

PESTICIDE USE
IN BRITISH COLUMBIA FORESTRY

1983

by
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Protection Branch

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FOREWORD

"Pesticide Use in British Columbia Forestry, 1983" is the third annual report of its kind resulting from surveys conducted through a cooperative project by the B.C. Council of Forest Industries, the B.C. Ministry of Environment and the B.C. Ministry of Forests. Information gathered for this report represents all forestry pesticide use permits issued by the B.C. Pesticide Control Branch in 1983, plus those issued in previous years which were active in 1983. Tables and graphs depict amounts of each pesticide used, and respective areas treated. Also, included is such information as: areas treated by control purpose and pesticide used; areas treated by forest region and pesticide used; areas treated by method of application and pesticide used; areas treated by forest type; areas scheduled for treatment compared to areas actually treated by pesticide; reasons for pesticide use permit cancellations by area affected; as well as herbicide use trends from 1975 - 1983.

INTRODUCTION

"Pesticide use in British Columbia Forestry, 1983" is the third report of its kind, resulting from an ongoing cooperative project by the B.C. Council of Forest Industries, the B.C. Ministry of Forests and the B.C. Ministry of Environment (Pesticide Control Branch), to establish accurate records of annual pesticide use on B.C. forest and rangeland.

Information on 1983 forestry pesticide use was obtained from a survey of all B.C. pesticide users conducted by the Ministry of Environment (Pesticide Control Branch). Data summarized in tabulations and illustrated graphically in this report include:

- (1) Numbers of 1983 pesticide use permits issued; implemented, cancelled and appealed.
- (2) Environmental Appeal Board decisions on all appealed permits.
- (3) Total hectares of forest land treated with pesticides.
- (4) Total kilograms of pesticide active ingredient applied to forest land.
- (5) Total hectares of forest land treated with pesticide by control purpose - e.g. conifer release, pre-commercial thinning, insect control;
- (6) Total hectares of forest land treated with pesticides by method of treatment - e.g. tree injection methods, aerial helicopter spray;
- (7) Total hectares of forest land treated with pesticides by forest stand type identity - e.g. mature, immature, not satisfactorily restocked;

- (8) Total hectares of forest land treated with pesticides by forest region - e.g. Prince George, Nelson, Kamloops.

The above mentioned data is further differentiated by:

- (i) User - e.g. B.C. Forest Service, B.C. forest industry or a combination of both.
- (ii) Pesticide used - e.g. 2,4-D amine, glyphosate;
- (iii) Type of pesticide - e.g. herbicide, fungicide, insecticide;
- (iv) Project type - e.g. research or operational.

Other graphical comparisons include:

- (1) Areas scheduled for pesticide treatments compared to areas actually treated;
- (2) Reasons for pesticide use permit cancellations by area affected;
- (3) Total areas of forest land treated with herbicides by the B.C. Forest Service and B.C. forest industry, 1975-1983.

Also included as appendices are two graphs, one comparing herbicide use to other types of vegetation management practices employed by the B.C. Forest Service, and the other comparing forestry pesticide use to agricultural pesticide use in western Canada.

A similar compilation is underway for pesticides used in 1984 for purposes of forest management in B.C. In the future, it is anticipated that these summary reports will be issued soon after the end of the year denoted, mainly as a result of an improved information storage - retrieval process.

FORESTRY PESTICIDE USE INFORMATION SYSTEMS

Forestry pesticide use information will continue to be gathered on an annual basis by the Ministry of Environment, Pesticide Control Branch. An example of the 1984 pesticide use follow-up form issued by the Pesticide Control Branch is shown in Figure 1.

In 1984, the Pesticide Control Branch established a new pesticide permit information system on the ENVI VAX computer which can be accessed by local and remote terminals. This system was constructed to assist in the permit approval process and is also able to provide basic information to general pesticide users on permits on a daily basis. Summary information on overall pesticide use by active ingredient, location, user, application method, et cetera, will also be available by request.

The Ministry of Forests plans to obtain direct access to this information through its own terminal located in Protection Branch. This will allow for the addition and update of forestry pesticide use survey data for use in future reports.

Figure 1. 1984 FOLLOW-UP FORM ISSUED TO FOREST PESTICIDE USE PERMIT HOLDERS, BY THE B.C. PESTICIDE CONTROL BRANCH



Province of
British Columbia

Ministry of
Environment

Pesticide Control Branch
810 Blanshard Street
Victoria
British Columbia
V8V 1X5
Telephone: 387-4321

Pesticide Use Follow-up Report

1984

To Permit Holder:

Re: Actual Pesticide Use Under Permit

Please complete and return this form prior to December 31, 1984.

Pesticide Use in 1984 Under Permit No. _____

Pesticide	Quantity of Active Ingredient Used (kg)	Area Treated (ha)
Total area:		

STAND INFORMATION (if applicable, refer to back for explanation of terms)

Type Identity _____

Treated Stand Type Label:

1. Species & % _____
2. Average Age _____
3. Average Height (m) _____
4. Average dbh & Range (cm) _____
5. Site Class _____
6. Crown Closure (%) _____
7. Stems/ha _____

Height of Target Species (m) _____

If no work was conducted under this permit in 1984 please give reason.

RESULTS OF THE 1983 B.C. FORESTRY PESTICIDE USE SURVEY

A total of 138 forestry pesticide use permits were issued by the Pesticide Control Branch in 1983, of which 89 or 64 percent were actually implemented. Forty-nine or 35 percent were cancelled or postponed by the permit holder or the Pesticide Control Branch (Table I).

Only five forestry pesticide use permits were appealed in 1983 compared to 39 in 1982 (Table II). None of the appealed permits were cancelled as a result of Environmental Appeal Board decisions but two were amended.

The herbicide 2,4-D amine/ester was applied to 5 203.1 hectares or 74 percent of B.C. forest and rangelands treated with pesticides in 1983 (Table III, Figure 2). This area was almost twice as large as areas treated with 2,4-D in 1982 (2 802.2 hectares) and 1981 (2 762.2 hectares).

Three other major pesticides used in 1983 in terms of area were MSMA, glyphosate and picloram with, respectively, 1 044.4, 284.4 and 257.1 hectares treated.

In terms of weight, the three most commonly used pesticides were 2,4-D amine/ester, MSMA and fosamine with, respectively, 6 568.8, 720.7 and 283.7 kilograms of active ingredients applied. A total of 243.6 kilograms of glyphosate, 166.5 kilograms of picloram and 156.7 kilograms of other pesticides were also used (Table III, Figure 3).

The greatest use of pesticides occurred in the Vancouver, Nelson and Prince George Forest Regions with 4 718.9, 941.3, and 756.4 hectares treated respectively (Table IV, Figure 4).

Vegetation management on conifer plantations, mainly for the purpose of conifer release, remained as in 1981 and 1982 the dominant type of pesticide application. In 1983, 4 617.7 hectares were treated for this purpose compared with 3 636.7 hectares in 1981 and 2 664.7 hectares in 1982.

Other types of stand tending operations using herbicides (i.e. site preparation, pre-commercial thinning, seed tree and brush control) were conducted on 719.9 hectares. Right-of-way maintenance and rangeland noxious weed control respectively accounted for 488.4 and 354.9 treated hectares (Table V, Figure 5).

Insect pest control was practiced on 811.8 hectares of forest land of which 796.2 hectares involved scattered individual "trap trees" treated with MSMA for bark beetle control. Other insecticides listed were used to control the Douglas-fir tussock moth and forest nursery and seed orchard insects (Table VI, Figure 5).

Tree injection methods (e.g. hack and squirt, frill and squirt, etc.) to control unwanted vegetation, mostly involving conifer release operations, were used on 5 819.8 hectares of forest land. Backpack sprayers, truck mounted

spray booms and hand held powerhose nozzle equipment were used to apply pesticides to 874 hectares, while only 271.8 hectares were treated by helicopters or fixed wing aircraft (Table VII, Figure 6).

