301	985 306	50.1

[a] Spruce and pine accounted for 47.3% of total harvest.
[b] Harvest by species not available. Inventory species composition data was used to approximate harvesting by species.
[c] Success rate without site preparation. All spruce sites that receive scarification are planted.
[d] Spruce and pine accounted for 73% of total harvest.
[e] Mostly balsam fir; includes 50 720 ha of pine.
[f] A 10% success rate for pine; 80% success rate for balsam fir.
[g] Mostly balsam fir; 11.6% pine.
[h] Pine and fir.
[i] Mostly balsam fir; 24.5% pine.
[j] Balsam fir.
[k] Spruce and balsam fir.

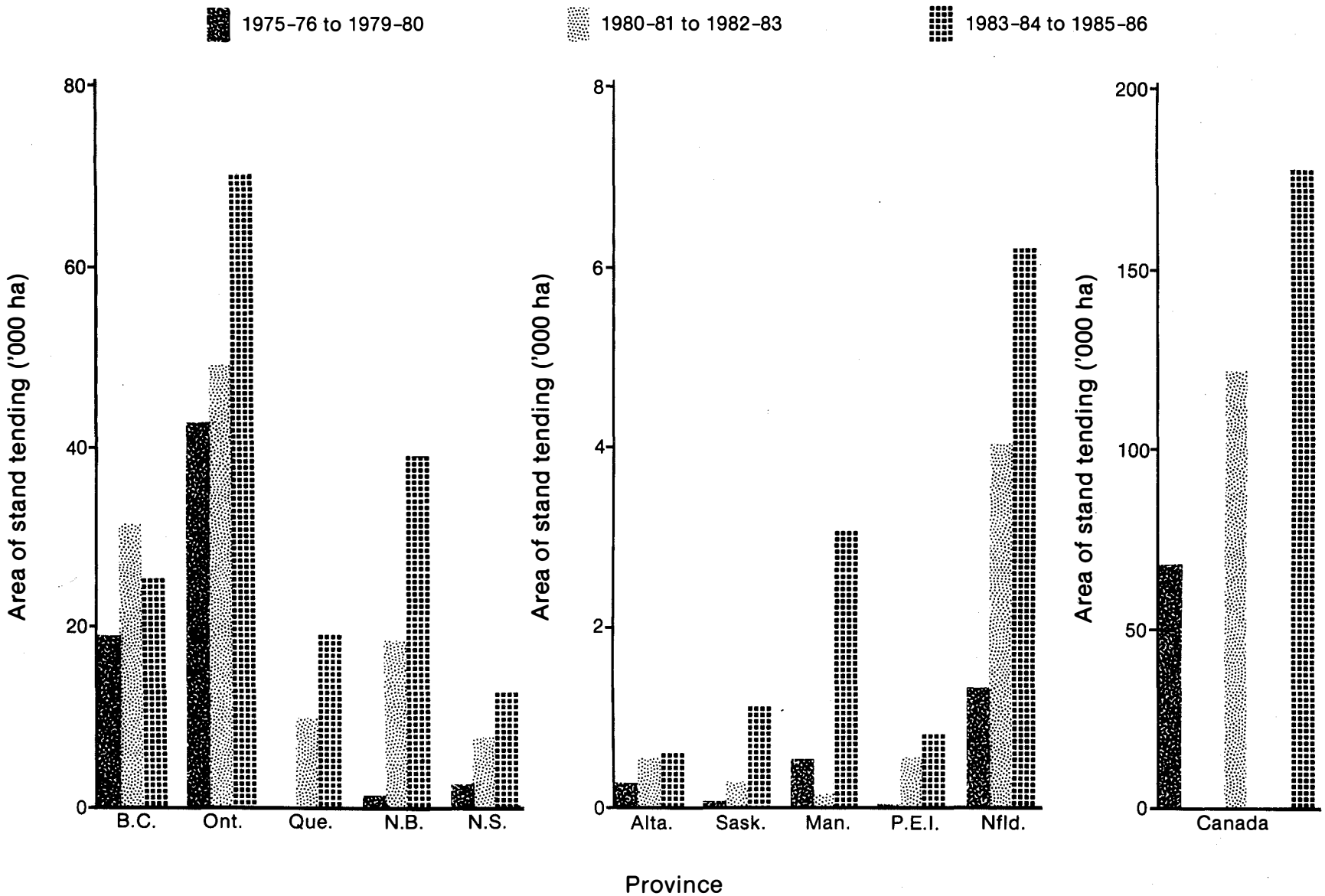

Figure 9. Average area of all methods of stand tending, by period.

increases. Some of the increase in stand tending has been a result of the federal–provincial forest development agreements (Appendix 3). The accelerated growth resulting from stand tending treatments is expected to contribute significantly to alleviate impending economic wood supply shortages in many localized areas of the nation. Several provinces provided estimates on the percentage volume increases afforded by thinning; the range is 25–40%. Stand tending also offers a comparatively rapid return on investment (as opposed to reforestation). Most stand tending appears to be performed on second–growth forests (Table 6).

Stand tending data consist of information on fertilizing, thinning, pruning, and weeding by manual, mechanical, and chemical means. The area of fertilization dropped 96.4% between the 1980–81 to 1982–83 and 1983–84 to 1985–86 periods. Thinning and chemical weeding by ground or aerial application made up approximately 83% of all stand tending during both periods 2 and 3 (Fig. 10). Chemical weeding (the suppression of competing vegetation or the release of conifer understories) shows the largest percentage increases of all stand tending methods. Chemical weeding increased nationally from 38.8% of all stand tending during 1980–81 to 1982–83 to 57.8% in the latest period (Fig. 10). The need to produce timber supplies within economic constraints has placed greater emphasis on the role of herbicides to ensure that regenerated stands reach a free–to–grow state. Herbicide use increased 735% between periods 2 and 3 in British Columbia; however, this large increase brought the total area treated in Period 3 to only 27 741 ha. Increases of 232% and 171% occurred in Nova Scotia and New Brunswick between the same periods. New Brunswick had the largest absolute increase in area of chemical weeding (64 627 ha) followed by Ontario (49 350 ha).

Pest Control

There has been a decline in the area of pest control since 1982–83 (Table 7). It dropped 43.4% during Period 3, largely due to declines in the area of spruce budworm control in Quebec and New Brunswick. Mountain pine beetle and dwarf mistletoe are the major forest pests in British Columbia. The area of infestation of mountain pine beetle in that province declined from more than 462 000 ha in 1983 to approximately 300 000 ha in 1985. Control measures against the mountain pine beetle are also continuing in Alberta but at a much reduced scale since the peak outbreaks from 1980 to 1982, during which the area of pest control encompassed 32 000 ha. Table 7 does not include areas of mountain pine beetle control for either province because the scattered cut and burn control programs, quite different from the blanket aerial spraying control programs conducted in other parts of the country, are rarely monitored in terms of area treated. Jack pine budworm is the major pest in Manitoba and Saskatchewan. Substantial control measures have begun in Newfoundland against the spruce budworm and the hemlock looper.

SUMMARY AND CONCLUSIONS

The data indicates that Canada's silvicultural performance is increasing in terms of absolute quantity and relative to the area harvested (Figs. 11–13), suggesting a continuing trend toward more intensive management of our forests and away from the extensive management that has characterized much of Canadian forestry.

These increases are in part attributable to federal–provincial forest development agreements, which contributed $102 million to treat 405 000 ha of land from 1982–83 to 1985–86. Artificial regeneration and stand tending account for 31% and 28% of the area treated. It is uncertain whether these agreements will be renewed when they expire around the end of the decade. Industrial silviculture will assume a greater role in Canada as industry–government Crown land leasehold agreements continue to evolve.

Site preparation in Canada increased to 29.6% of the area harvested in the latest period compared to 24.3% in Period 2 (Fig. 13). Scarification continues to be the most commonly used technique (67%), followed by prescribed burning (18%). Chemical site preparation has almost doubled between periods 2 and 3 although it is a small fraction (4%) of all site preparation.

For Canada as a whole, 71.2% of all site preparation was used for planting, 17.0% for direct seeding, and only 11.8% for enhancement of natural regeneration. Compared to earlier estimates (Kuhnke and Brace 1986), the current figures indicate increased

Table 6. Percentage of stand treatments on natural and second-growth forests, 1983–84 to 1985–86

Province	Type of stand treatment[a]	Second-growth forest (%)		Natural forest (%)
		Naturally regenerated	Artificially regenerated	
Alberta	Fertilization	100	0	0
	Thinning	0	90	10
	Mechanical weeding	0	100	0
	Chemical weeding	0	100	0
Saskatchewan	Thinning	100	0	0
	Mechanical weeding	0	100	0
Manitoba	Thinning	40	60	0
	Chemical weeding	30	70	0
Quebec	Fertilization	100	0	0
	Thinning	100	0	0
	Mechanical weeding	100	0	0
	Chemical weeding	100	0	0
New Brunswick	Thinning	20	0	80
	Mechanical weeding	0	0	100
	Chemical weeding	0	0	100
Nova Scotia	Thinning	100	0	0
	Mechanical weeding	10	90	0
	Chemical weeding	20	80	0
Prince Edward Island	Mechanical weeding	0	100	0
	Chemical weeding	0	100	0
Newfoundland	Fertilization	100	0	0
	Mechanical weeding	100	0	0
	Chemical weeding	50	50	0

[a] These may not be the only treatments performed. Data for stand treatments not shown here are not available.

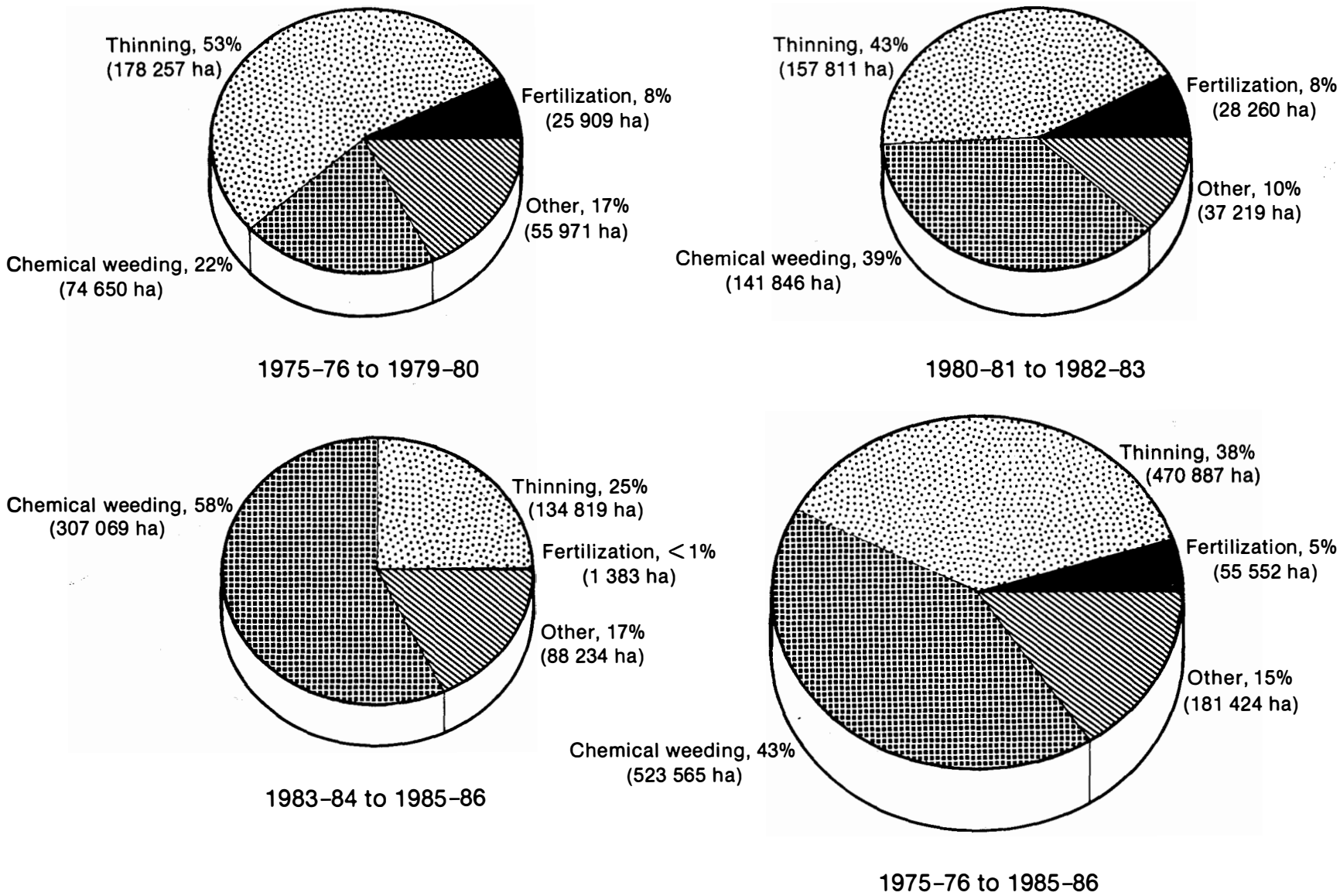

Figure 10. Stand tending methods in Canada, 1975–76 to 1985–86. Note: 'Other' comprises largely manual and mechanical weeding and includes pruning, which is not more than 26% of 'Other'.

