PESTICIDE USE

IN BRITISH COLUMBIA FORESTRY

1984

by
P. Humphreys
Protection Branch

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FOREWORD

"Pesticide Use in British Columbia Forestry, 1984" is the fourth internal report on annual pesticide use resulting from a cooperative survey project established in 1981 by the B.C. Council of Forest Industries, the B.C. Ministry of Forests and the B.C. Ministry of Environment. Information used to generate this report is now an annual requirement by the Ministry of Environment (Pesticide Control Branch) of all pesticide use permit holders. Data included represents all B.C. forest companies and B.C. Forest Service pesticide use permits which were active in 1984. Summarized in tables and illustrated graphically, information presented includes amounts of each pesticide used and respective areas treated; areas treated by control purpose and method of application; areas treated by forest type, areas actually treated compared to areas scheduled for treatment by pesticide; reasons for pesticide use permit non-utilization, as well as herbicide use trends from 1975 - 1984.

INTRODUCTION

"Pesticide use in British Columbia Forestry, 1984" represents the fourth and possibly final report of its kind utilizing the B.C. Forest Service internal report format. Future reports on pesticide use in B.C. forestry are expected to take a public information leaflet format.

It succeeds internal reports PM-PB-8, PM-PB-11 and PM-PB-13 on pesticide use in British Columbia Forestry for the years 1981, 1982 and 1983, respectively.

All four reports were generated through a cooperative project by the B.C. Council of Forest Industries, the B.C. Ministry of Environment (Pesticide Control Branch) and the B.C. Ministry of Forests to establish annual records of actual pesticide applications to B.C. forest and rangeland.

Since 1983 the B.C. Ministry of Environment, Pesticide Control Branch, has required pesticide use permit holders to submit follow-up data on all actual permits each year. This report, similar to the 1982 and 1983 reports, was generated from such data, which is summarized and illustrated in tables, graphs, and includes the following information:

(1) Numbers of 1984 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 - 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 - herbicide, fungicide, or insecticide;

(iv) Project type - 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, 1975-1984.

FORESTRY PESTICIDE USE INFORMATION SYSTEMS

A computerized pesticide use information system was developed in 1984 by the Ministry of Environment, Pesticide Control Branch, to assist in their permit approval and tracking process.

Information, stored on the ENV1 VAX computer, consists of items marked on the Ministry of Environment, Pesticide use permit application and follow-up report (Figures 1 and 2). This computer is capable of being accessed by local and remote terminals.

The Pesticide Control Branch has proposed that direct users of their system be all those responsible for overseeing permit review and approval in Victoria. This will include the Ministry of Forests, Protection Branch, which will achieve direct on-line access to this system via their own terminal in 1985.

The main objectives of this pesticide information system will be to provide permit information to forestry pesticide users on a daily basis, and to generate summaries on overall pesticide use for Protection Branch reports and requests from individuals involved in forestry.

RESULTS OF THE 1984 B.C. FORESTRY PESTICIDE USE SURVEY

Results of the 1984 pesticide use survey are summarized in tables and graphs on the following pages.

A total of 313 forestry pesticide use permits were issued in 1984, of which 181 or 58 percent were actually implemented. Most of the 313 permits were valid for three years. One hundred and four or 33 percent of the permits issued were cancelled, postponed or unreported[1] and 28 or 9 percent were cancelled by the Pesticide Control Branch at the request of the permit holders. (Table I).

The number of forestry pesticide use permits issued in 1984 roughly tripled from the previous year.

Fourteen permits were appealed in 1984 compared to 5 in 1983 and 39 in 1982. Two of the appealed permits were cancelled or revoked as a result of Environmental Appeal Board decisions, five were amended and five were supported. Two appeals were withdrawn. (Table II).

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1 Four permits were still unaccounted for (i.e., no follow-up information had been received) when this report was written.

A total of 9546.6 hectares of immature forest stands were treated with pesticides in 1984. Residual, not satisfactorily restocked and mature stands accounted for, respectively, 2000.2, 1097.9 and 346.8 hectares. Pesticide applications to rangeland, roadsides, forest nurseries and seed orchards involved 1137.1 hectares (Table VIII, Figure 8).

Forty-four percent or 14,132.1 hectares were actually treated with pesticides out of 31,877.6 hectares scheduled for treatment in 1984. Of the reasons given for the non-utilization of pesticide use permits, 1640.3 hectares were not treated because of funding or manpower problems, 1614.4 hectares were not treated because of postponement, 1536.9 hectares were not treated because of technical problems, 1335.5 hectares were not treated because of cancellations and 1155.0 hectares were not treated because the projects were completed in previous years or the project was abandonded (Figure 9).

Total area treated with herbicides more than doubled from 6181 hectares in 1983 to 14,132.1 hectares in 1984. This has been the greatest area treated with herbicides, for forest management purposes, in a single year, to date.

The herbicides 2,4-D amine/ester and glyphosate, which was registered for forestry in 1984, were the two major pesticides utilized by foresters. 2,4-D amine/ester was applied to 7467.0 hectares or 53 percent of B.C. forests treated with pesticides, and glyphosate to 6008.4 hectares or 43 percent (Table III, Figure 3).

In terms of weight of active ingredient applied, the three most commonly used pesticides were 2,4-D amine/ester (7260.1 kg. active ingredient), glyphosate (6492.5 kg. active ingredient) and MSMA (564.2 kg. active ingredient). (Table III, Figure 4).