A total of 4 832.6 hectares of immature stands and 1 096.1 hectares of mature stands were treated with pesticides in 1983. A further 703.5 hectares of rangeland, roadsides and forest nurseries and seed orchards also received pesticide treatments (Table VIII, Figure 7).

More area scheduled for pesticide treatments was actually treated in 1983 than the previous year. In 1982 only 45 percent of scheduled area was actually treated, while 58 percent of scheduled area was treated in 1983 (Table IX, Figure 8).

Of the reasons given for pesticide use permit cancellations, 911.2 hectares were not treated because of lack of funding and/or manpower, 424.3 hectares were not treated because of technical problems, 315.7 hectares were not treated because of Pesticide Control Branch or permit holder cancellations and 264.4 hectares were not treated because of project postponements (Figure 9).

Overall area treated with herbicides in 1983 was 6 181 hectares, approximately 2 000 hectares more than the previous year but still slightly below the 1981 ten-year peak of 6 593 hectares (Figure 10).

TABLE I. THE FATE OF 1983 PESTICIDE USE PERMITS ISSUED
BY THE B. C. PESTICIDE CONTROL BRANCH, MINISTRY OF ENVIRONMENT

	B.C. FOREST SERVICE		FOREST INDUSTRY		TOTAL	
	#	%	#	%	#	%
PERMITS ISSUED (TOTAL)	99	100	39	100	138	100
PERMITS IMPLEMENTED BY HOLDER	55	55.6	34	87.2	89	64.5
PERMITS CANCELLED OR POSTPONED BY HOLDER	30	30.3	4	10.2	34	24.6
PERMITS CANCELLED BY THE PESTICIDE CONTROL BRANCH	14	14.1	1	2.6	15	10.9

TABLE II. THE FATE OF APPEALED 1983 PESTICIDE USE PERMITS
AS DETERMINED BY THE B.C. ENVIRONMENTAL APPEAL BOARD

	B.C. FOREST SERVICE #	FOREST INDUSTRY #	TOTAL #
PERMITS APPEALED	3	2	5
APPEALED PERMITS CANCELLED	0	0	0
APPEALED PERMITS AMENDED	0	2	2
APPEALED PERMITS SUPPORTED	2	0	2
APPEALS WITHDRAWN	1	0	1

TABLE III. SUMMARY OF PESTICIDE USE¹, 1983

PESTICIDE	B.C. FOREST SERVICE			FOREST INDUSTRY		
	OP ²	ha treated RES ³	kg a.i. OP RES	ha treated OP RES	kg a.i. OP RES	
ACEPHATE	2.8	0.5	3.9 0.06			
ASULAM	2.1	0.0	4.5 0.0	3.0 0.0	7.5 0.0	
B.T.	0.0	0.5	0.0 15 BIU ⁵			
CARBARYL	0.0	1.0	0.0 0.3	3.8 0.0	1.0 0.0	
CARBOFURAN	0.0	0.5	0.0 0.6			
CHLORPYRIFOS	0.0	5.0	0.0 13.0			
DIMELAMINE SELENITE				0.0 0.0	0.0 0.7	
FERBAM	0.0	2.4	0.0 0.02			
FOSAMINE	28.1	0.0	192.4 0.0	19.7 0.0	91.3 0.0	

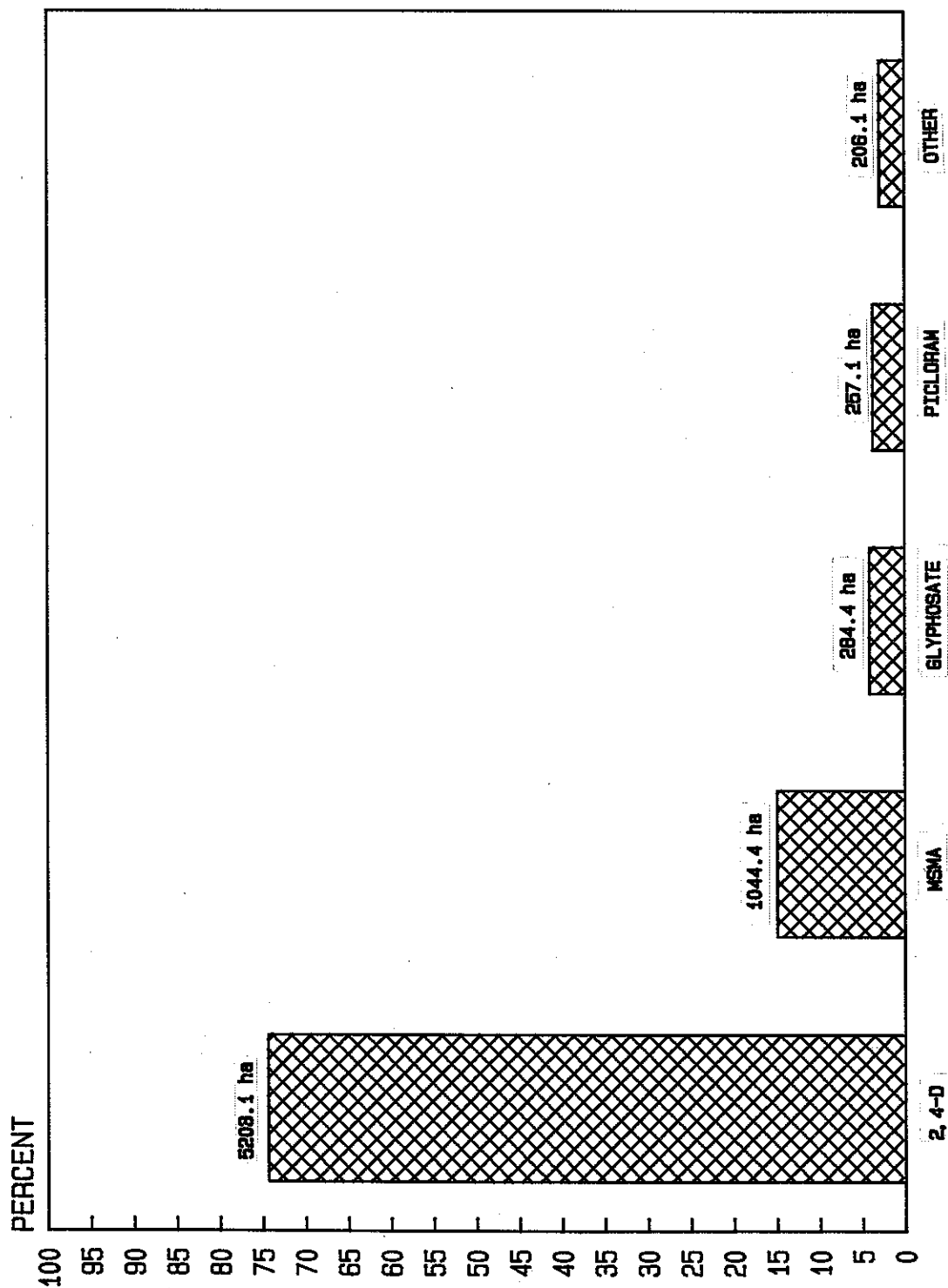
1. Data presented includes pesticides applied to rangeland administered by the B.C. Forest Service.
2. Operational Projects.
3. Research Projects.
4. PIB - Polyhedral Inclusion Bodies.
5. BIU - Billion International Units.