Table 7. Area of pest control

Province or territory	Area of pest control (ha)											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia[a]	1 785	2 667	2 384	2 908	2 287	1 564	3 830	0	2 374	3 948	3 488	27 235
Alberta	0	0	0	0	0	0	0	0	0	0	0	0[b]
Saskatchewan	0	0	0	0	0	0	0	0	12	434	0	446
Manitoba	0	0	0	0	0	0	0	0	0	428	760	1 188
Ontario	14 167	41 060	10 522	4 085	22 072	36 422[c]	2 477	28 685	43 770	47 280	10 339	280 879
Quebec	(2 800 000)[d]	(2 900 000)	(1 400 000)	(1 200 000)	(600 000)	188 511	705 164	1 298 495	1 253 605	712 282	698 343	13 756 400
New Brunswick	2 695 000	3 881 000	1 682 000	1 554 000	1 598 000	1 900 000	1 693 000	1 867 570	1 245 000	32 000	545 000	19 392 570
Nova Scotia	0	0	556	25 670	30 752	25 670	31 195	19 153	20 726	20 537	49 719	223 978
Prince Edward Island	0	0	0	0	0	0	0	0	0	0	0	0
Newfoundland	0	0	76 910	376 600	0	0	0	0	0	0	145 086	598 596
Yukon Territory	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Territories	0	0	0	0	0	0	0	0	0	0	0	0
Canada	5 510 952	6 824 727	3 172 372	3 163 263	2 253 111	2 152 167	2 455 666	3 213 903	2 565 487	1 516 909	1 452 735	34 281 292

[a] Mainly dwarf mistletoe control, sanitation treatments, and spraying against western spruce budworm that began in 1983–84 using *Bacillus thuringiensis*.
[b] Does not include the control program started in 1979 against the mountain pine beetle that was conducted over an area of 32 000 ha.
[c] All figures from 1980–81 to 1985–86 include insecticides and herbicides. Figures in Kuhnke and Brace (1986) for 1981–82 and 1982–83 were areas of aerial insecticide spraying only.
[d] Numbers in brackets are estimates.

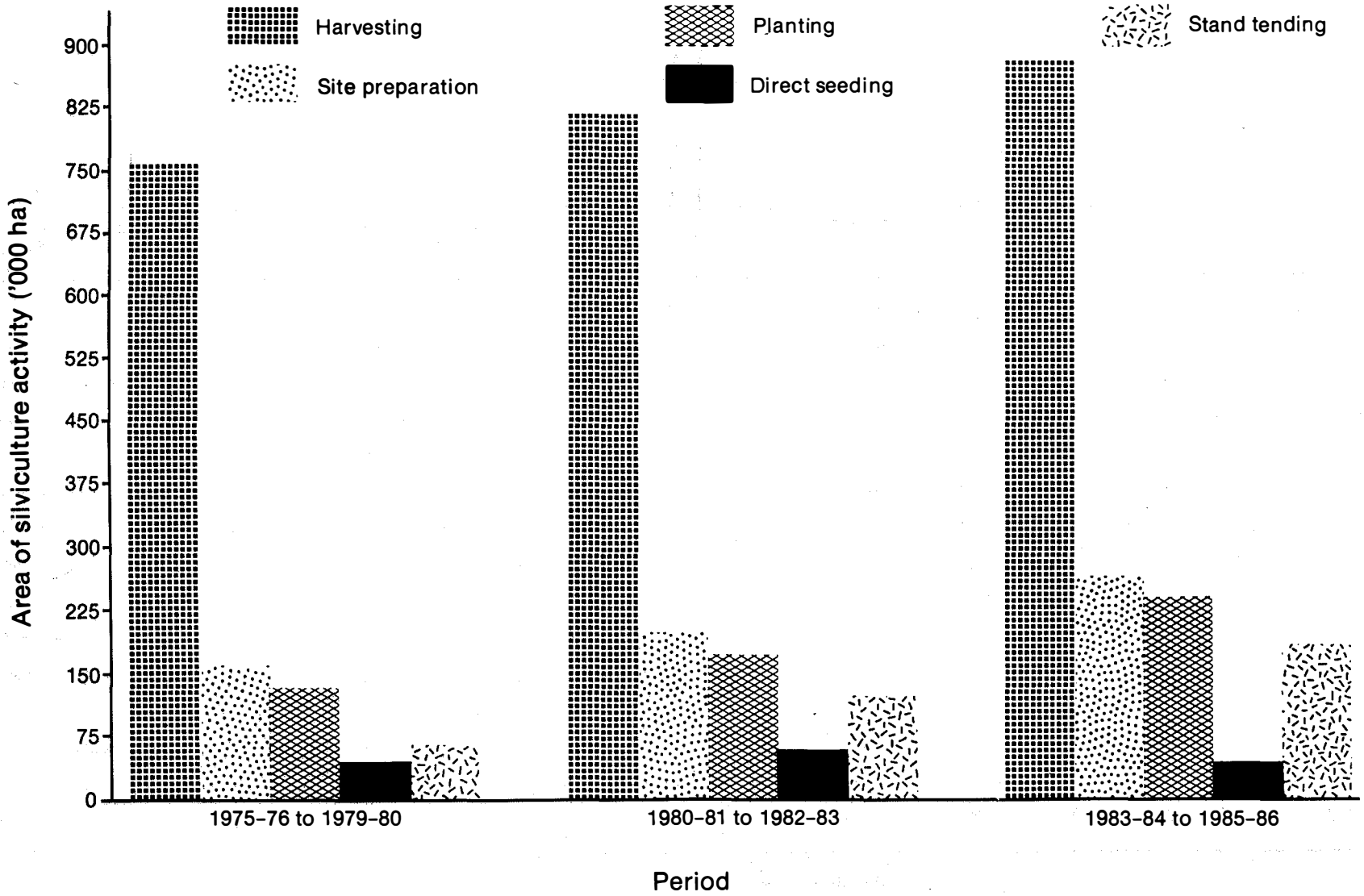

Figure 11. Average area of silviculture activity for Canada, by period.

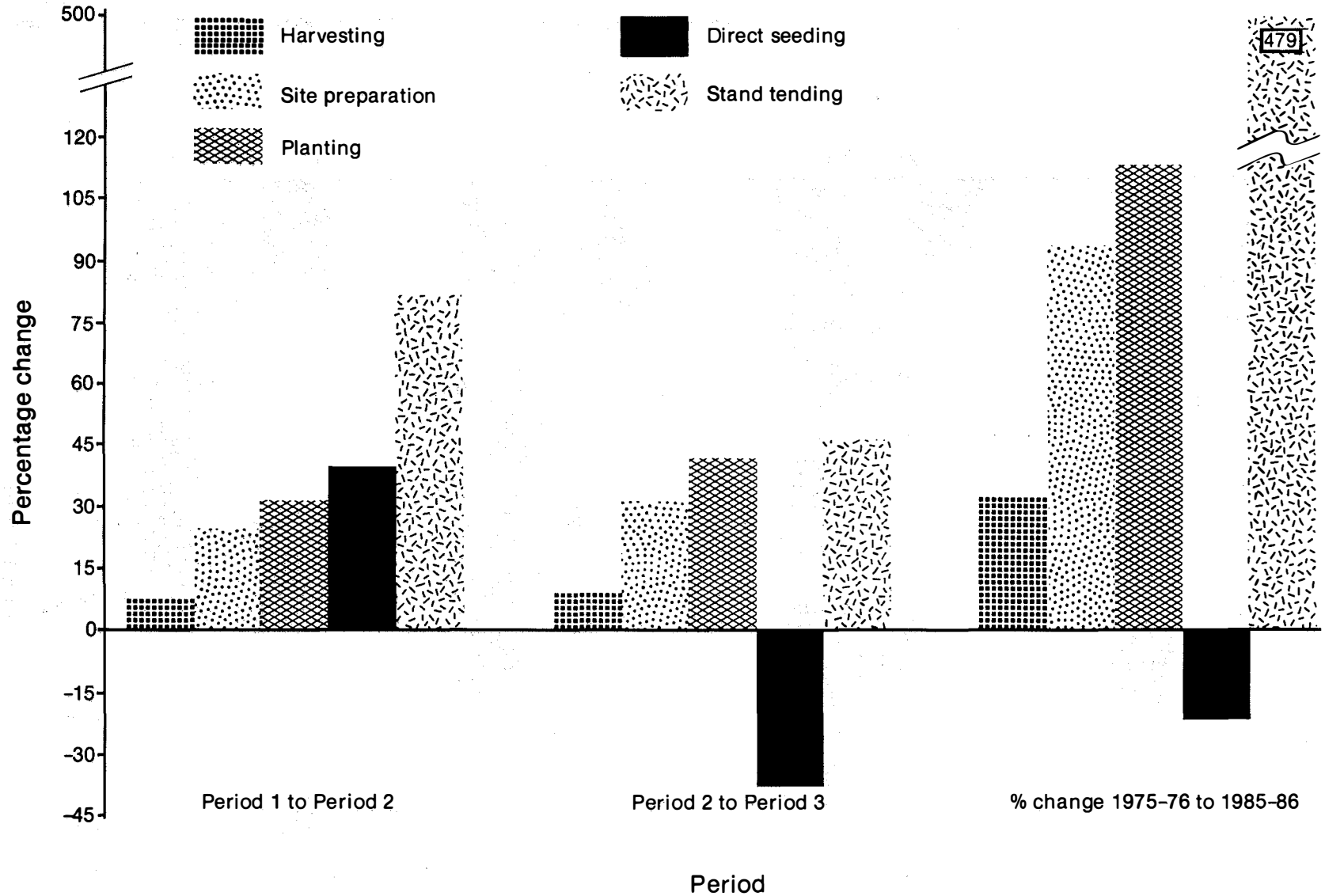

Figure 12. Percentage change in silviculture activity between period averages for Canada (Period 1 = 1975-76 to 1979-80; Period 2 = 1980-81 to 1982-83; Period 3 = 1983-84 to 1985-86).