Most 1984 pesticide use projects were located in the Vancouver, Prince George and Prince Rupert forest regions with respectively, 9975.1, 2533.6 and 868.2 hectares treated with pesticides (Table IV, Figure 5).

Stand tending operations involving vegetation management remained in 1984, as in previous years, the most common purpose of forestry pesticide use.

Herbicide applications for conifer release were made to 7475.1 hectares. This was an increase from 1983 of 2,857.4 hectares.

Other types of stand tending operations using herbicides also increased from 1983 by 4191.2 hectares. In 1984 brushing and weeding, site preparation, seed tree control and pre-commercial thinning involved a total of 5265.6 hectares. Right-of-way maintenance and rangeland noxious weed control together accounted for 1153.1 hectares, while insect, fungus and deer control accounted for 238.2 hectares treated with other types of pesticides (Tables V and VI, Figure 6).

Tree injection or cut surface treatments employing such equipment as brush saws, injectors and spot guns, were used on 9231.0 hectares. Backpack sprayers and vehicle mounted spray booms or nozzles were used to apply pesticides to respectively, 1172.8 hectares and 961.0 hectares. Aerial (helicopter) spray applications involved 2761.9 hectares of forest land. This area was approximately eleven times greater than that treated aerially in 1983 (Table VII, Figure 7).

TABLE I. THE FATE OF 1984 PESTICIDE USE PERMITS ISSUED BY THE B. C. PESTICIDE CONTROL BRANCH, MINISTRY OF ENVIRONMENT

	B.C. FOREST SERVICE		FOREST INDUSTRY		TOTAL	
	#	%	#	%	#	%
PERMITS ISSUED (TOTAL)	167	100	146	100	313	100
PERMITS IMPLEMENTED BY HOLDER	102	61	79	54	181	58
PERMITS CANCELLED OR POSTPONED BY HOLDER	43	26	61	42	104	33
PERMITS CANCELLED BY THE PESTICIDE CONTROL BRANCH	22	13	6	4	28	9

TABLE II. THE FATE OF APPEALED 1984 PESTICIDE USE PERMITS AS DETERMINED BY THE B.C. ENVIRONMENTAL APPEAL BOARD

	B.C. FOREST SERVICE #	FOREST INDUSTRY #	TOTAL #
PERMITS APPEALED	9	5	14
APPEALED PERMITS CANCELLED/REVOKED	2	0	2
APPEALED PERMITS AMENDED	2	3	5
APPEALED PERMITS SUPPORTED	3	2	5
APPEALS WITHDRAWN	2	0	2

TABLE III. SUMMARY OF PESTICIDE USE[1], 1984

PESTICIDE	B.C. FOREST SERVICE ha treated OP[2]	B.C. FOREST SERVICE ha treated RES[3]	B.C. FOREST SERVICE kg a.i. OP	B.C. FOREST SERVICE kg a.i. RES	FOREST INDUSTRY ha treated OP	FOREST INDUSTRY ha treated RES	FOREST INDUSTRY kg a.i. OP	FOREST INDUSTRY kg a.i. RES
ASULAM	4.2	0	9.0	0	0	0.1	0	0.2
BENOMYL	0	0.5	0	0.6	0	0	0	0
CARBARYL	0	0	0	0	30.0	0	30.0	0
CARBOFURAN	0	0.5	0	0.8	0	0	0	0
DPX-T6376	0	0.04	0	0.005	0	0.04	0	0.01
FERBAM	0	0.5	0	0.1	0	0	0	0
FOSAMINE	20.1	0	75.4	0	24.9	0	21.0	0
GLYPHOSATE	3456.5	64.0	4124.7	42.7	2477.5	10.4	2313.5	11.6
HEXAZINONE	0	0.5	0	2.5	0	20.3	0.1	61.9
MSMA	191.0	0	1.5	0	148.1	0	562.7	0