TABLE III. SUMMARY OF PESTICIDE USE¹, 1983

PESTICIDE	B.C. FOREST SERVICE			FOREST INDUSTRY		
	ha treated OP ²	RES ³	kg a.i. OP	ha treated OP	kg. a.i. OP	RES
GLYPHOSATE	0.0	216.2	0.0	4.2	64.0	4.5 27.5
HEXAZINONE	0.0	9.0	0.0	0.0	0.4	0.0 2.0
MSMA	715.0	80.0	5.0	249.2	0.2	708.5 1.2
NAOPROMIDE	0.0	0.1	0.0			
N.P. VIRUS	0.0	0.5	0.0			125 PIB ⁴
OXYDEMEION-METHYL	0.0	1.0	0.0			0.6
OXYFLUORFEN				0.0	0.02	0.0 0.01
PICLORAM	257.1	0.0	166.5			0.0
PROMETRYN	0.0	28.5	0.0			22.2
PROPAZINE	0.0	69.2	0.0			45.6
TRICLOPYR	0.0	27.5	0.0	0.0	0.5	0.0 1.8
2,4-D AMINE	1947.4	0.5	3173.0	3255.2	0.01	3395.2 0.01

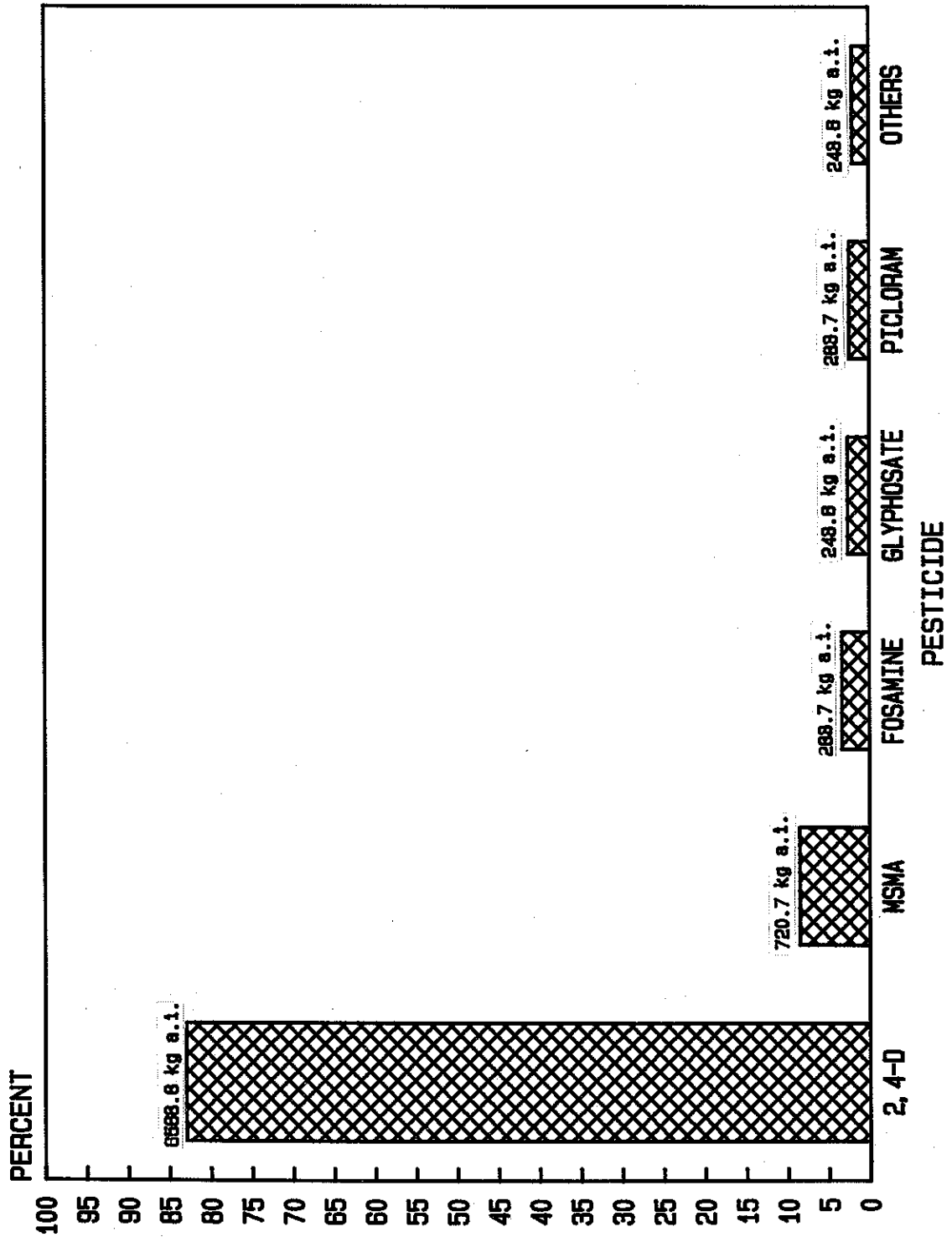
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FIGURE 2. PERCENT PESTICIDE USE BY AREA TREATED, 1983¹