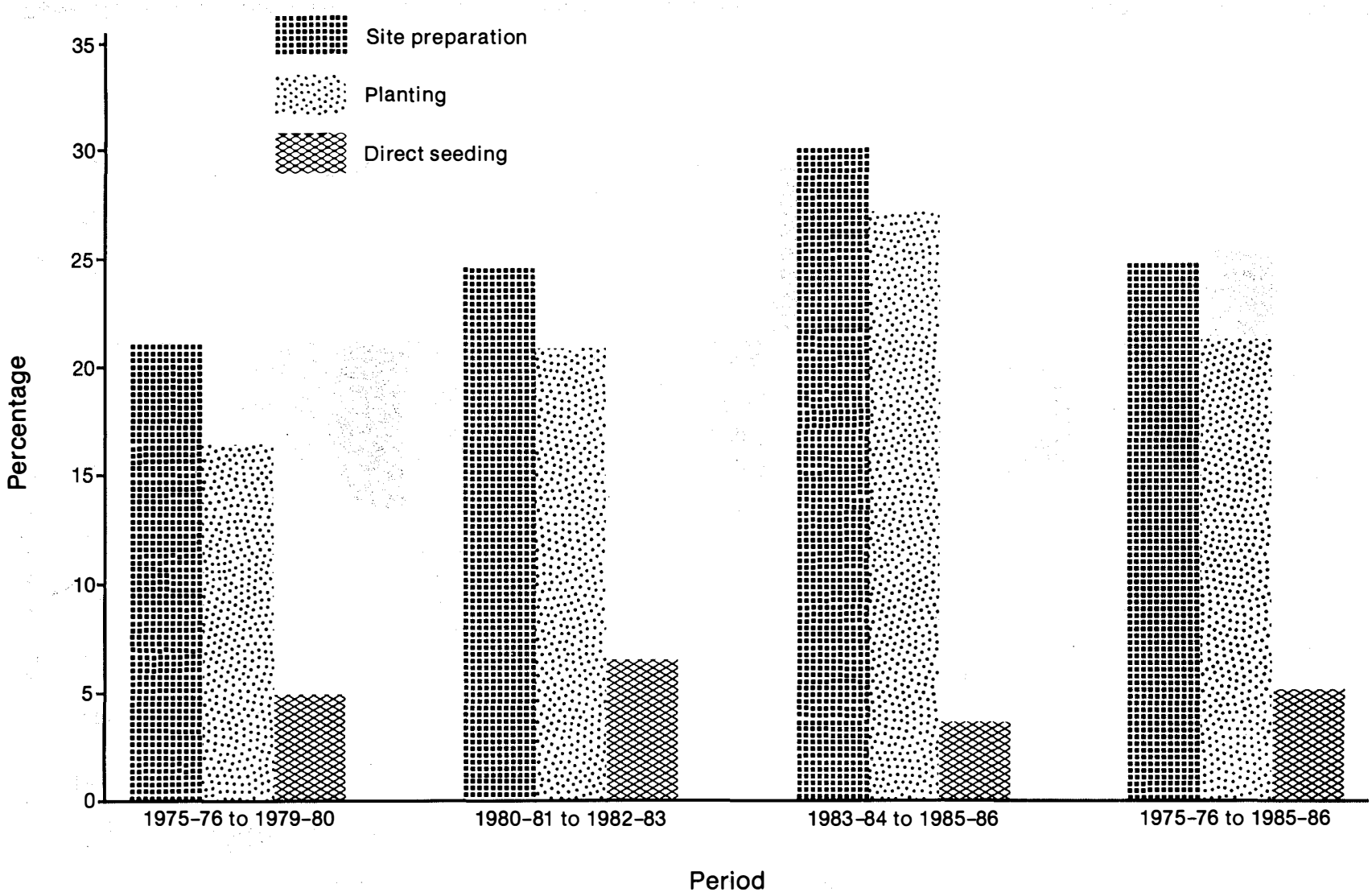

Figure 13. Silviculture percentages relative to area harvested for Canada, by period.

emphasis on ensuring the viability of silvicultural investments. Most planting in Canada receives site preparation. Data is not available to indicate the amount of site preparation used for treatment of failure areas, though it may be high, judging from the success rates of planting and direct seeding operations.

Area planted shows substantial increases throughout the whole reporting period, including increases relative to the area harvested (Figs. 11–13). Direct seeding appears to be losing popularity; its use has declined an average of 38.4% since the 1980–81 to 1982–83 period. The estimated overall success rate of natural regeneration has risen by 3.8% from an earlier estimate to 50.1% of the current cutover, largely as a result of more complete information.

Assuming complete success in planting and direct seeding operations, regeneration by planting, direct seeding, and natural regeneration totals 76.0% of the 11–year cutover area. Applying the appropriate national average success rates to planting and direct seeding lowers the percentage of the average cutover area that is adequately reforested to 67.7%. Fully 73.9% of the successful reforestation in Canada is attributable to natural regeneration. Figure 14 indicates that despite increased silviculture, little encroachment on the gap between area harvested and area successfully regenerated has occurred over the 11–year reporting period. The area not adequately regenerated by natural regeneration has exceeded the area of successful planting and direct seeding. The effects of this gap on economic wood supplies can be lessened to some extent through planting and direct seeding of high productivity sites in close proximity to industrial processing facilities.

Stand tending has increased more than any other silvicultural activity over the 11–year period (Fig. 12), increasing an average of 45.6% between periods 2 and 3 and 479% over the entire 11–year reporting period.

Thinning and chemical weeding made up 83% of all stand tending from 1983–84 to 1985–86. Chemical weeding shows the largest percentage increases of all stand tending methods. Large percentage increases in chemical weeding occurred in British Columbia, Nova Scotia, and New Brunswick.

The importance of stand tending in ensuring that successful plantations reach a free–to–grow state to realize optimum volumes for future timber supplies is becoming increasingly apparent in Canadian forestry. Surveys of cutover areas that were deemed satisfactorily stocked 5–10 years ago in Alberta indicate that up to 38% of these areas are no longer satisfactorily stocked according to provincial standards and over 50% of the areas have excessive densities (Drew 1987). Stocking standards establish acceptable degrees of site occupancy but neglect the effects of site quality and competition on growth and development of a stand (Frisque et al. 1978).

With almost 32% of the current cutover area reverting to an inadequately reforested state, further increases in silviculture, particularly in stand tending, may be necessary. As these data are a subset of forestry data covering all depletions and accruals in the forest estate, the statistics herein provide only a general overview of silvicultural practices in Canada. They are not meant to address questions of the overall adequacy or efficiency of silviculture as a component of forest management.

ACKNOWLEDGMENTS

The author wishes to thank the staffs of each of the provincial and territorial agencies in Canada for their cooperation in providing data used in this report and members of the Forestry Canada's FORSTATS Committee for assistance in obtaining data. Appreciation is extended to the following persons in particular: Chuck Macklin, FORSTATS, Pacific Forestry Centre; Robin Brown and Ralph Winter, British Columbia Ministry of Forests and Lands; T. John Drew and Lindsay Kerchoff, Alberta Department of Forestry, Lands, and Wildlife; Murray Little, Jamie Benson, and J.B. Smith, Saskatchewan Department of Parks, Recreation and Culture; Jack Smyth and Kathy Campbell, FORSTATS, Great Lakes Forestry Centre; Gilbert Aubin and Gilles Poulin, FORSTATS, Laurentian Forestry Centre; Yvon Martin, Ministère de l'Energie et des Ressources de Quebéc; Thom Erdle, New Brunswick Department of Natural Resources; Francois Julien, FORSTATS, Forestry Canada—Maritimes; Edward Bailey and Peter Neely, Nova Scotia Department of Lands and Forests; Bill Glen, Prince Edward Island Department of Energy and Forestry; George Ross and Len Moores, Newfoundland Department of Forest Resources and Lands; W. McJannet, Yukon Forestry Service; and Chris Carlysle, Northern Affairs Program, Renewable Resources.

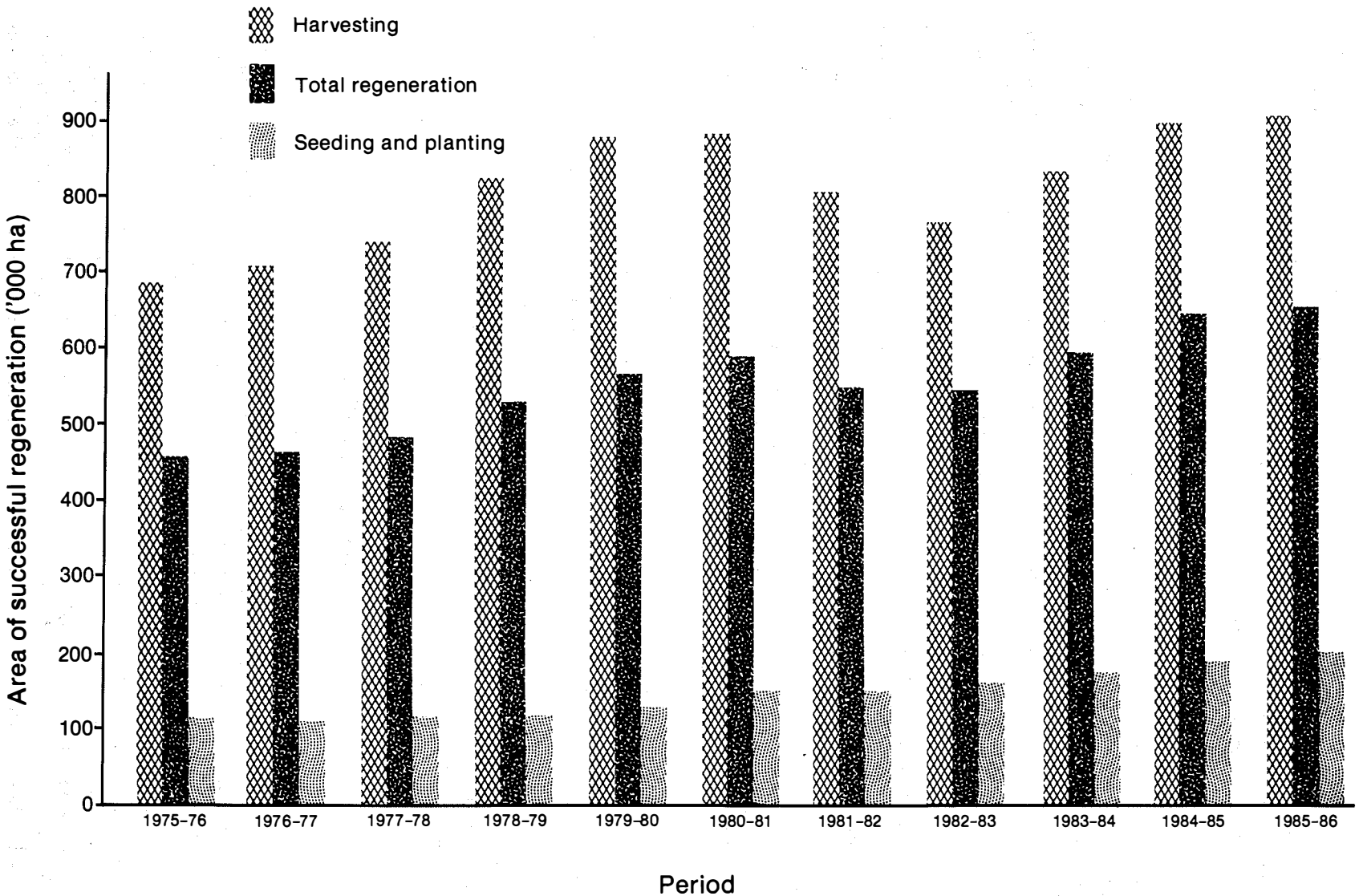

Figure 14. Area of successful regeneration relative to area harvested for Canada, 1975-76 to 1985-86 (based on 1983-84 to 1985-86 national average success rates).

The author also wishes to acknowledge the contributions of the reviewers of this report. These include Robin Brown, British Columbia Ministry of Forests and Lands; T. John Drew, Alberta Department of Forestry, Lands and Wildlife; Jack Smyth, FORSTATS, Great Lakes Forestry Centre; Diana Boylen, Northern Forestry Centre, and T.B. Williamson, Northern Forestry Centre.

Special recognition is due to the Northern Forestry Centre editors, Brenda Boughton and Judy Samoil, and to Russ Bohning, also of the Northern Forestry Centre, for his assistance in photo selection.

REFERENCES

Brace, L.G.; Golec, P.J. 1982. Silviculture statistics for Canada, 1975–80. Environ. Can., Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-245.

Brace, L.G.; Golec, P.J. 1983. Statistiques sylvicoles canadiennes, 1975–80. Environ. Can., Serv. can. for., Cent. rech. for. Nord., Edmonton, Alberta. Rapp. inf. NOR-X-245F.

CCFM (Canadian Council of Forest Ministers). 1987. A national forest sector strategy for Canada. Ottawa, Ontario.

Drew, T.J. 1987. Excellence and results-oriented regeneration in Alberta's spruce forest: the place for cleaning and tending. Pages 176–186 *in* F. McComb, chairman. Proc. Ind. Veg. Manage. Assoc. Alberta Semin. 18–19 March 1987, Calgary, Alberta. Ind. Veg. Manage. Assoc. Alberta, Calgary, Alberta.