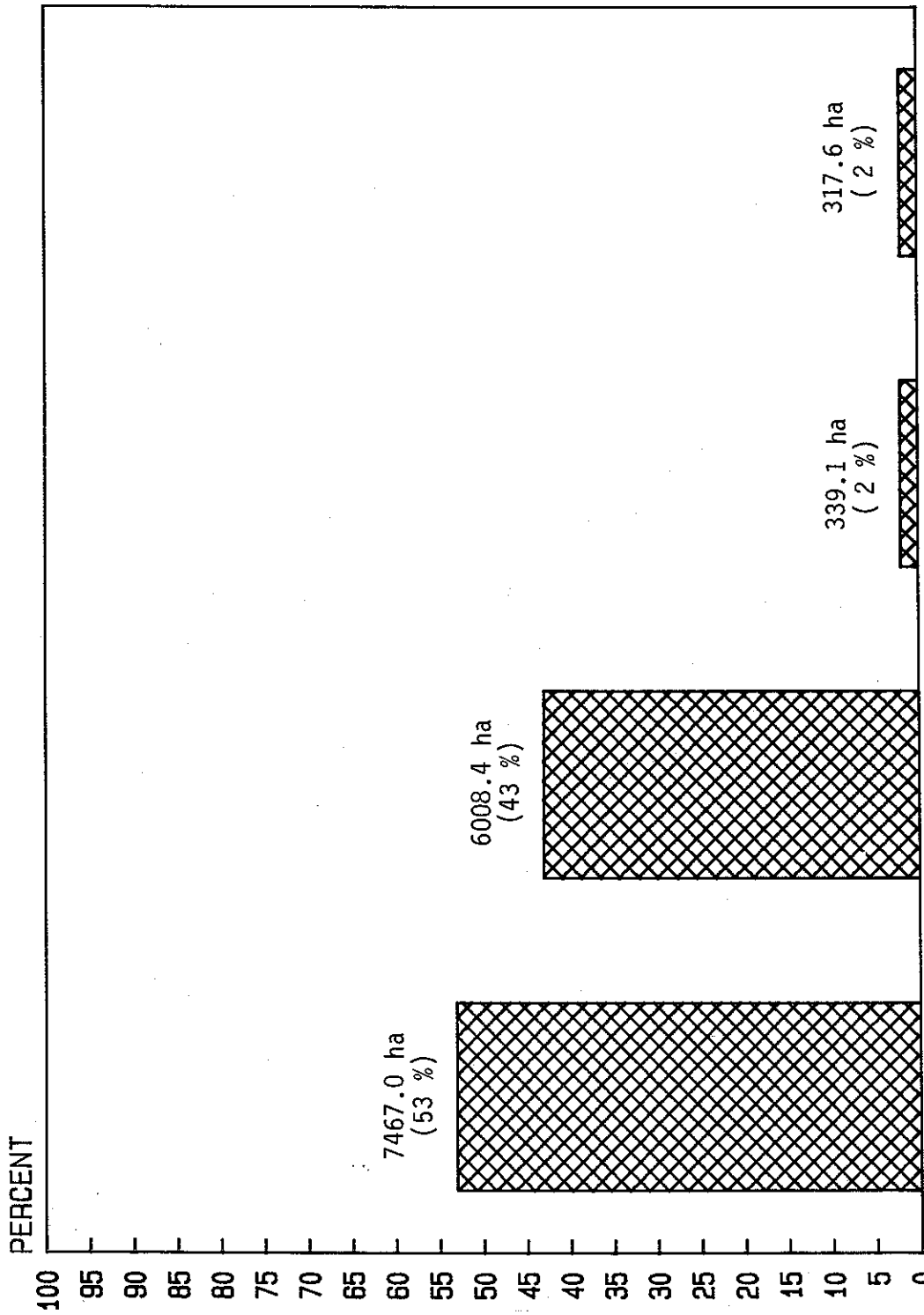
1. Data presented includes pesticides applied to rangeland administered by the B.C. Forest B.C. Forest Service.
2. Operational Projects.
3. Research Projects.

TABLE III. SUMMARY OF PESTICIDE USE[1], 1984

PESTICIDE	B.C. FOREST SERVICE ha treated OP[2]	B.C. FOREST SERVICE ha treated RES[3]	B.C. FOREST SERVICE kg a.i. OP	B.C. FOREST SERVICE kg a.i. RES	FOREST INDUSTRY ha treated OP	FOREST INDUSTRY ha treated RES	FOREST INDUSTRY kg. a.i. OP	FOREST INDUSTRY kg. a.i. RES
OXYDEMETON - METHYL	0	1.5	0	1.9	0	0	0	0
OXYFLUORFEN	0	0	0	0	0	1.5	0	0.5
PERMETHRIN	6.0	0	0.4	0	0	0	0	0
PICLORAM	197.2	0.5	128.4	0.5	0	0	0	0
PUTRESCENT EGG SOLIDS	3.5	0	3.1	0	0	0	0	0
THIRAM	0	0	0	0	2.0	0	2.2	0
TRICLOPYR	0	2.9	0	2.1	0	0.8	0	1.4
2,4-D	2437.9	0.6	3016.8	0.8	5028.5	0	4242.5	0