¹ B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

FIGURE 3. PERCENT PESTICIDE USE BY WEIGHT OF ACTIVE INGREDIENT, 1983 ¹



¹ B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

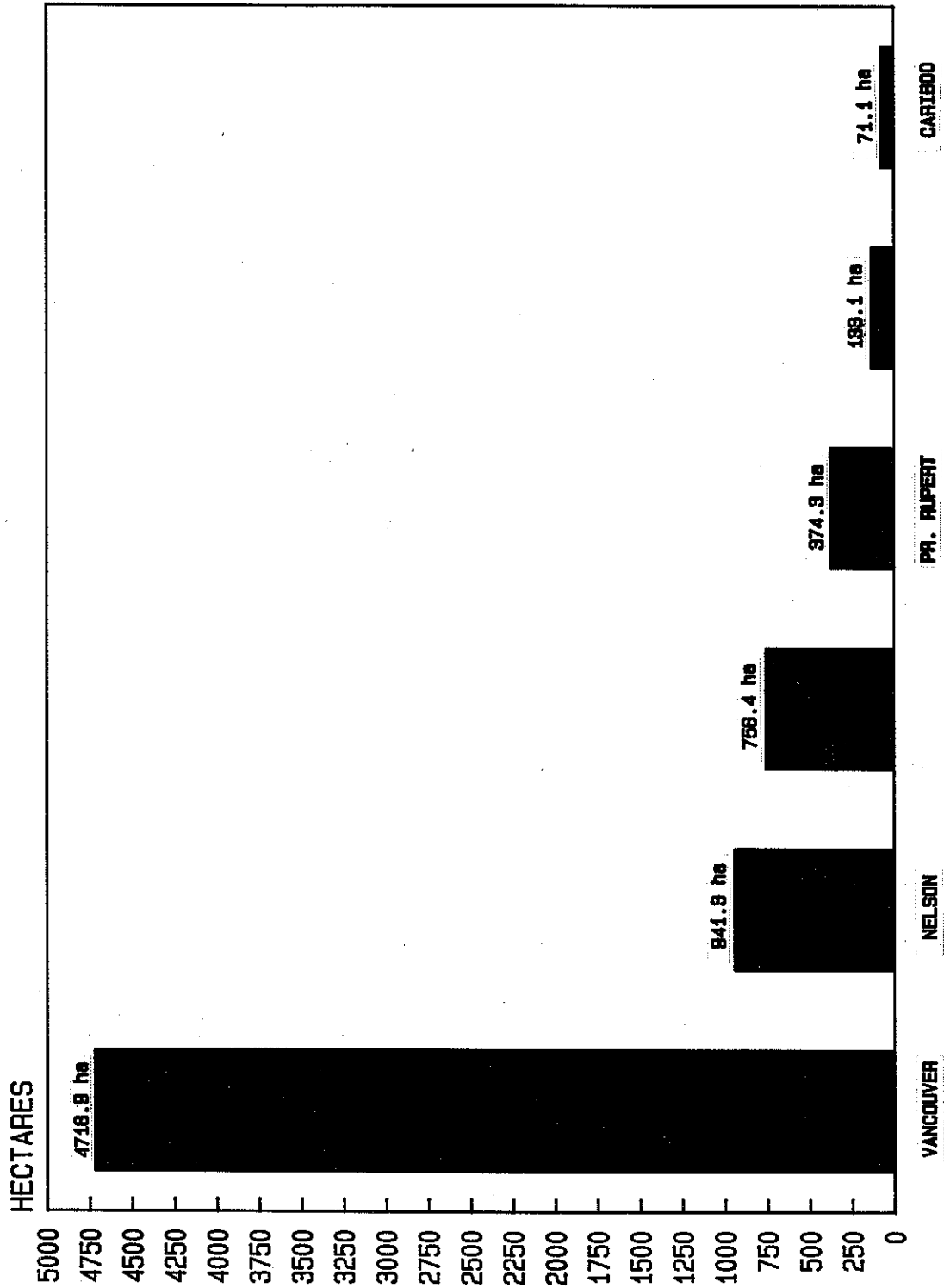
TABLE IV. SUMMARY OF PESTICIDE USE BY FOREST REGION, 1983

PESTICIDE	HECTARES TREATED											
	Vancouver BCFS	FI	Prince Rupert BCFS	FI	Prince George BCFS	FI	Nelson BCFS	FI	Kamloops BCFS	FI	Cariboo BCFS	FI
ACEPHATE	0.5	3.0							2.8			
ASULAM	2.0						0.06					
B.t.									0.5			
CARBARYL			0.5			3.8			0.5			
CARBOFURAN	0.5											
CHLORPYRIFOS					5.0							
FERBAM									2.4			
FOSAMINE	28.1	19.7										
GLYPHOSATE	171.8	67.6	32.0		11.2	0.6	1.2					
HEXAZINONE					9.0						0.4	
MSMA		248.2			5.0		790.0	1.2				

TABLE IV. SUMMARY OF PESTICIDE USE BY FOREST REGION 1983

PESTICIDE	HECTARES TREATED											
	Vancouver BCFS	FI	Prince Rupert BCFS	FI	Prince George BCFS	FI	Nelson BCFS	FI	Kamloops BCFS	FI	Cariboo BCFS	FI
NAOPROMIDE	0.1											
N.P. VIRUS									0.5			
OXYDEMETON METHYL	1.0											
OXYFLUORFEN										0.02		
PICLORAM					12.2		47.8		126.0		71.1	
PROMETRYN	28.5											
PROPAZINE	69.2											
TRICLOPYR	27.5	0.5										
2,4-D	1359.7	2691.0	302.0	39.8	280.2	429.4	6.0	95.0				

FIGURE 4. AREA TREATED WITH PESTICIDES BY FOREST REGION, 1983 ¹



¹ B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

TABLE V. HERBICIDE USE BY CONTROL PURPOSE, 1983

PURPOSE	HERBICIDES USED	B.C. FOREST SERVICE ha Treated	kg a.i. used	FOREST INDUSTRY ha treated	kg a.i. used
BRUSH CONTROL	Glyphosate 2,4-D	0.8	1.9	1.5	4.7
CONIFER RELEASE	Asulam Glyphosate Hexazinone Triclopyr 2,4-D	205.2 27.0 1575.9	179.3 12.9 2896.5	3.0 64.1 0.4 0.5 2741.6	7.5 27.0 2.0 1.8 2196.5
NOXIOUS WEED CONTROL	Napropamide Oxyfluorfen Picloram Prometryn Propazine	0.1 257.1 28.5 69.2	0.2 166.5 22.2 45.6	0.02	0.01
PRE-COMMERCIAL THINNING	MSMA			248.2	707.0

TABLE V. HERBICIDE USE BY CONTROL PURPOSE, 1983

PURPOSE	HERBICIDES USED	B.C. FOREST SERVICE ha Treated	kg a.i. used	FOREST INDUSTRY ha treated	kg a.i. used
RIGHT-OF-WAY MAINTENANCE	Fosamine Glyphosate 2,4-D	28.1	192.4	19.7	91.3
				3.5	3.7
				437.1	1094.0
SEED TREE CONTROL	Triclopyr 2,4-D	0.5	0.4	75.0	100.0
		13.6	21.9		
SITE PREPARATION	Asulam Glyphosate Hexazinone 2,4-D	2.1	4.5	0.6	1.3
		10.2	30.3		
		9.0	39.3		
		358.4	255.1		