Frisque, G.; Weetman, G.F.; Clemmer, E. 1978. Reproduction and trial projected yields 10 years after cutting 36 pulpwood stands in eastern Canada. For. Eng. Res. Inst. Can., Pte. Claire, Quebec. Tech. Rep. TR-23.

Kuhnke, D.H.; Brace, L.G. 1986. Silviculture statistics for Canada, 1975–76 to 1982–83. Can. For. Serv., North. For. Cent., Edmonton, Alberta. Inf. Rep. NOR-X-275.

Kuhnke, D.H.; Brace, L.G. 1986. Statistiques sylvicoles canadiennes, 1975–76 a 1982–83. Serv. can. for., Cent. for. Nord., Edmonton, Alberta. Rapp. inf. NOR-X-275F.

Weetman, G.F. 1987. Seven important determinants of Canadian silviculture. For. Chron. 63(6):457–461.

APPENDIX 1

SILVICULTURE QUESTIONNAIRE, 1986

INTRODUCTION

As part of the Canadian Forest Resource Data Program, the Northern Forestry Centre (NoFC) is responsible for producing national biennial reports on silviculture. The first survey was undertaken in 1981 and resulted in the publication of Information Report NOR-X-245, "Silviculture statistics for Canada, 1975-80". The second Information Report, "Silviculture statistics for Canada, 1975-76 to 1982-83", an expansion of the first report, was published in the spring of 1986.

This questionnaire is very similar to the 1981 one. Once again, both industry and government figures on public and private lands are being sought but only in the form of provincial or territorial totals, not by sub-provincial breakdown. The data collected will be used to update the silviculture data base at NoFC and to publish a national silviculture statistics report covering 11 years of data.

GUIDE

I. Site Preparation

A. Administrative unit - use the appropriate code.

B. Year - fill in the last two digits of the year in which the fiscal year ended, e.g. for the 1980-81 fiscal year, write "81".

Data are being collected for the fiscal years 1983-84 and 1984-85. Values for 1985-86 may be included, if available.

C. Harvesting method - number of hectares in the administrative unit which were cut in various patterns during the fiscal year.

1. clear-cut
   a) strip
   b) block-regular or irregular shapes

2. shelterwood
   a) strip
   b) uniform

3. seed tree
   a) single
   b) group

4. selection

D. Treatment - number of hectares in the administrative unit which received treatment during the fiscal year.

Fill in areas of single treatment only. Where combination of treatments is common, make a note of the areas, and their treatments at the bottom of the page.

1. prescribed burning - as a means of site preparation only, does not include hazard abatement
2. lop and scatter
3. crushing
4. windrowing
5. scarification
6. herbicide

II. Direct Seeding

A. Administrative unit - use appropriate code.

B. Year - end of fiscal year.

C. Pattern - number of hectares in the administrative unit which were seeded during the fiscal year:

1. broadcast
2. partial

D. Method - percentage of area seeded using various types of equipment:

1. Manual - seed distributed without the use of motor driven machinery, e.g. cyclone seeder is manual;

2. Mechanical ground - seed distributed using motor driven machinery on the ground;

3. Mechanical aerial - seed distributed by airborne equipment.

E. Species - fill in the blank with the name of appropriate species:

1. Area - total number of hectares in the administrative unit that was seeded with the species during the fiscal year;

2. Application - average application of that species of seed within the administrative unit during the fiscal year.

III. Planting Bareroot

A. Administrative unit - use appropriate code.

B. Year - end of fiscal year.

C. Planting method:

1. Manual - percentage of hectares within the administrative unit planted without the use of motor driven planting machinery;

2. Mechanical - percentage of hectares within the administrative unit planted using motor driven planting machinery.

D. Species - fill in blank with appropriate species name:

1. Area - number of hectares within the administrative unit planted with each species during the year - includes manual and mechanical planting.

2. Number of seedlings

3. Age - average age of each species of seedling planted (years in seedbed and transplant bed)

IV. Planting Container

A. Administrative unit - use appropriate code.

B. Year - end of fiscal year.

C. Planting method

1. Manual - percentage of hectares within the administrative unit planted without the use of motor driven planting machinery.

2. Mechanical - percentage of hectares within the administrative unit planted using motor driven planting machinery.

D. Species - fill in blank with appropriate species name

1. Area - number of hectares within the administrative unit planted with each species during the year - includes manual and mechanical planting.

2. Number of seedlings

3. Age - average age of each species of seedling planted (in weeks)

V. Stand Treatments

Fill in areas of single treatments only. Where combination of treatments is common, make a note of the areas and their treatments at the bottom of the page.

A. Administrative unit - use appropriate code.

B. Year - end of fiscal year.

C. Major species - fill in the name of each species for which an area within the administrative unit was managed (plantation species, or the most common species in a natural stand).

D. Fertilizing

1. Area - the number of hectares of each species within the administrative unit which were treated with fertilizers.

2. Treatment schedule - the age(s) of the major species at the time(s) of treatment (in years).

E. Thinning

1. Area - the number of hectares of each species within the administrative unit which were thinned. Includes pre-commercial and commercial thinning.

2. Treatment schedule - the age(s) of the major species at the time(s) of treatment.

F. Pruning

1. Area - the number of hectares of each species within the administrative unit which were pruned.

2. Treatment schedule - the age(s) of the major species at the time(s) of treatment.

G. Weeding - Mechanical

1. Area - the number of hectares of each species within the administrative unit which were mechanically weeded.

2. Treatment schedule - the age(s) of the major species at the time(s) of treatment.

H. Weeding - Chemical

1. Area - the number of hectares of each species within the administrative unit which were chemically weeded.

2. Treatment schedule - the age(s) of the major species at the time(s) of treatment.

I. Pest Control

1. Area - the number of hectares of each species within the administrative unit which were treated for pests.

2. Treatment schedule - the age(s) of the major species at the time(s) of treatment.

VI. An Overview of Regeneration Effectiveness

Please answer the questions on the questionnaire sheet.

VII. An Overview of Stand Treatment Effectiveness

Please answer the questions on the questionnaire sheet.

DEFINITIONS

Administrative unit - see guide

Broadcast seeding* - the scattering of seed more or less evenly over a whole area on which a forest stand is to be raised.

Clear cut* - a silvicultural system in which the old crop is cleared over a considerable area at one time.

Crushing - the compacting of slash with heavy machinery, e.g. Marden, Letourneaux.

Direct seeding - the artificial sowing of seeds in an area by manual or mechanical means.

Fertilizing - the addition of nutrients to the soil (in organic or inorganic form)

Herbicide* - any chemical preparation used to kill or inhibit the growth of forbs, grasses, and woody plants, and their seeds.

Lopping and scattering* - chopping the branches, tops and small trees left on a site after logging and spreading this residue more or less evenly over the ground without burning.

Natural seeding - the seeding of an area by natural means, i.e. from slash borne seeds or from standing, seed-producing trees.

Partial seeding* - seeding confined to limited areas, e.g. drills, strips, patches (spots), nests, generally according to a regular spatial pattern.

Pest control - reduction or elimination of harmful insect or disease populations by chemical, biological, or mechanical means.

Prescribed burning* - controlled application of fire to wild-land fuels in either their natural or modified state, under such conditions of weather, fuel moisture, soil moisture etc. as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives of silviculture, wildlife management, grazing, fire-hazard.

Pruning* - the removal of live or dead branches from the bole of a tree for a variety of reasons, e.g. to improve access or the quality of lumber sawn from the bole.

Scarification* - loosening the top soil of open areas, or breaking up the forest floor, in preparation for artificial or natural regeneration.

Seed-tree cutting method* - removal in one cut of the mature timber from an area, save for a small number of seed bearers left singly or in small groups.

Selection cutting* - an uneven-aged silvicultural system in which trees are removed individually or in groups, here and there, from a large area each year.

Shelterwood cutting* - any regeneration cutting in a more or less regular and mature crop, designed to establish a new crop under the protection (overhead or side) of the old.

Thinning* - a felling made in an immature crop or stand in order primarily to accelerate diameter increment but also, by suitable selection to improve the average form of the trees that remain. Includes pre-commercial and commercial thinning.

Weeding* - generally, a cultural operation eliminating or suppressing undesireable vegetation, mainly herbaceous, during the seedling stage or a forest crop and therefore before the first cleaning, so as to reduce competition with the seedling stand. If it is done with chemicals, it is termed chemical weeding.

Windrow* - slash, brushwood, etc. concentrated along a line, so as to clear the intervening ground between the two of them.

ADMINISTRATIVE UNITS

Province	Code
British Columbia	100
Alberta	200
Saskatchewan	300
Manitoba	400
Ontario	500
Québec	600
New Brunswick	700
Nova Scotia	800
Prince Edward Island	900
Newfoundland	1000
Yukon	1100
Northwest Territories	1200

* from: Ford-Robertson, F.C. (ed.). 1971. Terminology of forest science, technology practice and products. SAF, Washington, D.C.

I. SITE PREPARATION

Administrative unit	Year	HARVESTING METHOD							TREATMENT					
		Clearcut		Shelterwood		Seed Tree								
		Strip (ha)	Block (ha)	Strip cut (ha)	Uniform cut (ha)	Single Tree (ha)	Group (ha)	Selection (ha)	Prescribed burning (ha)	Lop and Scatter (ha)	Crushing (ha)	Windrow (ha)	Scarifi-cation (ha)	Herbicide (ha)

II. DIRECT SEEDING

Administrative unit	Year	PATTERN		METHOD			SPECIES										
		Broadcast (ha)	Partial (ha)	Manual (% of total	Mechanical Ground (% of total)	Mechanical Aerial (% of total)	Area (ha)	Application (kg/ha)		Area (ha)	Application (kg/ha)		Area (ha)	Application (kg/ha)		Area (ha)	Application (kg/ha)

III. PLANTING BAREROOT

Administrative Unit	Year	PLANTING METHOD		SPECIES															
		Manual (% of (total)	Mechanical (% of total)		Area (ha)	Number of seedlings	Age		Area (ha)	Number of Seedlings	Age		Area (ha)	Number of seedlings	Age		Area (ha)	Number of seedlings	Age

IV. PLANTING CONTAINER

Administrative Unit	Year	PLANTING METHOD		SPECIES															
		Manual (% of total)	Mechanical (% of total)		Area (ha)	Number of Seedlings	Age		Area (ha)	Number of seedlings	Age		Area (ha)	Number of seedlings	Age		Area (ha)	Number of seedlings	Age

V. STAND TREATMENT

Administrative Unit	Year	Major Species	Fertilising		Thinning		Pruning		Weeding Mechanical		Weeding Chemical		Pest Control		Area (ha)
			Area (ha)	Treatment Schedule (years)	Area (ha)	Treatment Schedule (years)	Area (ha)	Treatment Schedule (years)	Area (ha)	Treatment Schedule (years)	Area (ha)	Treatment Schedule (years)	Area (ha)	Treatment Schedule (years)	

VI. AN OVERVIEW OF REGENERATION EFFECTIVENESS

1. On the average, what percentage of area harvested is expected to become satisfactorily stocked without planting or seeding?

- with site preparation	- without site preparation
spruce	spruce
pine	pine
fir	fir
other (please specify: use the reverse side if more space required)	other (please specify)

2. On the average, what percentage of planted areas remain satisfactorily stocked without replanting?

- originally with site preparation	- originally without site preparation
spruce	spruce
pine	pine
fir	fir
other (please specify)	other (please specify)

3. On the average, what percentage of direct seeded areas become satisfactorily stocked without reseeding?

- originally with site preparation	- originally without site preparation
spruce	spruce
pine	pine
fir	fir
other (please specify)	other (please specify)

4. On the average, how much time elapses after harvest before planting or seeding are conducted? (A range of time would be acceptable if a single figure is not possible or appropriate).

   planting

   direct seeding

5. What percentage of all site preparation is done for purposes of:

   natural regeneration

   planting

   direct seeding

   (Note: the above percentages should sum to 100%).