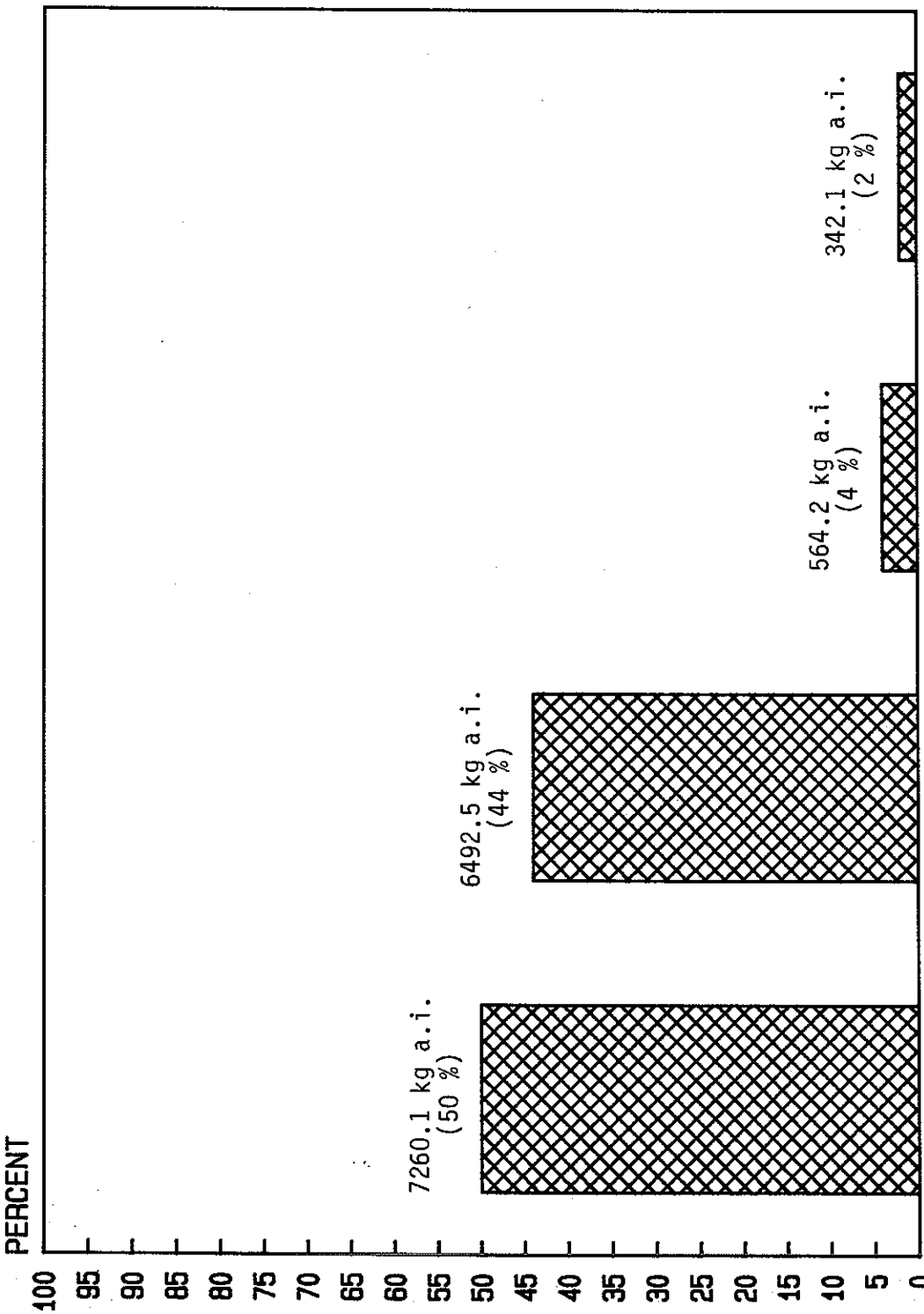
1. Data presented includes pesticides applied to rangeland administered by the B.C. Forest Service.
2. Operational Projects.
3. Research Projects.

FIGURE 3. PERCENT PESTICIDE USE BY AREA TREATED, 1984 [1]



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

FIGURE 4. PERCENT PESTICIDE USE BY WEIGHT OF ACTIVE INGREDIENT, 1984 [1]



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

TABLE IV. SUMMARY OF PESTICIDE USE BY FOREST REGION, 1984

PESTICIDE	HECTARES TREATED											
	Vancouver		Prince Rupert		Prince George		Nelson		Kamloops		Cariboo	
	BCFS[1]	FI[2]	BCFS	FI	BCFS	FI	BCFS	FI	BCFS	FI	BCFS	FI
ASULAM	3.7	0.1	0	0	0	0	0.5	0	0	0	0	0
BENOMYL	0.5	0	0	0	0	0	0	0	0	0	0	0
CARBARYL	0	0	0	30.0	0	0	0	0	0	0	0	0
CARBOFURAN	0.5	0	0	0	0	0	0	0	0	0	0	0
DPX-T6376	0.04	0	0	0	0	0	0	0	0	0.04	0	0
FERBAM	0	0	0	0	0	0	0	0	0.5	0	0	0
FOSAMINE	20.1	24.9	0	0	0	0	0	0	0	0	0	0
GLYPHOSATE	2546.6	1966.1	88.5	214.4	668.7	298.9	214.2	8.0	2.5	0.5	0	0
HEXAZINONE	0.1	0.6	0	6.8	0	12.0	0.4	0	0	0.9	0	0
MSMA	0	145.4	0	0	6.0	2.7	185.0	0	0	0	0	0