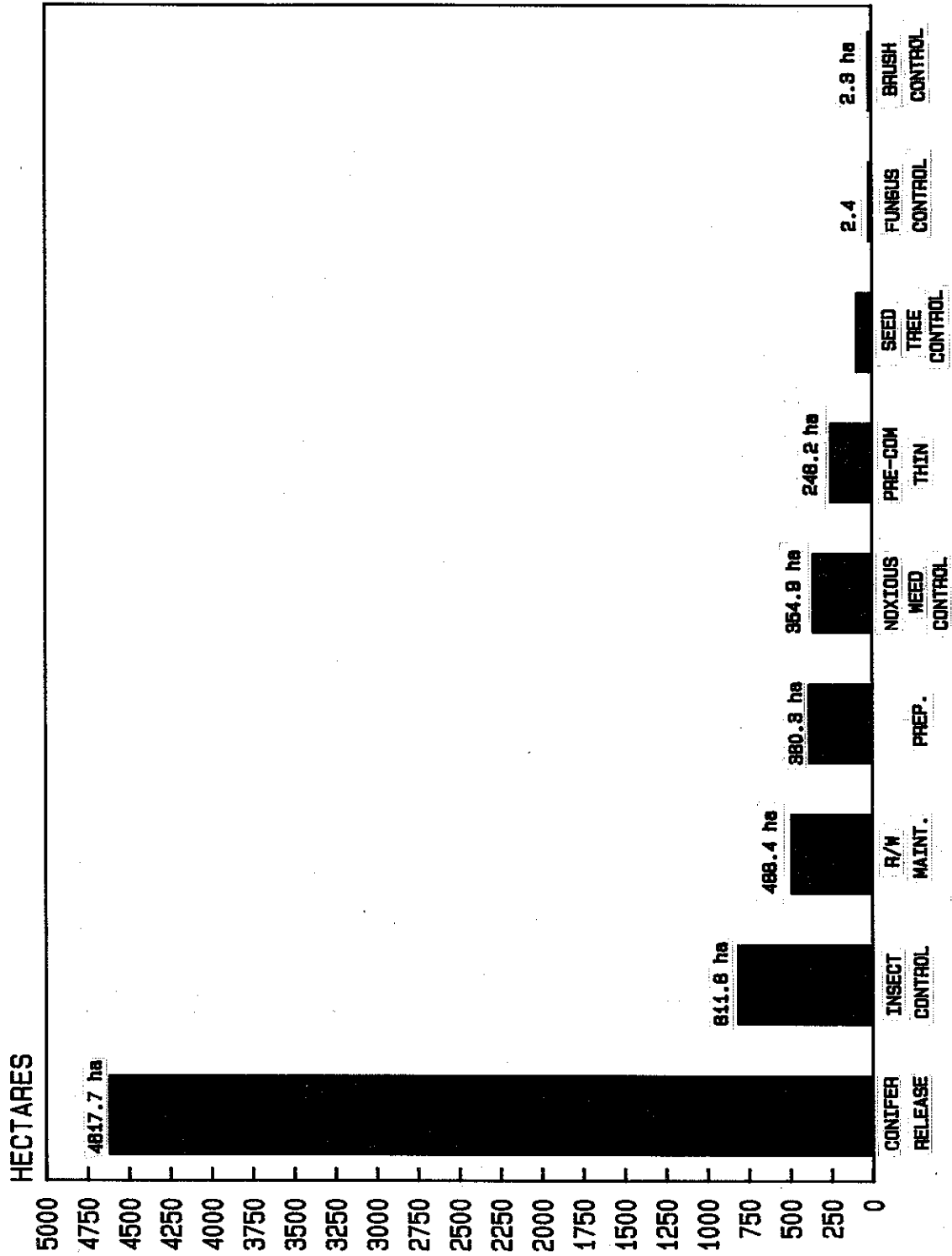
TABLE VI. INSECTICIDE AND OTHER TYPES OF PESTICIDE USE BY CONTROL PURPOSE, 1983

PURPOSE	INSECTICIDES AND OTHER PESTICIDES USED	B.C. FOREST SERVICE ha treated	kg a.i. used	FOREST INDUSTRY ha Treated	kg a.i. used
INSECT CONTROL	Acephate	3.3	4.0		
	B.t.	0.5	15.0 BIU ¹		
	Carbaryl	1.0	0.3	3.8	1.0
	Carbofuran	0.5	0.6		
	Chlorpyrifos	5.0	12.9		
	MSMA	795.0	11.4	1.2	2.7
	NPV	0.5	125.0 PIB ²		
	Oxydemeton-Methyl	1.0	0.6		
<hr/>					
FUNGUS CONTROL	Ferbam	2.4	0.024		
<hr/>					
VERTEBRATE CONTROL	Dimelamine Selenite			0.0	0.7

¹ BIU = Billion International Units

² PIB = Polyhedral Inclusion Bodies

FIGURE 5. SUMMARY OF THE PURPOSE OF PESTICIDE USE BY AREA TREATED, 1983¹



¹ B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

TABLE VII. PESTICIDE USE BY METHOD OF APPLICATION, 1983

METHOD OF APPLICATION	PESTICIDES USED	B.C. FOREST SERVICE ha TREATED	FOREST INDUSTRY ha TREATED
AERIAL SPRAY FIXED WING	Acephate	2.8	0.0
	Total	2.8	0.0
AERIAL SPRAY HELICOPTER	Glyphosate	9.5	0.0
	Hexazinone	9.0	0.0
	Triclopyr	27.0	0.0
	2,4-D	223.5	0.0
	Total	269.0	0.0
BACKPACK	Asulam	0.1	
	B.t.	0.5	
	Carbaryl	1.0	3.8
	Glyphosate	158.6	1.3
	Napropamide	0.1	
	Oxyfluorfen		0.02
	Picloram	83.3	
	Triclopyr	0.5	0.5
	2,4-D	6.0	1.5
	Total	250.1	7.12
POWERHOSE ¹ NOZZLE	Asulam		3.0
	Ferbam	2.4	
	Fosamine		6.4
	Glyphosate	4.0	
	Picloram	173.8	
	2,4-D	17.3	269.7
	Total	197.5	279.1

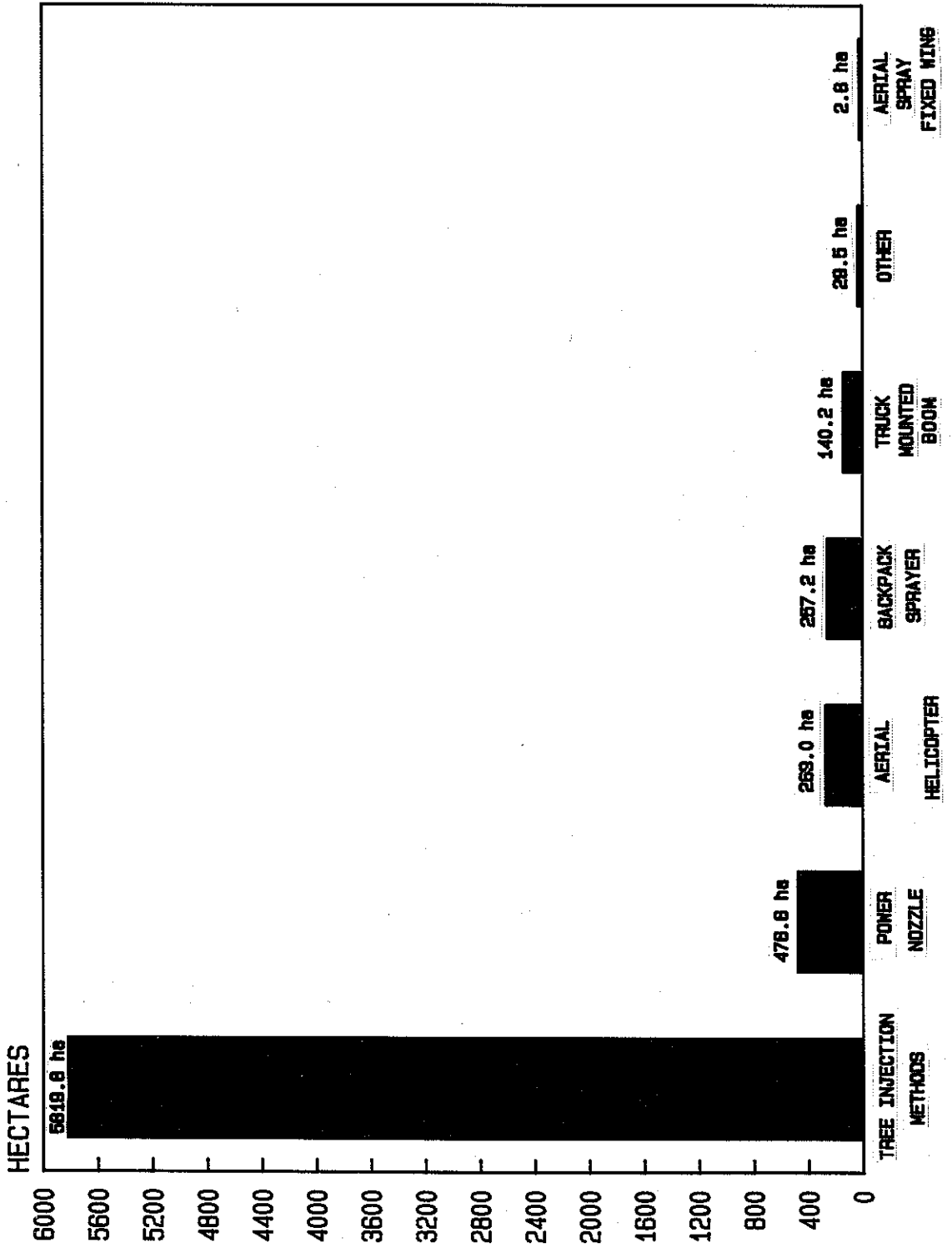
¹ Any system which involves tank, hose and nozzle. Nozzle is hand held and can be selectively directed. System may be truck or trailer mounted.
(Source: Ministry of Environment, Pesticide Control Branch)

TABLE VII. PESTICIDE USE BY METHOD OF APPLICATION, 1983

METHOD OF APPLICATION	PESTICIDES USED	B.C. FOREST SERVICE ha TREATED	FOREST INDUSTRY ha TREATED
TREE INJECTION TREATMENTS (hack & squirt, frill & squirt, cut stump, etc.)	Acephate	0.5	
	Chlorpyrifos	5.0	
	Glyphosate	44.0	63.4
	MSMA	795.0	249.4
	Oxydemeton-methyl	0.5	
	2,4-D	1701.1	2960.9
	Total	2546.1	3273.7
TRUCK MOUNTED ² SPRAY BOOM	Asulam	2.0	
	Fosamine	28.1	13.3
	Glyphosate		3.5
	NPV	0.5	
	Oxydemeton-methyl	0.5	
	Propazine	69.2	
	2,4-D		23.1
	Total	100.3	39.9
OTHER	Carbofuran	0.5	
	Glyphosate	0.1	
	Hexazinone		0.4
	Prometryn	28.5	
	Total	29.1	0.4

² Any system which involves a boom with one or more nozzles attached which creates a continuous broadcast spray. (Source: Ministry of Environment, Pesticide Control Branch).