6. On the average, what percentage of areas regenerated by direct seeding or planting receive site preparation?

	first-time	repeated treatment
direct seeding		
planting		

VII. AN OVERVIEW OF STAND TREATMENT EFFECTIVENESS

1. On the average, what percentage of each stand treatment is applied to naturally and artificially regenerated SECOND GROWTH forests?

Stand treatment	naturally regenerated	artificially regenerated
fertilizing		
thinning		
pruning		
mechanical weeding		
chemical weeding		

2. On the average, what percent increases in volume (m^3/ha) can be expected from stand treatments? Please indicate a time frame if one has not been entered in the questionnaire.

Stand treatment	% volume increase	Which species?
fertilizing		
thinning		
mechanical weeding		
chemical weeding		

3. What percentage of "established forest land" receives some form of stand treatment? Established forest land can be loosely defined as the area of planted or direct seeded lands that have reached the free-to-grow stage or beyond.

APPENDIX 2

NATIONAL SILVICULTURE DATA

Table A. Area harvested

Province or territory	Area harvested (ha)											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	156 976	175 952	166 081	196 533	187 547	187 834	147 889	162 172	188 228	198 453	210 397	1 978 062
Alberta	20 256	19 060	21 450	22 103	24 689	23 562 [a]	20 934	27 287	32 739	28 121	33 825	274 026
Saskatchewan	17 500	16 900	16 200	21 100	25 100	16 930	18 280	15 830	19 690	21 910	19 693	209 133
Manitoba	(15 700) [b]	(17 000)	(18 000)	(20 000)	(24 600)	(24 600)	18 900	20 400	14 100	15 700	15 900	204 900
Ontario	196 760	156 721	187 993	194 998	218 579	242 679	227 603	222 921	183 208	217 806	217 984	2 267 252
Quebec	135 094	181 737	193 295	226 127	241 826	245 000	250 000	195 000	272 085	280 739	266 180	2 487 083
New Brunswick	(94 400)	(92 800)	(86 500)	(89 200)	(100 000)	(85 900)	(65 500)	(72 445)	(81 570)	(83 000)	(87 070)	(938 385)
Nova Scotia	27 260	26 285	28 335	32 120	33 703	(36 439)	(36 429)	(35 710)	20 745	30 604	29 778	337 408
Prince Edward Island	(1 600)	(1 600)	(1 600)	(1 600)	(1 780)	(2 500)	(2 700)	(2 700)	(2 500)	(2 500)	(3 200)	(24 280)
Newfoundland	(15 700)	(14 700)	(14 300)	(17 600)	(17 700)	15 175	13 454	8 000	13 900	17 600	16 400	164 529
Yukon Territory	620	560	747	935	280	58	45	43	321	561	135	4 305
Northwest Territories	706	396	688	693	629	742	903	427	870	1 075	990	8 119
Canada	682 572	703 711	735 189	823 009	876 433	881 419	802 637	762 935	829 956	898 069	901 552	8 897 482

[a] From 1980–81 to 1985–86, an additional 39 631 hectares were cleared of aspen under a special stand conversion program and were not harvested in the commercial sense.
[b] Numbers in brackets are estimates.

Table B. Area of site preparation

Province or territory	Area of site preparation (ha)											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia[a]	73 809	77 249	48 169	51 408	67 295	65 194	54 893	62 631	73 439	84 413	91 421	749 921
Alberta	17 537	14 606	16 976	20 396	15 143[b]	13 019	13 568	16 611	19 607	18 082	19 404	184 949
Saskatchewan	3 918	3 089	4 665	5 973	6 815	7 633	8 634	11 141	6 901	6 831	7 481	73 081
Manitoba	3 965	4 038	4 080	4 443	4 356	4 055	4 161	3 627	4 338	4 839	6 674	48 576
Ontario	45 231	39 157	47 961	48 706	53 390	56 620	57 157	70 984	78 142	86 932	98 953	683 233
Quebec	3 008	2 570	7 555	9 539	14 769	13 903	16 152	14 800	21 940	29 902	50 906	185 044
New Brunswick	10 100	11 000	13 900	16 000	18 500	24 926	27 384	18 601	11 132	8 862	9 293	169 698
Nova Scotia	595	634	850	2 608	2 255	8 010	8 845	7 410	6 263	7 984	12 025	57 479
Prince Edward Island[a]	0	48	0	16	566	566	289	511	579	1 485	1 371	5 431
Newfoundland	0	0	28	320	1 508	379	1 317	1 856	1 848	3 769	3 446	14 471
Yukon Territory	0	0	0	0	224	0	0	0	0	0	0	224
Northwest Territories	0	0	0	0	0	0	0	0	0	0	0	0
Canada	158 163	152 391	144 184	159 409	184 821	194 305	192 400	208 172	224 189	253 099	300 974	2 172 107

[a] Data does not include areas found not to require treatment.
[b] From 1979–80 to 1985–86, an additional 40 359 ha were scarified under a special stand conversion program.

Table C. Area of site preparation as a percentage of area harvested

Province or territory	% area of site preparation											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	47.0	43.9	29.0	26.2	35.9	34.7	37.1	38.6	39.0	42.5	43.5	37.9
Alberta	86.6	76.6	79.1	92.3	61.3	55.2	64.8	60.9	59.9	64.3	57.4	67.5
Saskatchewan	22.4	18.3	28.8	28.3	27.2	45.1	47.2	70.4	35.0	31.2	38.0	34.9
Manitoba	(25.3)[a]	(23.8)	(22.7)	(22.2)	17.7	16.5	22.0	17.8	30.8	30.8	42.0	23.7
Ontario	23.0	25.0	25.5	25.0	24.4	23.3	25.1	31.8	42.7	39.9	45.4	30.1
Quebec	2.2	1.4	3.9	4.2	6.1	5.7	6.5	7.6	8.1	10.7	19.1	7.4
New Brunswick	(10.7)	(11.9)	(16.1)	(17.9)	(18.5)	(29.0)	(41.8)	(25.7)	(13.6)	(10.7)	(10.7)	(18.1)
Nova Scotia	2.2	2.4	3.0	8.1	6.7	(22.0)	(24.3)	(20.8)	30.2	26.1	40.4	17.0
Prince Edward Island	(0.0)	(3.0)	(0.0)	(1.0)	(31.8)	22.6	10.7	18.9	23.2	59.4	42.8	22.4
Newfoundland	0.0	0.0	(0.2)	(1.8)	(8.5)	2.5	9.8	23.2	13.3	21.4	21.0	8.8
Yukon Territory	0.0	0.0	0.0	0.0	80.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2
Northwest Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada	23.2	21.7	19.6	19.4	21.1	22.0	24.0	27.3	27.0	28.2	33.4	24.4

[a] Numbers in brackets are estimates.

Table D. Area planted[a]

Province or territory	Area planted (ha)											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	63 078	60 161	55 741	58 269	63 677	63 675	66 605	82 795	94 726	100 032	101 442	810 201
Alberta	6 016	4 799	5 484	7 145	8 264	9 250[b]	11 349	11 501	12 324	13 795	9 229	99 156
Saskatchewan	3 663	3 492	4 501	5 701	6 991	5 790	4 013	6 043	6 370	4 858	5 276	56 698
Manitoba	1 116	1 046	832	1 220	570	762	4 134	2 203	1 820	1 708	4 169	19 580
Ontario	30 050	26 170	26 507	27 549	30 830	32 080	38 107	37 842	48 171	62 994	72 084	432 384
Quebec	15 905	15 329	16 544	14 079	14 062	13 841	15 875	17 077	25 909	29 224	39 127	216 972
New Brunswick	6 675	8 050	9 607	10 700	15 700	22 038	22 121	22 458	19 985	19 406	19 453	176 193
Nova Scotia	1 425	1 230	2 331	3 290	2 676	3 741	5 085	4 249	4 020	4 936	6 584	39 567
Prince Edward Island	(120)[c]	(120)	(120)	94	84	423	490	475	534	573	894	3 927
Newfoundland	0	0	0	0	184	360	1 853	802	1 836	2 427	2 762	10 224
Yukon Territory	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Territories	0	0	0	0	0	0	0	0	0	0	0	0
Canada	128 048	120 397	121 667	128 047	143 038	151 960	169 632	185 445	215 695	239 953	261 020	1 864 902

[a] Container and bare-root stock.
[b] From 1980–81 to 1985–86, an additional 41 259 ha were planted under a special stand conversion program.
[c] Numbers in brackets are estimates.

Table E. Area planted as a percentage of area harvested

Province or territory	% area planted											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	40.2	34.2	33.6	29.6	34.0	33.9	45.0	51.1	50.3	50.4	48.2	41.0
Alberta	29.7	25.2	25.6	32.3	33.5	39.3	54.2	42.1	37.6	49.1	27.3	36.2
Saskatchewan	20.9	20.7	27.8	27.0	27.9	34.2	22.0	38.2	32.4	22.2	26.8	27.1
Manitoba	(7.1)[a]	(6.2)	(4.6)	(6.1)	(2.3)	(3.1)	21.9	10.8	12.9	10.9	26.2	9.6
Ontario	15.3	16.7	14.1	14.1	14.1	13.2	16.7	17.0	26.3	28.9	33.1	19.1
Quebec	11.8	8.4	8.6	6.2	5.8	5.6	6.4	8.8	9.5	10.4	14.7	8.7
New Brunswick	(7.1)	(8.7)	(11.1)	(12.0)	(15.7)	(25.7)	(33.8)	(31.0)	(24.5)	(23.4)	(22.3)	(18.8)
Nova Scotia	5.2	4.7	8.2	10.2	7.9	(10.3)	(14.0)	(11.9)	19.4	16.1	22.1	11.7
Prince Edward Island	(7.5)	(7.5)	(7.5)	(5.9)	(4.7)	(16.9)	(18.1)	(17.6)	(21.4)	(22.9)	(27.9)	(16.2)
Newfoundland	0.0	0.0	0.0	0.0	(1.0)	2.4	13.8	10.0	13.2	13.8	16.8	6.2
Yukon Territory	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northwest Territories	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada	18.8	17.1	16.5	15.6	16.3	17.2	21.1	24.3	26.0	26.7	29.0	21.0

[a] Numbers in brackets are estimates.

Table F. Area of direct seeding

Province or territory	Area direct seeded (ha)											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	0	0	0	0	0	0	0	0	315	284	0	599
Alberta	4 747	6 325	10 110	7 505	5 543[a]	6 635	4 701	5 370	8 974	8 436	6 293	74 639
Saskatchewan	0	0	0	0	0	0	0	0	0	0	0	0
Manitoba	223	199	61	126	2 774	1 093	272	118	697	145	0	5 708
Ontario	23 510	27 039	28 791	23 582	24 251	47 294	27 869	29 991	21 246	16 229	18 894	288 696
Quebec	5 693	1 810	3 373	5 703	6 744	9 949	9 525	14 506	6 116	8 649	1 002	73 070
New Brunswick	125	550	393	0	0	0	172	9	0	0	0	1 249
Nova Scotia	0	10	1	127	77	0	0	55	0	0	0	270
Prince Edward Island	0	0	0	0	0	0	0	0	0	0	0	0
Newfoundland	0	0	0	0	0	36	54	230	0	0	0	320
Yukon Territory	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Territories	0	0	0	0	0	0	0	0	0	0	0	0
Canada	34 298	35 933	42 729	37 043	39 389	65 007	42 593	50 279	37 348	33 743	26 189	444 551

[a] From 1979–80 to 1984–85, an additional 1766 ha were direct seeded under a special stand conversion program.