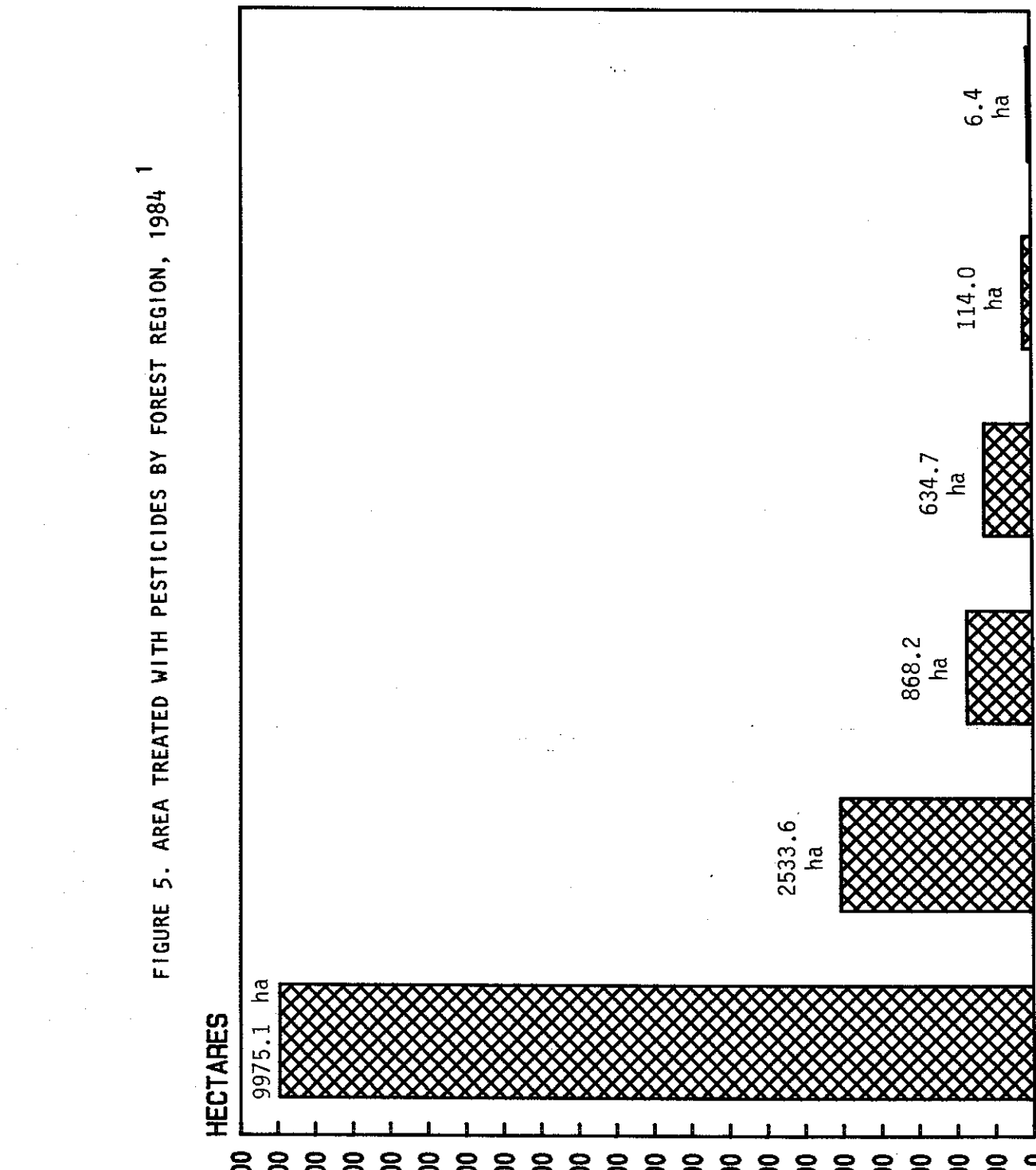
1. B.C. Forest Service
2. Forest Industry

TABLE IV. SUMMARY OF PESTICIDE USE BY FOREST REGION 1984

PESTICIDE	HECTARES TREATED											
	Vancouver		Prince Rupert		Prince George		Nelson		Kamloops		Cariboo	
	BCFS[1]	FI[2]	BCFS	FI	BCFS	FI	BCFS	FI	BCFS	FI	BCFS	FI
OXYDEMETON-METHYL	1.5	0	0	0	0	0	0	0	0	0	0	0
OXYFLUORFEN	0	0	0	0	0	0	0	0	0	1.5	0	0
PERMETHRIN	0	0	0	0	0	0	0	0	0	0	6.0	0
PICLORAM	0	0	0.5	0	7.4	0	81.8	0	0	0	108.0	0
PUTRESCENT EGG SOLIDS (DEER-AWAY)	3.5	0	0	0	0	0	0	0	0	0	0	0
THIRAM	0	2.0	0	0	0	0	0	0	0	0	0	0
TRICLOPYR	2.9	0.8	0	0	0	0	0	0	0	0	0	0
2,4-D	1824.9	3430.9	528.0	0	62.1	1475.8	23.0	121.8	0.5	0	0	0

1. B.C. Forest Service
2. Forest Industry

FIGURE 5. AREA TREATED WITH PESTICIDES BY FOREST REGION, 1984 [1]



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

TABLE V. HERBICIDE USE BY CONTROL PURPOSE, 1984

PURPOSE	HERBICIDES USED	B.C. FOREST SERVICE ha treated	B.C. FOREST SERVICE kg a.i. used	FOREST INDUSTRY ha treated	FOREST INDUSTRY kg a.i. used
BRUSHING AND WEEDING	asulam	3.7	7.9	0.1	0.2
	DPX-T6376	0	0	0.04	0.01
	glyphosate	868.1	1183.6	861.8	813.1
	hexazinone	0.4	2.4	19.0	60.3
	oxyflourfen	0	0	1.5	0.5
	picloram	1.7	1.8	0	0
	triclopyr	2.9	2.1	0.6	0.8
	2,4-D	761.8	948.7	1632.9	128.2
CONIFER RELEASE	asulam	0.5	1.1	0	0
	glyphosate	2029.3	2341.5	1436.1	1248.3
	hexazinone	0.1	0.1	1.3	1.6
	triclopyr	0	0	0.2	0.6
	2,4-D	1375.9	1875.8	2631.7	2915.6
NOXIOUS WEED CONTROL	picloram	196.0	127.0	0	0
PRE-COMMERCIAL THINNING	glyphosate	0	0	0.5	0.4
	MSMA	0	0	145.4	561.6