FIGURE 6. SUMMARY OF METHODS OF PESTICIDE APPLICATION BY AREA TREATED, 1983¹



¹ B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

TABLE VIII. AREAS TREATED BY FOREST INVENTORY TYPE IDENTITY, 1983¹

TYPE IDENTITY ¹	HECTARES TREATED		
	B.C. FOREST SERVICE	FOREST	TOTAL INDUSTRY
IMMATURE	1647.4	3185.2	4832.6
MATURE	1087.7	8.4	1096.1
RESIDUAL	143.3	0.0	143.3
NON SATISFACTORILY RESTOCKED	129.0	0.6	129.6
NON-COMMERCIAL	0.0	90.0	90.0
NON-FOREST	0.0	0.0	0.0
DISTURBED, STOCKING DOUBTFUL	0.0	0.0	0.0
NOT APPLICABLE ²	387.5	316.0	703.5

1. Reference: Province of British Columbia, Ministry of Forests, May, 1979. Silviculture Manual, Chapter 4, Appendix 4 - 6.
2. Represents all pesticide applications to rangeland, roadsides and forest nurseries and seed orchards.

FIGURE 7. AREA OF FOREST TYPE IDENTITY TREATED WITH PESTICIDES, 1983

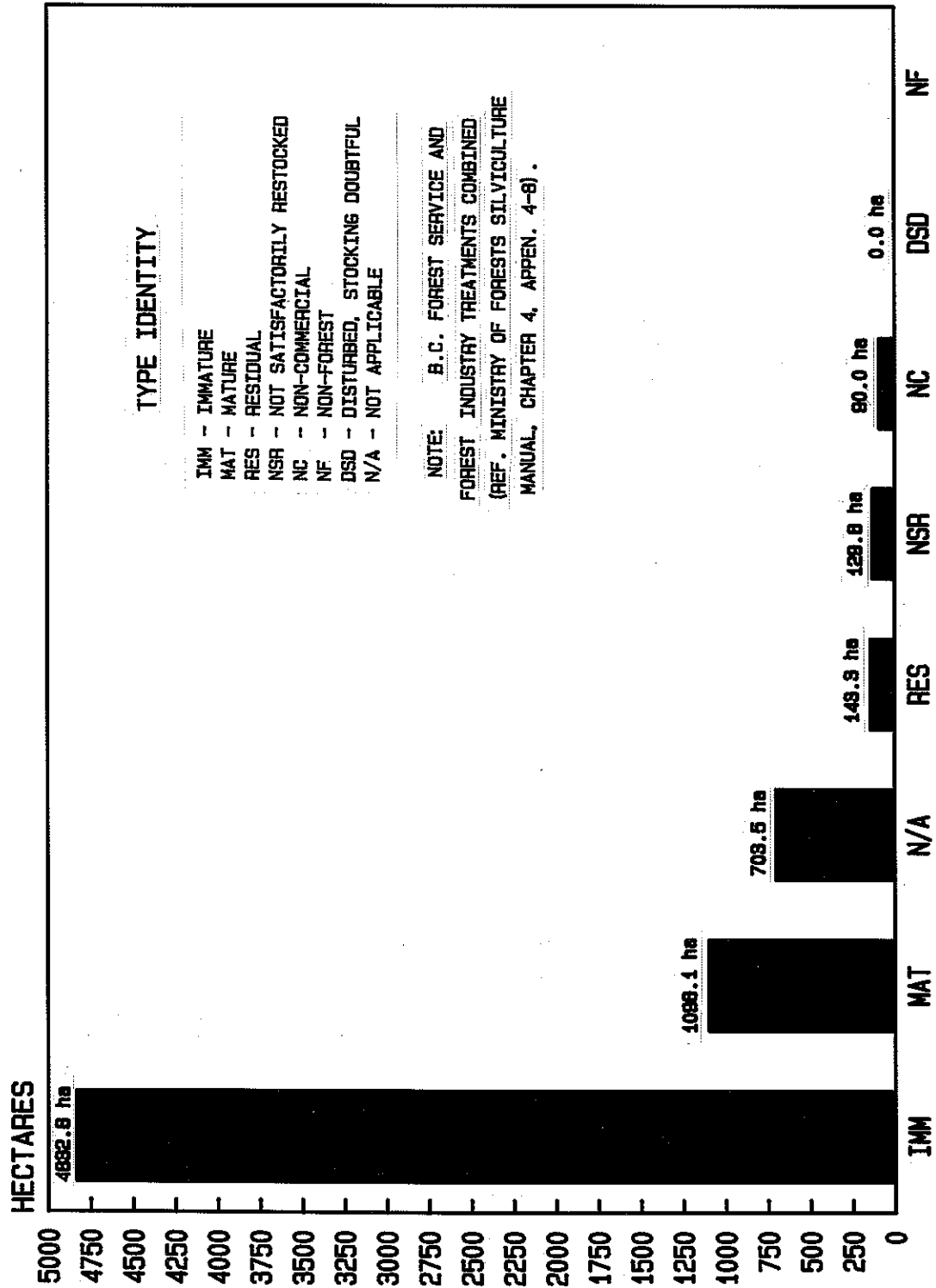
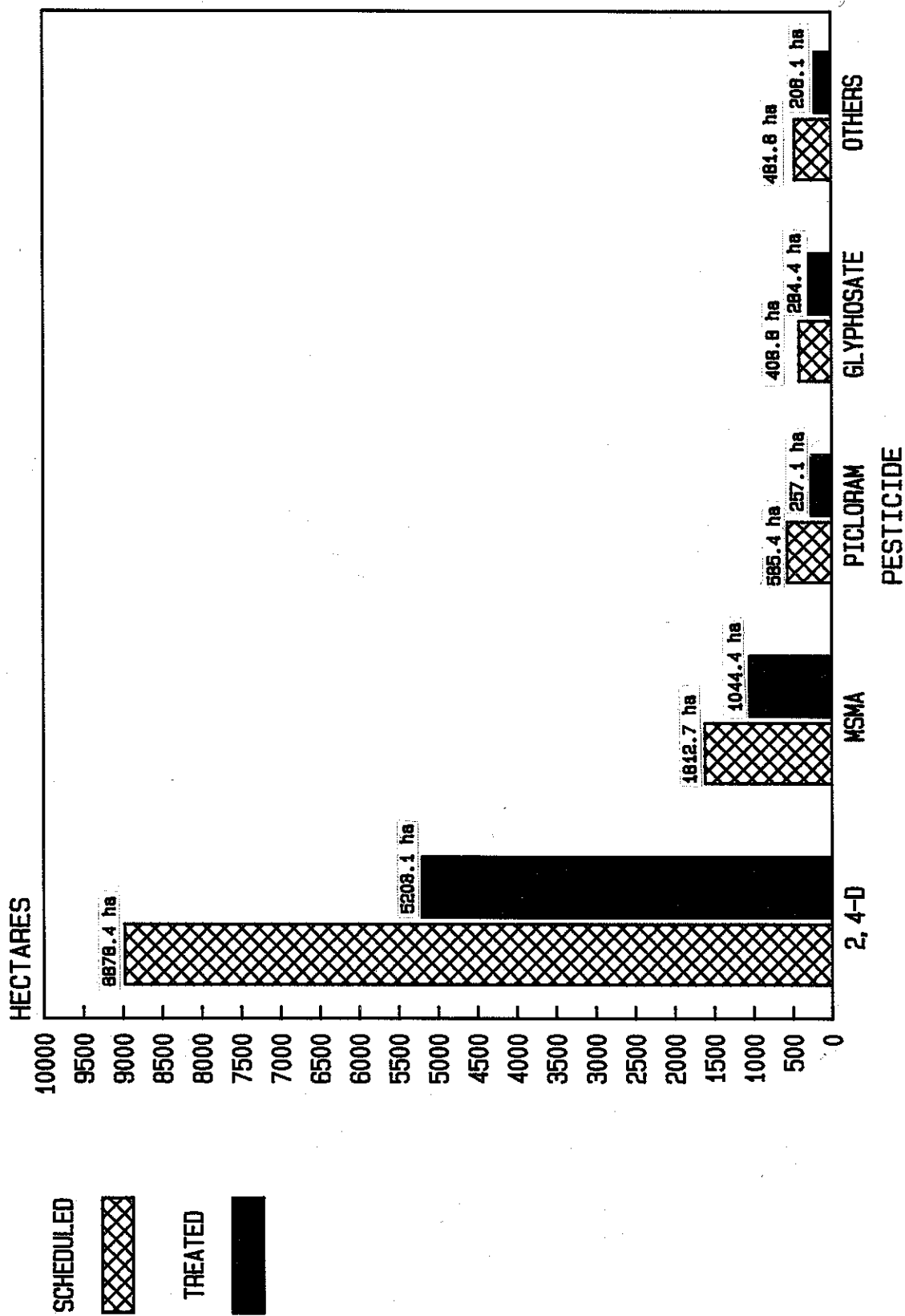