Table G. Area of direct seeding as a percentage of area harvested

Province or territory	% area direct seeded											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0
Alberta	23.4	33.2	47.1	34.0	22.5	28.2	22.5	19.7	27.4	30.0	18.6	27.2
Saskatchewan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manitoba	(1.4)[a]	(1.2)	(0.3)	(0.6)	(11.3)	(4.4)	1.4	0.6	4.9	0.9	0.0	2.8
Ontario	11.9	17.3	15.3	12.1	11.1	19.5	12.2	13.5	11.6	7.5	8.7	12.7
Quebec	4.2	1.0	1.7	2.5	2.8	4.1	3.8	7.4	2.2	3.1	0.4	2.9
New Brunswick	(0.1)	(0.6)	(0.5)	(0.0)	(0.0)	(0.0)	(0.3)	(0.0)	(0.0)	(0.0)	(0.0)	(0.1)
Nova Scotia	0.0	0.0	0.0	0.4	0.2	(0.0)	(0.0)	(0.2)	0.0	0.0	0.0	0.1
Prince Edward Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newfoundland	0.0	0.0	0.0	0.0	0.0	0.2	0.4	2.9	0.0	0.0	0.0	0.2
Canada	5.0	5.1	5.8	4.5	4.5	7.4	5.3	6.6	4.5	3.8	2.9	5.0

[a] Numbers in brackets are estimates.

Table H. Area of all methods of stand tending

Province or territory	Area of stand tending (ha)											
	1975–76	1976–77	1977–78	1978–79	1979–80	1980–81	1981–82	1982–83	1983–84	1984–85	1985–86	Total
British Columbia	1 841	9 733	23 435	26 586	33 279	30 877	37 677	26 031	15 739	30 865	29 416	265 479
Alberta[a]	143	583	123	245	272	270[b]	701	624	245	510	1 005	4 721
Saskatchewan	12	10	0	0	142	121	404	260	791	1 817	712	4 269
Manitoba[a]	562	377	558	624	220	263	0	0	1 559	4 592	2 944	11 699
Ontario	33 277	38 324	52 850	48 269	39 228	51 036	41 444	54 506	47 560	69 994	92 838	569 326
Quebec	–[c]	–	–	–	–	10 829	12 686	6 446[d]	15 960	21 220	19 800	86 941
New Brunswick[e]	0	0	1 032	1 807	3 436	18 924	17 618	18 263	30 488	40 040	45 700	177 308
Nova Scotia	1 334	1 625	2 146	2 504	3 556	7 451	9 264	5 923	7 133	13 115	16 526	70 577
Prince Edward Island	0	0	0	0	20	49	353	1 112	814	707	856	3 911
Newfoundland	213	196	1 928	1 976	2 321	3 006	4 248	4 750	5 559	6 205	6 795	37 197
Yukon Territory	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Territories	0	0	0	0	0	0	0	0	0	0	0	0
Canada	37 382	50 848	82 072	82 011	82 474	122 826	124 395	117 915	125 848	189 065	216 592	1 231 428

[a] Thinning only.
[b] Includes 52 ha of chemical weeding. An additional 2 140 ha of thinning and 1 145 ha of chemical weeding were done from 1980–81 to 1985–86 under a special stand conversion program.
[c] Not available.
[d] Precommercial thinning only. Data on other treatments are not available.
[e] Figures for 1977–78 to 1979–80 differ from those in Brace and Golec (1982) because they were received after the publication date.

APPENDIX 3

FOREST ECONOMIC AND REGIONAL DEVELOPMENT AGREEMENT DATA FOR CANADA

Table A. Area of all site preparation performed under forest economic and regional development agreements Appendix 3

Province	Area of site preparation (ha)						
	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0	0	0	14 270	14 270	19 253	33 523
Alberta	0	0	0	0	0	1 608	1 608
Saskatchewan	0	0	3 986	5 261	9 247	2 269	11 516
Manitoba	0	0	447	588	1 035	2 050	3 085
Ontario	0	0	39 475	14 855	54 330	53 069	107 399
Quebec[a]	0	0	0	65 754	65 754	81 682	147 436
New Brunswick	0	0	224	1 652	1 876	1 168	3 044
Nova Scotia	1 651	2 896	4 857	8 343	17 747	11 611	29 358
Prince Edward Island	0	314	648	1 483	2 445	1 416	3 861
Newfoundland	0	0	0	0	0	772	772
Canada	1 651	3 210	49 637	112 206	166 704	174 898	341 602

[a] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table B. Expenditures for all site preparation[a] performed under forest economic and regional development agreements

Province	Expenditure ($'000)						
	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0.0	0.0	0.0	3 506.0	3 506.0	9 416.3	12 922.3
Alberta	0.0	0.0	0.0	0.0	0.0	2 023.1	2 023.1
Saskatchewan	0.0	0.0	488.8	777.3	1 266.1	274.7	1 540.8
Manitoba	0.0	0.0	140.1	176.0	316.1	395.5	711.6
Ontario	0.0	0.0	8 350.3	1 121.8	9 472.1	8 231.0	17 703.1
Quebec[b]	0.0	0.0	0.0	13 299.3	13 299.3	18 699.3	31 998.6
New Brunswick	0.0	0.0	42.8	269.6	312.4	192.9	505.3
Nova Scotia	124.2	479.6	715.7	1 264.6	2 584.1	2 015.3	4 599.4
Prince Edward Island	0.0	48.2	140.3	309.4	497.9	280.7	778.6
Newfoundland	0.0	0.0	0.0	0.0	0.0	141.9	141.9
Canada	124.2	527.8	9 878.0	20 724.0	31 254.0	41 670.7	72 924.7

[a] Figures may not be identical to those quoted in other sources such as Smyth (1988) due to different sources and methods of compilation.
[b] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table C. Area of all regeneration performed under forest economic and regional development agreements

	Area of planting and direct seeding (ha)						
Province	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0	0	0	13 953	13 953	20 467	34 420
Alberta	0	0	0	0	0	0	0
Saskatchewan	0	0	0	2 882	2 882	3 177	6 059
Manitoba	0	0	1	638	639	993	1 632
Ontario	0	0	13 992	18 753	32 745	13 799	46 544
Quebec[a]	0	0	0	35 832	35 832	55 227	91 059
New Brunswick	0	0	12 130	14 747	26 877	15 649	42 526
Nova Scotia	1 959	3 263	3 030	3 776	12 028	5 059	17 087
Prince Edward Island	0	1	347	492	840	699	1 539
Newfoundland	0	0	0	0	0	797	797
Canada	1 959	3 264	29 500	91 073	125 796	115 867	241 663

[a] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table D. Expenditures for all regeneration[a] performed under forest economic and regional development agreements

Province	Expenditure ($'000)						
	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0.0	0.0	0.0	3 436.0	3 436.0	6 970.8	10 406.8
Alberta	0.0	0.0	0.0	0.0	0.0	12.0	12.0
Saskatchewan	0.0	0.0	421.6	1 171.2	1 592.8	1 339.5	2 932.3
Manitoba	0.0	0.0	235.4	400.1	635.5	339.3	974.8
Ontario	0.0	0.0	2 855.1	6 536.6	9 391.7	2 969.7	12 361.4
Quebec[b]	0.0	0.0	0.0	11 745.1	11 745.1	19 812.8	31 557.9
New Brunswick	0.0	0.0	4 064.7	4 790.9	8 855.6	5 220.4	14 076.0
Nova Scotia	450.3	851.9	1 052.1	1 352.1	3 706.4	2 551.5	6 257.9
Prince Edward Island	0.0	0.1	68.7	102.2	171.0	178.7	349.7
Newfoundland	0.0	0.0	0.0	0.0	0.0	289.8	289.8
Canada	450.3	852.0	8 697.6	29 534.2	39 534.1	38 684.5	79 218.6

[a] Figures may not be identical to those quoted in other sources such as Smyth (1988) due to different sources and methods of compilation.
[b] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table E. Area of all stand tending performed under forest economic and regional development agreements

Province	Area of stand tending (ha)						
	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0	0	0	5 546	5 546	34 587	40 133
Alberta	0	0	0	30	30	55	85
Saskatchewan	0	0	56	764	820	629	1 449
Manitoba	0	0	618	339	957	642	1 599
Ontario	0	0	8 806	10 605	19 411	28 751	48 162
Quebec[a]	0	0	0	14 561	14 561	16 119	30 680
New Brunswick	0	0	5 378	24 183	29 561	8 758	38 319
Nova Scotia	4 454	6 300	11 580	16 762	39 096	17 299	56 395
Prince Edward Island	0	473	1 037	1 160	2 670	1 217	3 887
Newfoundland	0	0	0	0	0	6 788	6 788
Canada	4 454	6 773	27 475	73 950	112 652	114 845	227 497

[a] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table F. Expenditures for all stand tending[a] performed under forest economic and regional development agreements

Province	Expenditure ($'000)						
	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0.0	0.0	0.0	2 151.0	2 151.0	7 438.6	9 589.6
Alberta	0.0	0.0	0.0	53.8	53.8	22.5	76.3
Saskatchewan	0.0	0.0	11.1	239.7	250.8	239.6	490.4
Manitoba	0.0	0.0	586.8	147.5	734.3	290.9	1 025.2
Ontario	0.0	0.0	1 172.5	1 966.0	3 138.5	4 923.2	8 061.7
Quebec[b]	0.0	0.0	0.0	6 571.2	6 571.2	6 107.8	12 679.0
New Brunswick	0.0	0.0	2 953.8	5 210.2	8 164.0	4 923.2	13 087.2
Nova Scotia	742.4	1 673.3	2 259.7	4 110.0	8 785.4	5 004.7	13 790.1
Prince Edward Island	0.0	248.0	474.4	601.9	1 324.3	609.7	1 934.0
Newfoundland	0.0	0.0	0.0	0.0	0.0	3 638.7	3 638.7
Canada	742.4	1 921.3	7 458.3	21 051.3	31 173.3	33 198.9	64 372.2

[a] Figures may not be identical to those quoted in other sources such as Smyth (1988) due to different sources and methods of compilation.
[b] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table G. Area of all pest control[a] performed under forest economic and regional development agreements

	Area of pest control (ha)				
Province	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0	0	0	0	0
Alberta	0	0	0	0	0
Saskatchewan	0	0	0	0	0
Manitoba	0	1 066	1 066	–[b]	–
Ontario	0	0	0	30	30
Quebec[c]	0	30 949	30 949	14 633	45 582
New Brunswick	0	0	0	0	0
Nova Scotia	0	0	0	0	0
Prince Edward Island	0	0	0	0	0
Newfoundland	0	0	0	0	0
Canada	0	32 015	32 015	–	–

[a] Insect and disease control. Insect control includes biological control.
[b] Not available.
[c] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table H. Expenditures for all pest control[a] performed under forest economic and regional development agreements

Province	Expenditure ($'000)						
	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0.0	0.0	0.0	200.0	200.0	0.0	200.0
Alberta	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Saskatchewan	0.0	0.0	0.0	0.0	0.0	32.4	32.4
Manitoba	0.0	0.0	0.0	248.5	248.5	0.0	248.5
Ontario	0.0	0.0	0.0	0.0	0.0	31.0	31.0
Quebec[b]	0.0	0.0	0.0	730.8	730.8	740.3	1 471.1
New Brunswick	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nova Scotia	0.0	0.0	0.0	17.2	17.2	89.2	106.4
Prince Edward Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Newfoundland	0.0	0.0	0.0	0.0	0.0	402.7	402.7
Canada	0.0	0.0	0.0	1 196.5	1 196.5	1 295.6	2 492.1

[a] Figures may not be identical to those quoted in other sources such as Smyth (1988) due to different sources and methods of compilation.
[b] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table I. Summary of all silviculture treatments[a] performed under forest economic and regional development agreements Appendix 3

	Area of silviculture treatment (ha)						
Province	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0	0	0	33 769	33 769	74 307	108 076
Alberta	0	0	0	30	30	1 663	1 693
Saskatchewan	0	0	4 042	8 907	12 949	6 075	19 024
Manitoba	0	0	1 066	1 565	2 631	3 685	6 316
Ontario	0	0	62 273	44 213	106 486	95 619	202 105
Quebec[b]	0	0	0	116 147	116 147	153 028	269 175
New Brunswick	0	0	17 732	40 582	58 314	25 575	83 889
Nova Scotia	8 064	12 459	19 467	28 881	68 871	33 969	102 840
Prince Edward Island	0	788	2 032	3 135	5 955	3 332	9 287
Newfoundland	0	0	0	0	0	8 357	8 357
Canada	8 064	13 247	106 612	277 229	405 152	405 610	810 762

[a] Excluding pest control.
[b] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

Table J. Summary of all expenditures for silviculture treatments[a] performed under forest economic and regional development agreements

	Expenditure ($'000)						
Province	1982–83	1983–84	1984–85	1985–86	Subtotal	1986–87	Total
British Columbia	0.0	0.0	0.0	9 093.0	9 093.0	23 825.7	32 918.7
Alberta	0.0	0.0	0.0	53.8	53.8	2 057.6	2 111.4
Saskatchewan	0.0	0.0	921.5	2 188.2	3 109.7	1 853.8	4 963.5
Manitoba	0.0	0.0	962.3	723.6	1 685.9	1 025.7	2 711.6
Ontario	0.0	0.0	12 377.9	9 624.4	22 002.3	16 123.9	38 126.2
Quebec[b]	0.0	0.0	0.0	31 615.6	31 615.6	44 619.9	76 235.5
New Brunswick	0.0	0.0	7 061.3	10 270.7	17 332.0	10 336.5	27 668.5
Nova Scotia	1 316.9	3 004.8	4 027.5	6 726.7	15 075.9	9 571.5	24 647.4
Prince Edward Island	0.0	296.3	683.4	1 013.5	1 993.2	1 069.1	3 062.3
Newfoundland	0.0	0.0	0.0	0.0	0.0	4 070.4	4 070.4
Canada	1 316.9	3 301.1	26 033.9	71 309.5	101 961.4	114 554.1	216 515.5

[a] Excluding pest control.
[b] Forest Development Subsidiary Agreement and Gaspé and Lower St. Lawrence Program.