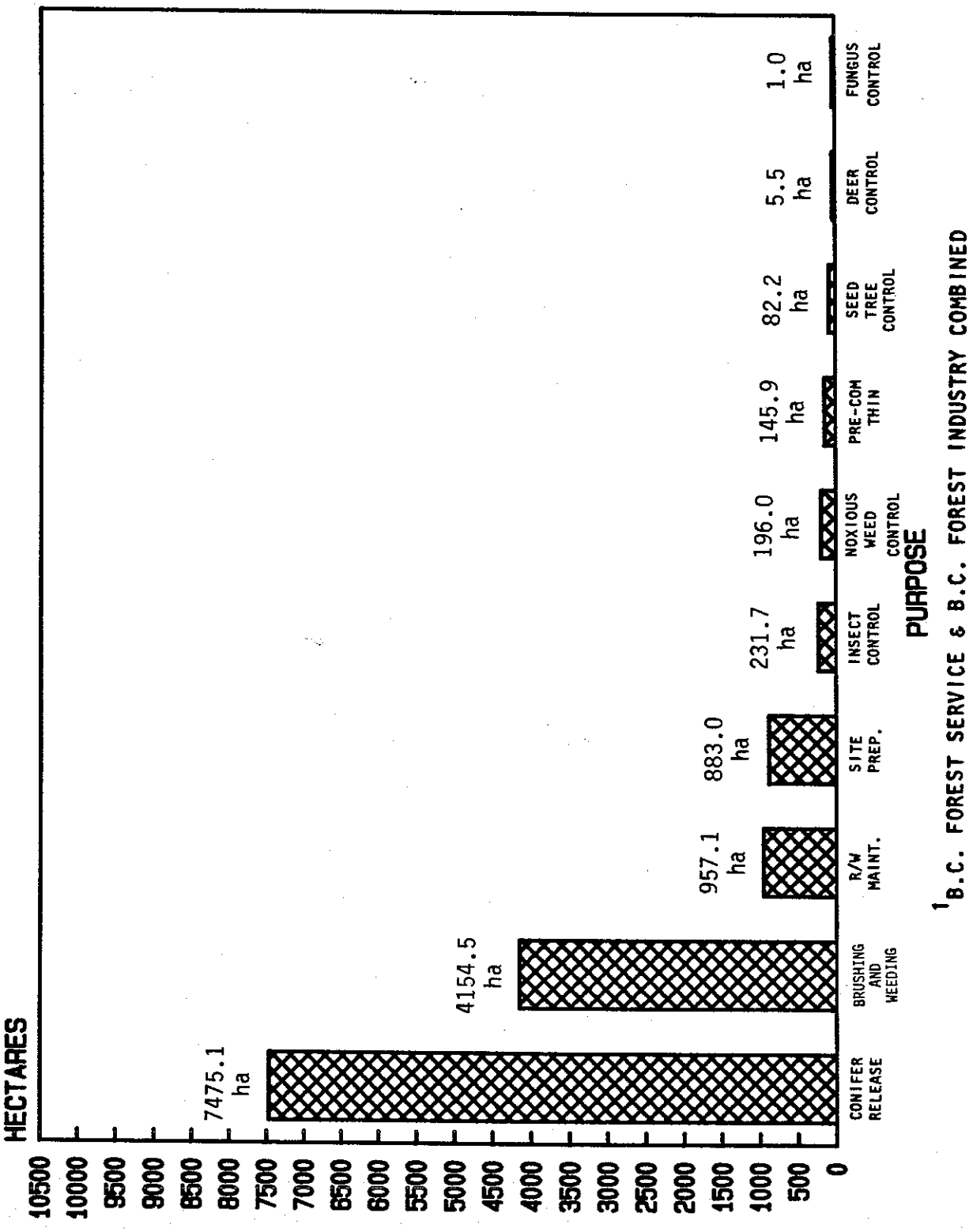
TABLE V. HERBICIDE USE BY CONTROL PURPOSE, 1984

PURPOSE	HERBICIDES USED	B.C. FOREST SERVICE ha treated	B.C. FOREST SERVICE kg a.i. used	FOREST INDUSTRY ha treated	FOREST INDUSTRY kg a.i. used
RIGHT-OF-WAY MAINTENANCE	fosamine	20.1	75.4	24.9	21.0
	glyphosate	20.5	29.5	128.5	234.3
	2,4-D	100.4	91.4	662.7	1161.0
SEED TREE CONTROL	glyphosate	46.0	4.4	0	0
	2,4-D	5.0	3.8	31.2	27.8
SITE PREPARATION	DPX-T6376	0.04	0.005	0	0
	glyphosate	556.6	608.3	61.0	20.8
	2,4-D	195.4	98.1	70.0	18.2

TABLE VI. INSECTICIDE AND OTHER TYPES OF PESTICIDE USE BY CONTROL PURPOSE, 1984

PURPOSE	INSECTICIDES AND OTHER PESTICIDES USED	B.C. FOREST SERVICE ha treated	B.C. FOREST SERVICE kg a.i. used	FOREST INDUSTRY ha treated	FOREST INDUSTRY kg a.i. used
INSECT CONTROL	carbaryl	0	0	30.0	30.0
	carbofuran	0.5	0.8	0	0
	MSMA	191.0	1.5	2.7	1.1
	oxydemeton-methyl	1.5	1.9	0	0
	permethrin	6.0	0.4	0	0
FUNGUS CONTROL	benomyl	0.5	0.6	0	0
	ferbam	0.5	0.1	0	0
VERTEBRATE CONTROL	putrescent egg solids (Deer-away)	3.5	3.1	0	0
	thiram	0	0	2.0	2.2

FIGURE 6. SUMMARY OF THE PURPOSE OF PESTICIDE USE BY AREA TREATED, 1984 [1]