TABLE IX. COMPARISON OF AREAS SCHEDULED FOR PESTICIDE TREATMENT WITH AREAS ACTUALLY TREATED, 1983

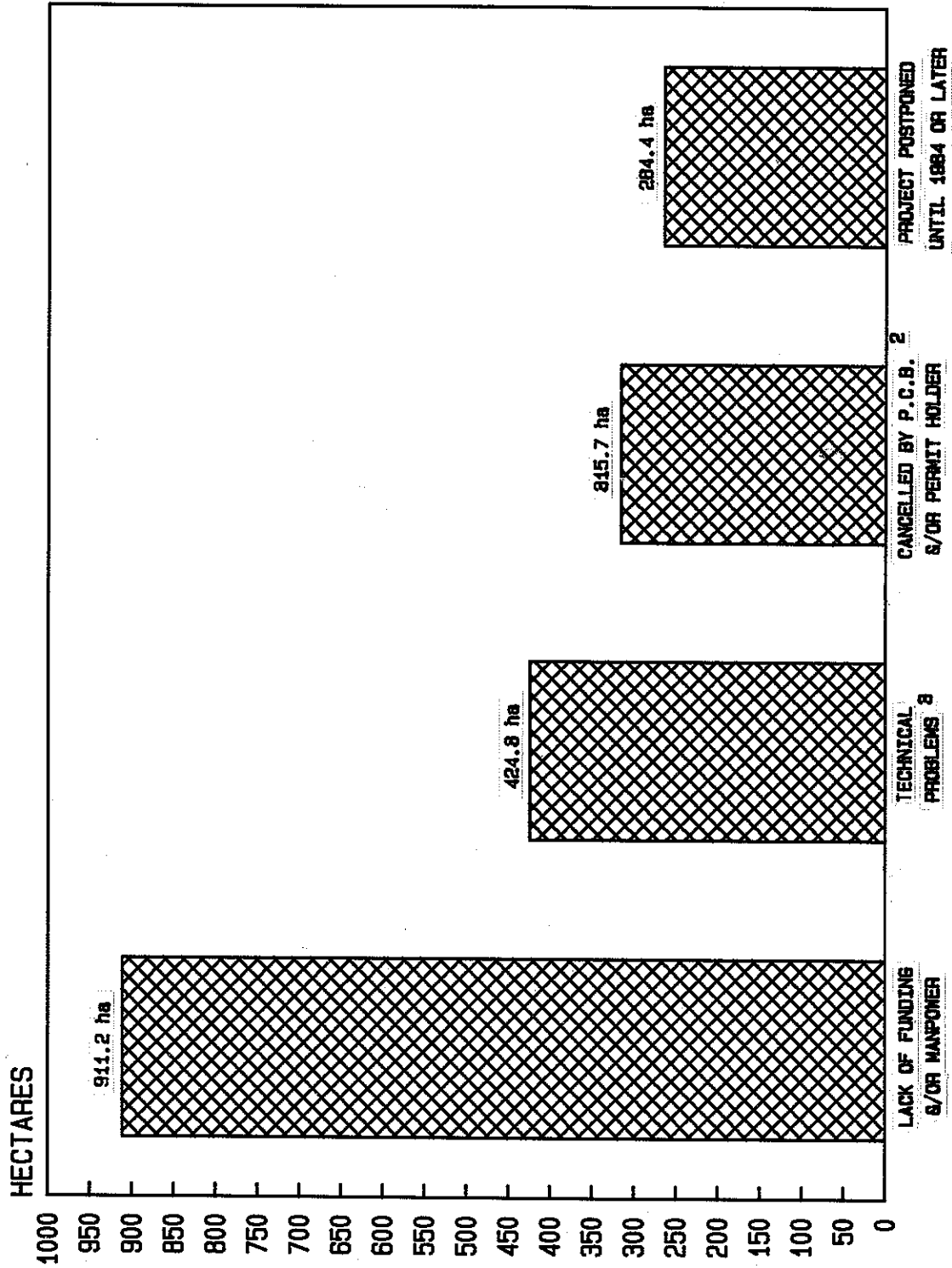
PESTICIDE	B.C. FOREST SERVICE		FOREST INDUSTRY	
	Hectares scheduled for treatment	Hectares actually treated	Hectares scheduled for treatment	Hectares actually treated
2,4-D AMINE	3640.6	1947.9	5337.8	3255.2
MSMA	1158.7	795.0	454.0	249.4
PICLORAM	565.4	257.1	0.0	0.0
GLYPHOSATE	295.8	216.2	113.1	68.2
OTHERS	373.8	178.7	87.8	27.4
TOTALS	6034.3	3394.9	5992.7	3600.2