APPENDIX 4

PROVINCIAL AND TERRITORIAL DATA

Table A. Harvesting, site preparation, and planting data for British Columbia[a]

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other[b]	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	133 277	23 699	60 615	13 194	0	0	50 440	58 257	12 638	14 564	63 078	72 821
1976–77	147 897	28 055	61 759	15 490	0	0	44 171	48 334	15 990	17 498	60 161	65 832
1977–78	140 169	25 912	29 942	18 227	0	0	32 012	34 317	23 729	25 438	55 741	59 755
1978–79	168 820	27 713	33 460	17 948	0	0	34 740	38 122	23 529	25 211	58 269	63 333
1979–80	157 395	30 152	47 468	19 827	0	0	40 534	48 040	23 143	26 932	63 677	74 972
1980–81	156 786	31 048	26 896	20 529	132	17 637	42 265	49 737	21 410	25 235	63 675	74 972
1981–82	125 148	22 741	18 372	20 758	9	15 754	31 577	37 173	35 028	41 127	66 605	78 300
1982–83	134 430	27 742	29 993	18 892	0	13 746	34 217	40 261	48 578	57 442	82 795	97 703
1983–84	165 946	22 282	34 457	25 251	304	13 427	47 948	54 860	46 778	53 518	94 726	08 378
1984–85	171 223	27 230	39 713	28 276	731	15 693	44 685	51 794	55 347	64 161	100 032	15 955
1985–86	185 549	24 848	44 090	15 412	5 150	26 769	43 640	48 072	57 802	63 672	101 442	111 744
Total	1 686 640	291 422	426 765	13 804	6 326	103 026	446 229	508 967	363 972	414 798	810 201	923 765

[a] Provincial Crown land only.
[b] Selection harvest.

Table B. Harvesting, site preparation, and planting data for Alberta

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	20 256	0	0	17 537	0	0	1 818	2 273	4 198	5 247	6 016	7 520
1976–77	19 060	0	0	14 606	0	0	761	952	4 038	5 045	4 799	5 997
1977–78	21 450	0	0	16 976	0	0	180	234	5 304	6 633	5 484	6 867
1978–79	22 103	0	0	20 396	0	0	110	129	7 035	8 218	7 145	8 347
1979–80	24 689	0	0	15 143	0	0	0	0	8 264	10 329	8 264	10 329
1980–81	23 562	0	217	12 802	0	0	523	799	8 727	10 528	9 250	11 327
1981–82	20 934	0	0	13 568	0	0	4 152	6 084	7 197	8 731	11 349	14 815
1982–83	27 287	0	0	16 611	0	0	4 857	6 220	6 644	7 913	11 501	14 133
1983–84	32 739	0	0	19 607	0	0	4 899	6 474	7 425	10 114	12 324	16 588
1984–85	28 121	0	0	18 082	0	0	2 734	3 217	11 061	13 058	13 795	16 275
1985–86	33 825	0	0	19 404	0	0	2 701	3 732	6 528	8 233	9 229	11 965
Total	274 026	0	217	184 732	0	0	22 735	30 114	76 421	94 049	99 156	124 163

Table C. Silviculture data for Alberta's Maintain Our Forests stand conversion program

Year	Land clearing (ha)	Silviculture activity (ha)				
		Scarification	Direct seeding	Planting	Thinning	Chemical weeding
1979–80	0	777	18	0	0	0
1980–81	6 720	3 001	0	2 305	82	0
1981–82	11 785	5 153	0	1 640	149	184
1982–83	10 091	9 955	30	6 606	702	0
1983–84	8 527	8 184	1 315	11 103	503	0
1984–85	1 216	8 759	403	7 752	334[a]	419
1985–86	1 292	4 530	0	11 852	370	542
Total	39 631	40 359	1 766	41 258	2 140	1 145

[a] Includes 9 ha of fertilization and 6 ha of mechanical weeding.

Table D. Harvesting, site preparation, and planting data for Saskatchewan

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	17 500	0	0	2 973	0	945	3 622	5 242	41	90	3 663	5 332
1976–77	16 900	0	0	1 969	0	1 120	3 363	4 530	129	214	3 492	4 744
1977–78	16 200	0	0	2 643	0	2 022	4 215	5 747	286	623	4 501	6 370
1978–79	21 100	0	0	4 169	0	1 804	5 359	8 099	342	641	5 701	8 740
1979–80	25 100	0	0	5 365	0	1 450	6 348	10 272	643	1 320	6 991	11 592
1980–81	16 930	0	0	7 633	0	0	5 006	9 480	784	1 235	5 790	10 715
1981–82	18 280	0	0	8 634	0	0	3 278	6 165	735	1 359	4 013	7 524
1982–83	15 830	0	0	11 141	0	0	5 198	10 181	845	1 571	6 043	11 752
1983–84	19 690	0	0	6 901	0	0	5 597	10 802	773	340	6 370	11 142
1984–85	21 910	0	0	6 831	0	0	4 858	9 207	0	0	4 858	9 207
1985–86	19 693	0	0	7 481	0	0	5 276	9 785	0	0	5 276	9 785
Total	209 133	0	0	65 740	0	7 341	52 120	89 510	4 578	7 393	56 698	96 903

Table E. Harvesting, site preparation, and planting data for Manitoba

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other	Prescribed burning	Scarification	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	(15 700)[a]	0	0	3 965	0	0	573	1 335	543	1 266	1 116	2 601
1976–77	(17 000)	0	0	4 038	0	0	743	2 068	303	842	1 046	2 910
1977–78	(18 000)	0	0	4 080	0	0	738	1 406	94	180	832	1 586
1978–79	(20 000)	0	0	4 342	0	101	917	1 217	303	402	1 220	1 619
1979–80	(24 600)	0	0	3 823	0	533	470	1 293	100	275	570	1 568
1980–81	(24 600)	0	0	3 836	0	219	567	1 164	195	400	762	1 564
1981–82	18 900	0	0	4 161	0	0	3 445	4 000	689	800	4 134	4 800
1982–83	20 400	0	0	3 627	0	0	1 817	3 772	386	800	2 203	4 572
1983–84	14 100	0	0	3 951	0	387	1 424	3 555	396	1 038	1 820	4 593
1984–85	15 700	0	0	3 838	0	1 001	863	2 236	845	2 274	1 708	4 510
1985–86	15 900	0	0	4 821	0	1 853	1 398	3 402	2 771	6 022	4 169	9 424
Total	204 900	0	0	4 482	0	4 094	12 955	5 448	6 625	14 299	19 580	39 747

[a] Numbers in brackets are estimates.

Table F. Harvesting, site preparation, and planting data for Ontario

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other[a]	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	140 896	55 864	0	45 231	0	0	27 284	(45 984)[b]	2 766	(4 791)	30 050	(50 775)
1976–77	114 171	42 550	0	39 157	0	0	24 165	(41 927)	2 005	(3 589)	26 170	(45 516)
1977–78	121 930	66 063	2 949	37 638	2 655	4 719	24 101	(43 343)	2 406	(4 381)	26 507	(47 724)
1978–79	141 381	53 617	4 247	36 290	4 152	4 017	25 189	52 928	2 360	5 487	27 549	58 415
1979–80	160 148	58 431	4 163	43 340	3 491	2 396	26 693	61 453	4 137	7 945	30 830	69 398
1980–81	217 157	25 522	2 362	50 624	3 634	0	27 146	65 360	4 934	10 497	32 080	75 857
1981–82	202 786	24 617	2 409	51 683	3 065	0	31 473	69 448	6 634	13 951	38 107	83 399
1982–83	200 337	22 584	5 277	60 527	5 180	0	30 278	63 660	7 564	16 465	37 842	80 125
1983–84	153 086	30 122	4 501	66 476	5 107	2 058	30 023	65 754	18 148	39 211	48 171	104 965
1984–85	187 319	30 487	3 830	73 893	4 416	4 793	25 752	49 661	37 242	76 656	62 994	126 317
1985–86	185 172	32 812	8 461	83 283	6 996	213	33 391	67 232	38 693	79 530	72 084	146 762
Total	1 824 383	442 869	38 199	588 142	38 696	18 196	305 495	626 750	126 889	262 503	432 384	889 253

[a] Harvesting in uneven-aged stands. Figures do not include harvesting methods, termed as regeneration, conducted in largely hardwood forests. Strip cutting, seed tree cutting, shelterwood cutting, and clear-cutting covered an area of 139 956 ha from 1980–81 to 1985–86.
[b] Numbers in brackets are estimates.

Table G. Harvesting, site preparation, and planting data for Quebec

Year	Harvesting (ha)[a]		Site preparation (ha)				Planting					
	Clear-cut	Other[b]	Prescribed burning	Scarification	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	104 609	30 485	0	3 008	0	0	15 905	36 582	0	0	15 905	36 582
1976–77	140 106	41 631	0	2 570	0	0	15 271	35 124	(58)[c]	132	15 329	35 256
1977–78	159 045	34 250	0	7 555	0	0	16 348	37 601	(196)	450	16 544	38 051
1978–79	185 908	40 219	0	(8 478)	0	1 061	14 026	32 259	(53)	122	14 079	32 381
1979–80	208 498	33 328	0	14 217	0	552	14 039	32 389	(23)	54	14 062	32 343
1980–81	199 920	45 080[d]	0	6 993	452	6 458	13 828	34 573	13	29	13 841	34 602
1981–82	204 000	46 000[d]	0	6 904	634	8 614	14 733	35 221	1 142	2 456	15 875	37 677
1982–83	159 120	35 880[d]	0	11 792	0	3 008	15 696	37 579	1 381	2 881	17 077	40 460
1983–84	239 800	32 285	0	16 088	2 200	3 652	21 345	53 354	4 564	10 118	25 909	63 472
1984–85	245 700	35 039	56	27 036	0	2 810	20 036	50 081	9 188	22 062	29 224	72 143
1985–86	242 150	24 030	246	43 201	2 694	4 765	26 958	67 394	12 169	29 147	39 127	96 541
Total	2 088 856	398 227	302	147 842	5 980	30 920	188 185	452 057	28 787	67 451	216 9725	19 508

[a] Crown land only.
[b] Selection harvest.
[c] Numbers in brackets are estimates.
[d] Includes cutovers on private land.