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

TABLE VII. PESTICIDE USE BY METHOD OF APPLICATION, 1984

METHOD OF APPLICATION	PESTICIDES USED	B.C. FOREST SERVICE ha TREATED	FOREST INDUSTRY ha TREATED
AERIAL SPRAY HELICOPTER	glyphosate	2133.0	601.9
	hexazinone	0	12.0
	2,4-D	15.0	0
BACKPACK (KNAPSACK) SPRAYERS	asulam	4.2	0.1
	carbaryl	0	30.0
	carbofuran	0.5	0
	DPX T6367	0	0.04
	glyphosate	335.6	207.4
	hexazinone	0.5	1.0
	oxydemeton-methyl	0.5	0
	permethrin	6.0	0
	putrescent egg solids	3.5	0
	thiram	0	2.0
	triclopur	2.9	0.8
	2,4-D	69.6	508.1
TREE INJECTION TREATMENTS (CUT SERFACE) TREATMENTS[1]	glyphosate	749.7	1551.1
	hexazinone	0	7.3
	MSMA	191.0	148.1
	oxydemeton-methyl	0.5	0
	2,4-D	2290.6	4292.7

1. Involves hack and squirt, frill and squirt and cut stump treatments. May employ brush saws, injectors, spot guns, etc.

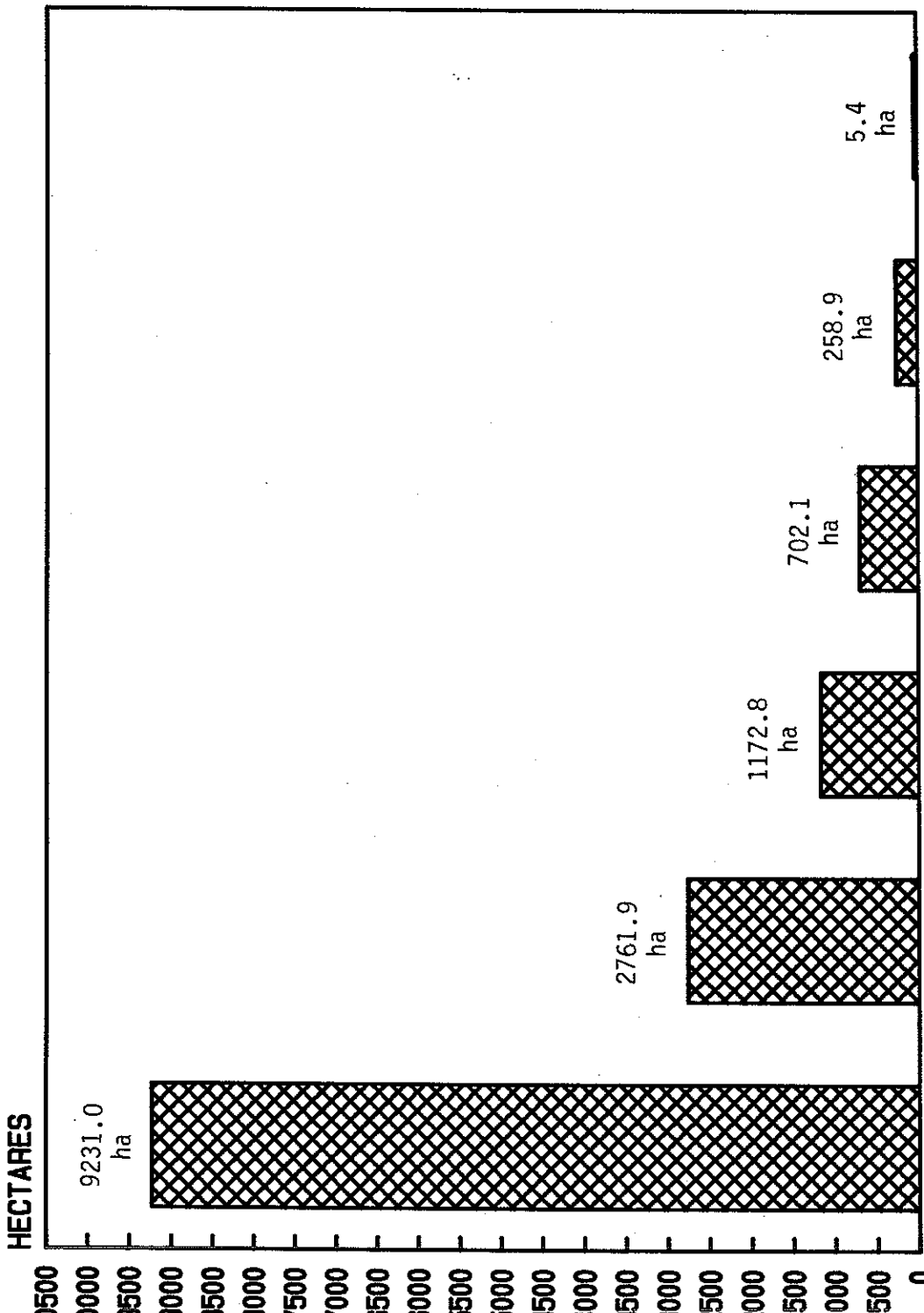
TABLE VII. PESTICIDE USE BY METHOD OF APPLICATION, 1984

METHOD OF APPLICATION	PESTICIDES USED	B.C. FOREST SERVICE ha TREATED	FOREST INDUSTRY ha TREATED
VEHICLE MOUNTED SPRAY BOOMS[2]	glyphosate	25.0	127.5
	oxyfluorfen	0	1.5
	2,4-D	18.9	86.0
VEHICLE MOUNTED SPRAY NOZZLES[3]	benomyl	0.5	0
	DPX T6376	0.04	0
	ferbam	0.5	0
	fosamine	20.1	24.9
	glyphosate	277.0	0
	picloram	196.0	0
	2,4-D	44.4	138.7
OTHER	carbofuran	0.2	0
	glyphosate	0.5	0
	hexazinone	0.5	0
	picloram	1.2	0
	2,4-D	0	3.0