FIGURE 8. COMPARISON OF AREA SCHEDULED FOR PESTICIDE TREATMENTS WITH AREA ACTUALLY TREATED, 1983¹



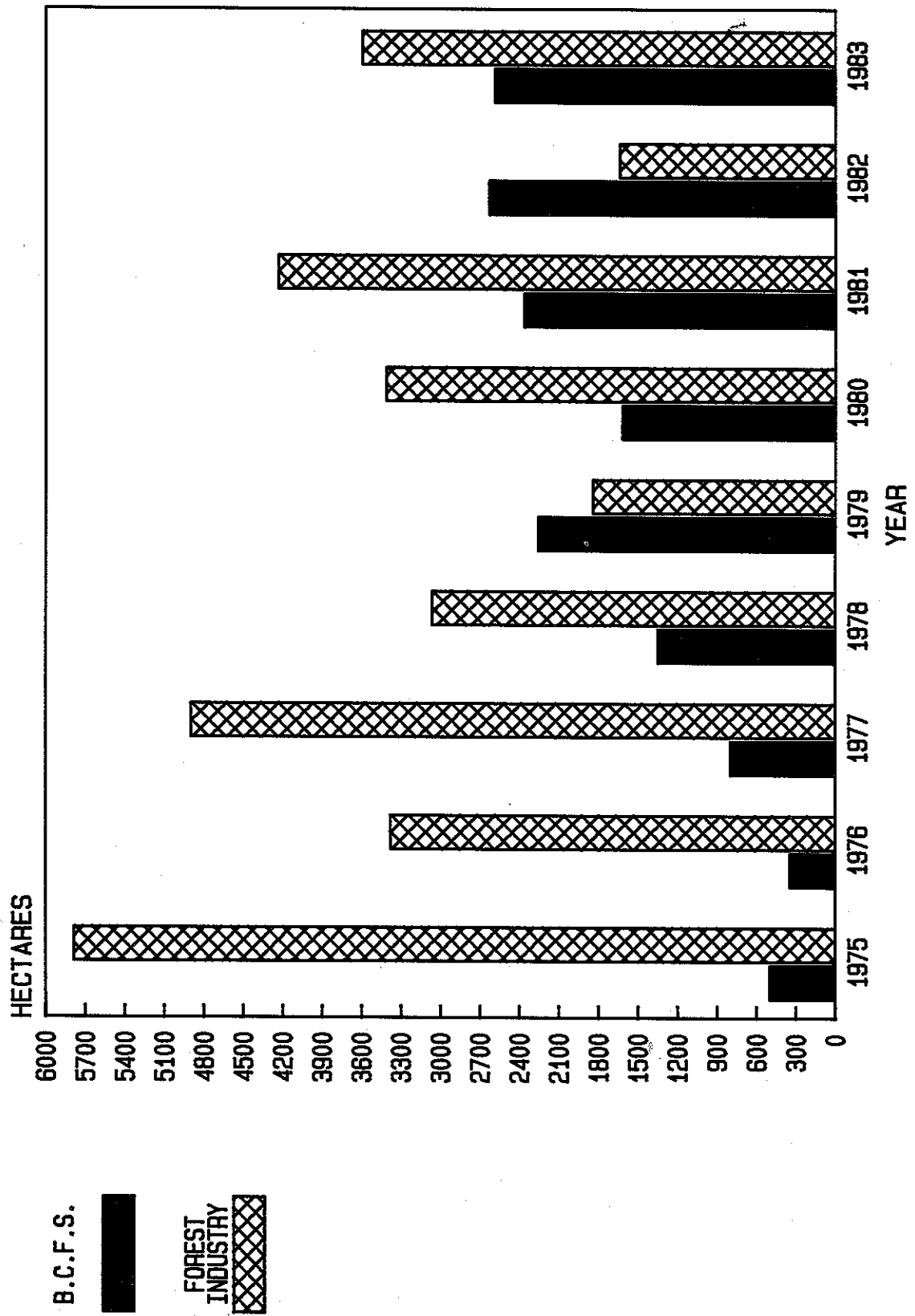
¹ B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

FIGURE 9. REASONS FOR PESTICIDE USE PERMIT CANCELLATIONS BY AREA AFFECTED, 1983¹



1. B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED.
2. P.C.B. - PESTICIDE CONTROL BRANCH, B.C. MINISTRY OF ENVIRONMENT.
3. INCLUDES ADVERSE WEATHER, EQUIPMENT PROBLEMS ETC.

FIGURE 10. TOTAL HECTARES OF LAND TREATED WITH HERBICIDES FOR FORESTRY PURPOSES, 1975-1983



DISCUSSION AND CONCLUSIONS

B.C. forestry pesticide use rebounded slightly in 1983 from the previous year which was beset by budget and staffing problems related to the current economic recession. More pesticide use projects had to be cancelled or postponed in 1982 than in 1983.

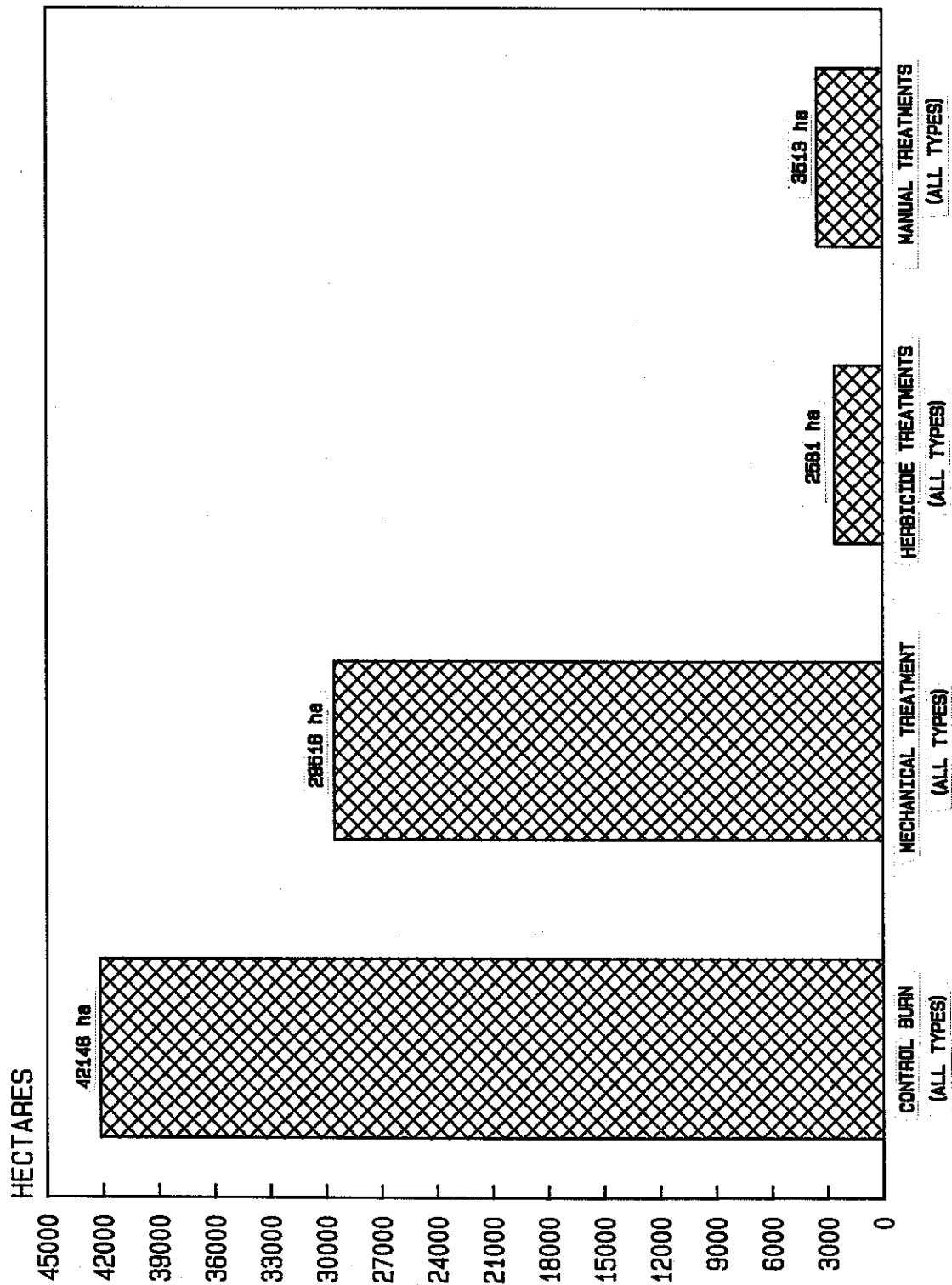
Herbicide applications to achieve stand tending goals remained the main purpose of pesticide use. Insecticides were mostly employed by the B.C. Forest Service for bark beetle control.

The use of 2,4-D increased markedly in 1983 from the previous two years and this may have resulted from the anticipated, but temporarily aborted registration of glyphosate as an alternative herbicide. Trial applications of glyphosate under research permit were the third largest pesticide use in 1983 in terms of area treated.

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APPENDIX I. METHODS OF VEGETATION MANAGEMENT BY AREA TREATED BY THE B.C. FOREST SERVICE, 1963-1984 FISCAL YEAR



SOURCE : B.C. FOREST SERVICE

APPENDIX II. USE OF 2,4-D IN WESTERN CANADA BY WEIGHT OF ACTIVE INGREDIENT, 1980-1983