Table H. Harvesting, site preparation, and planting data for New Brunswick

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other[a]	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	(94 400)[b]	0	300	9 800	0	0	5 300	13 096	1 375	3 398	6 675	16 494
1976–77	(92 800)	0	500	10 500	0	0	5 450	13 467	2 600	6 425	8 050	19 892
1977–78	(86 500)	0	400	13 500	0	0	5 200	12 849	4 407	10 890	9 607	23 739
1978–79	(89 200)	0	1 000	15 000	0	0	8 100	20 015	2 600	6 425	10 700	26 400
1979–80	(100 000)	0	1 500	16 802	198	0	8 500	21 004	7 200	17 791	15 700	38 795
1980–81	(85 900)	0	656	16 591[c]	1 624	6 055	8 943	19 835	13 095	30 951	22 038	50 786
1981–82	(65 500)	0	2 284	20 374[d]	124	4 602	7 071	16 376	15 050	36 061	22 121	52 437
1982–83	(72 445)	0	1 952	12 231	616	3 802	7 922	11 250	14 536	28 842	22 458	40 092
1983–84	(77 490)	(4 080)	50	10 570	239	273	1 838	3 414	18 147	39 276	19 985	42 690
1984–85	(78 850)	(4 150)	0	8 862	0	0	2 313	4 910	17 093	36 363	19 406	41 273
1985–86	(82 720)	(4 350)	0	9 293	0	0	1 573	3 257	17 880	37 589	19 453	40 846
Total	925 805	12 580	8 642	143 523	2 801	14 732	62 210	139 473	113 983	254 011	176 193	393 484

[a] Selection harvest.
[b] Numbers in brackets are estimates.
[c] Includes 1288 ha of burning and scarification.
[d] Includes 870 ha of burning and scarification and 108 ha of chemical treatment and scarification.

Table I. Harvesting, site preparation, and planting data for Nova Scotia

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other[a]	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	27 260	0	0	595	0	0	980	2 495	445	1 100	1 425	3 595
1976–77	26 285	0	0	634	0	0	777	1 925	453	1 120	1 230	3 045
1977–78	28 335	0	0	850	0	0	1 359	3 125	972	2 401	2 331	5 526
1978–79	32 120	0	0	2 608	0	0	1 907	3 045	1 383	3 416	3 290	6 461
1979–80	33 703	0	0	2 255	0	0	888	1 900	1 788	4 416	2 676	7 326
1980–81	(35 000)[b]	1 439	0	1 952	82	5 976	1 245	2 570	2 496	5 514	3 740	8 081
1981–82	(35 000)	1 429	129	1 879	68	6 769	2 567	6 915	2 518	6 906	5 085	13 821
1982–83	(35 000)	710	65	1 118	0	6 227	1 331	3 673	2 918	7 541	4 230	11 157
1983–84	20 100	645	2 088	1 038	57	3 080	1 605	4 682	2 415	7 037	4 020	11 719
1984–85	29 900	704	2 644	1 297	313	3 730	1 285	3 521	3 651	9 859	4 936	13 380
1985–86	28 800	978	77	0	887	11 061[c]	1 786	4 748	4 798	12 759	6 584	17 507
Total	337 408	5 905	5 003	14 226	1 407	36 843	15 730	38 599	23 837	62 070	39 567	100 669

[a] Mostly shelterwood harvesting.
[b] Numbers in brackets are estimates.
[c] Crushing and windrowing. Includes 1711 ha of pile burning.

Table J. Harvesting, site preparation, and planting data for Prince Edward Island

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	(1 600)[a]	0	0	0	0	0	(40)	(100)	(80)	(200)	(120)	(300)
1976–77	(1 600)	0	0	48	0	0	(40)	(100)	(80)	(200)	(120)	(300)
1977–78	(1 600)	0	0	0	0	0	(40)	(100)	(80)	(200)	(120)	(300)
1978–79	(1 600)	0	0	16	0	0	54	135	40	100	94	235
1979–80	(1 780)	0	0	566	0	0	44	110	40	100	84	210
1980–81	(2 500)	0	0	566	0	0	176	381	247	588	423	969
1981–82	(2 700)	0	0	280	9	0	25	63	465	1 150	490	1 213
1982–83	(2 700)	0	0	412	29	0	73	177	402	996	475	1 173
1983–84	(2 500)	0	0	485	94	0	162	452	372	1 042	534	1 494
1984–85	(2 500)	0	0	1 228	257	0	117	315	456	1 231	573	1 546
1985–86	(3 200)	0	0	1 110	261	0	179	407	715	1 625	894	2 032
Total	(24 280)	0	70	4 711	650	0	950	2 340	2 977	7 431	3 927	9 771

[a] Numbers in brackets are estimates.

Table K. Harvesting, site preparation, and planting data for Newfoundland

Year	Harvesting (ha)		Site preparation (ha)				Planting					
	Clear-cut	Other	Prescribed burning	Scarifi-cation	Chemical site preparation	Other	Bare-root area (ha)	Bare-root seedlings ('000)	Container area (ha)	Container seedlings ('000)	Total area planted (ha)	Total seedlings ('000)
1975–76	(15 700)[a]	0	0	0	0	0	0	0	0	0	0	0
1976–77	(14 700)	0	0	0	0	0	0	0	0	0	0	0
1977–78	(14 300)	0	0	28	0	0	0	0	0	0	0	0
1978–79	(17 600)	0	0	320	0	0	0	0	0	0	0	0
1979–80	(17 700)	0	0	1 508	0	0	0	0	184	460	184	460
1980–81	15 175	0	115	235	0	29	200	500	160	398	360	898
1981–82	13 454	0	76	1 097	0	144	1 074	2 243	779	1 625	1 853	3 868
1982–83	8 000	0	8	1 782	0	66	0	0	802	1 803	802	1 803
1983–84	13 900	0	8	1 840	0	0	919	2 101	917	2 001	1 836	4 102
1984–85	17 600	0	414	2 855	500	0	1 514	4 009	913	2 194	2 427	6 203
1985–86	16 400	0	225	1 880	228	1 113	1 273	2 859	1 489	3 075	2 762	5 934
Total	164 529	0	846	11 545	728	1 352	4 980	11 712	5 244	11 556	10 224	23 268

[a] Numbers in brackets are estimates.

Table L. Harvesting and site preparation data for Yukon Territory Appendix 4

Year	Harvesting (ha)		Site preparation (ha)		
	Clear-cut	Other	Prescribed burning	Scarifi-cation	Other
1975–76	112	508	0	0	0
1976–77	104	456	0	0	0
1977–78	250	497	0	0	0
1978–79	299	636	0	0	0
1979–80	0	280	0	224	0
1980–81	58	0	0	0	0
1981–82	45	0	0	0	0
1982–83	43	0	0	0	0
Total	911	2 377	0	224	0

Table M. Stand treatments in British Columbia[a] Appendix 4

Year	Area of stand treatments (ha)					
	Fertilizing	Thinning	Pruning	Mechanical weeding	Chemical weeding	Total
1975–76	0	1 244	0	597	0	1 841
1976–77	0	6 906	0	2 827	0	9 733
1977–78	7 449	12 432	0	3 554	0	23 435
1978–79	9 017	15 102	0	2 467	0	26 586
1979–80	6 202	22 629	0	4 448	0	33 279
1980–81	5 516	22 425	0	2 936	0	30 877
1981–82	15 746	18 671	0	2 220	1 040	37 677
1982–83	5 759	15 849	0	2 176	2 247	26 031
1983–84	0	8 259	110	3 829	3 541	15 739
1984–85	4	13 418	933	5 849	10 661	30 865
1985–86	17	10 872	0	5 288	13 239	29 416
Total	49 710	147 807	1 043	36 191	30 728	265 479

[a] Provincial Crown land only.

Table N. Stand treatments in Saskatchewan Appendix 4

Year	Area of stand treatments (ha)			
	Thinning	Mechanical weeding	Chemical weeding	Total
1975–76	12	0	0	12
1976–77	10	0	0	10
1977–78	0	0	0	0
1978–79	0	0	0	0
1979–80	0	142	0	142
1980–81	0	121	0	121
1981–82	267	0	137	404
1982–83	68	192	0	260
1983–84	576	215	0	791
1984–85	1 227	590	0	1 817
1985–86	672	20	0	692
Total	2 832	1 280	137	4 269

Table O. Stand treatments in Ontario Appendix 4

Year	Area of stand treatments (ha)						
	Fertilizing[a]	Thinning	Pruning	Manual cleaning	Mechanical cleaning	Chemical[b] cleaning	Total
1975–76	844	19 857	1 221	4 805	0	6 550	33 277
1976–77	673	20 119	1 029	5 963	0	10 540	38 324
1977–78	547	24 349	1 823	8 780	23	17 328	52 850
1978–79	697	19 424	1 563	5 872	44	20 669	48 269
1979–80	366	13 617	1 632	6 665	16	16 932	39 228
1980–81	344	13 362	1 646	5 586	316	29 782	51 036
1981–82	355	11 444	1 609	4 553	462	23 021	41 444
1982–83	277	13 636	2 020	6 738	600	31 235	54 506
1983–84	254	12 738	1 575	7 136[c]	416	25 441	47 560
1984–85	129	12 089	1 900	8 802[d]	416	46 658	69 994
1985–86	636	15 686	3 148	11 541	538	61 289	92 838
Total	5 122	176 321	19 166	76 441	2 831	289 445	569 326

[a] Includes cultivation and drainage.
[b] Aerial and ground application.
[c] Includes 69 ha of other tending.
[d] Includes 14 ha of other tending.

Table P. Stand treatments in Quebec Appendix 4

Year	Area of stand treatments (ha)				
	Fertilizing	Thinning	Mechanical weeding	Chemical weeding	Total
1980–81	0	3 684	157	6 988	10 829
1981–82	0	7 428	1 159	4 099	12 686
1982–83	0	6 446	–[a]	–	6 446
1983–84	40	420	10 400	5 100	15 960
1984–85	20	1 500	15 000	4 700	21 220
1985–86	0	3 000	9 500	7 300	19 800
Total	60	22 478	36 216	28 187	86 941

[a] Not available.

Table Q. Stand treatments in New Brunswick Appendix 4

Year	Area of stand treatments (ha)				
	Fertilizing	Thinning	Mechanical weeding	Chemical weeding	Total
1975–76	0	0	0	0	0
1976–77	0	0	0	0	0
1977–78	0	671	0	361	1 032
1978–79	0	1 175	0	632	1 807
1979–80	0	2 235	0	1 201	3 436
1980–81	110	5 615	0	13 199	18 924
1981–82	42	5 058	42	12 476	17 618
1982–83	83	5 997	85	12 098	18 263
1983–84	0	3 000	488	27 000	30 488
1984–85	0	5 040	0	35 000	40 040
1985–86	0	5 300	0	30 400	45 700
Total	235	34 091	615	142 367	177 308

Table R. Stand treatments in Nova Scotia Appendix 4

	Area of stand treatments (ha)				
Year[a]	Fertilizing	Thinning	Mechanical weeding	Chemical weeding	Total
1979–80	0	1 248	1 871	437	3 556
1980–81	0	6 015	146	1 290	7 451
1981–82	0	6 698	0	2 566	9 264
1982–83	0	4 477	22	1 424	5 923
1983–84	106	5 378	0	1 649	7 133
1984–85	0	6 913	113	6 089	13 115
1985–86	0	6 400	330	9 796	16 526
Total	106	37 129	2 482	23 251	62 968

[a] Breakdown of 7609 ha of stand treatments from 1975–76 to 1978–79 is not available.

Table S. Stand treatments in Prince Edward Island Appendix 4

	Area of stand treatments (ha)				
Year	Fertilizing	Thinning	Mechanical weeding	Chemical weeding	Total
1979–80	0	20	0	0	20
1980–81	0	45	1	3	49
1981–82	0	248	4	1	353
1982–83	0	1 024	0	88	1 112
1983–84	0	755	39	20	814
1984–85	0	534	26	147	707
1985–86	0	438	12	406	856
Total	0	3 064	82	765	3 911

Table T. Stand treatments in Newfoundland Appendix 4

	Area of stand treatments (ha)			
Year	Fertilizing	Thinning	Stand reclamation[a]	Total
1975–76	57	156	0	213
1976–77	0	196	0	196
1977–78	16	1 912	0	1 928
1978–79	0	1 976	0	1 976
1979–80	41	1 651	629	2 321
1980–81	0	1 597	1 409	3 006
1981–82	28	2 385	1 835	4 248
1982–83	0	3 566	1 184	4 750
1983–84	98	3 652	1 809	5 559
1984–85	79	4 076	2 050	6 205
1985–86	0	5 868	927	6 795
Total	319	27 035	9 843	37 197

[a] Includes manual and chemical weeding.