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

3. Any system which involves tank, hose and nozzle. Nozzle is hand held and can be selectively directed. (Source: Ministry of Environment, Pesticide Control Branch)

FIGURE 7. SUMMARY OF METHODS OF PESTICIDE APPLICATION BY AREA TREATED, 1984 [1]



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

TABLE VIII. AREAS TREATED BY FOREST INVENTORY TYPE IDENTITY, 1984

TYPE IDENTITY[1]	HECTARES TREATED		
	B.C. FOREST SERVICE	FOREST INDUSTRY	TOTAL
IMMATURE	4487.9	5058.7	9546.6
MATURE	196.1	150.7	346.8
RESIDUAL	339.9	1660.3	2000.2
NON SATISFACTORILY RESTOCKED	1019.4	78.5	1097.9
NON-COMMERCIAL	0	0.5	0.5
NON-FOREST	0	0	0
DISTURBED, STOCKING DOUBTFUL	3.0	0	3.0
NOT APPLICABLE[2]	341.7	795.4	1137.1

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 8. AREA OF FOREST TYPE IDENTITY TREATED WITH PESTICIDES, 1984

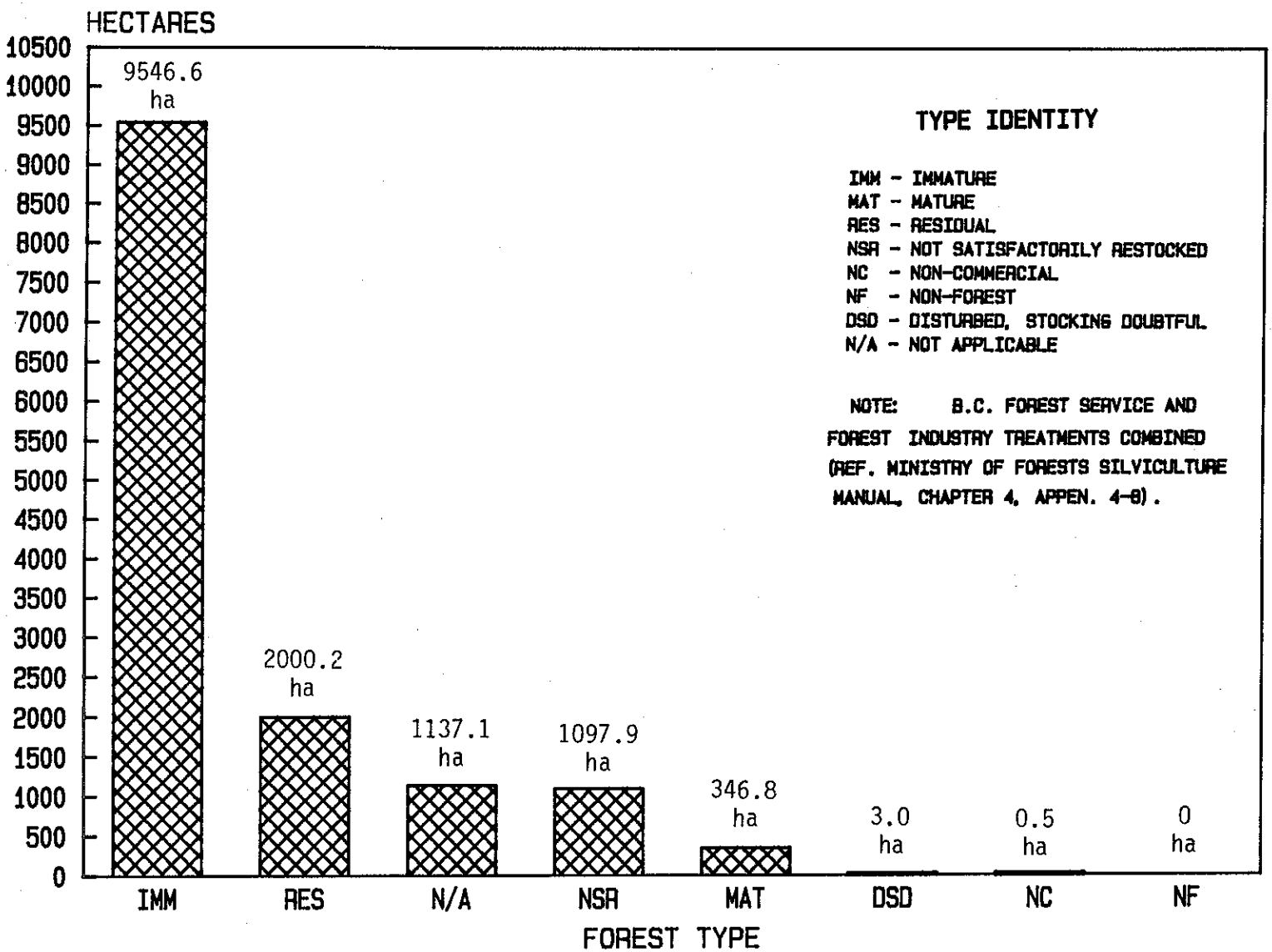
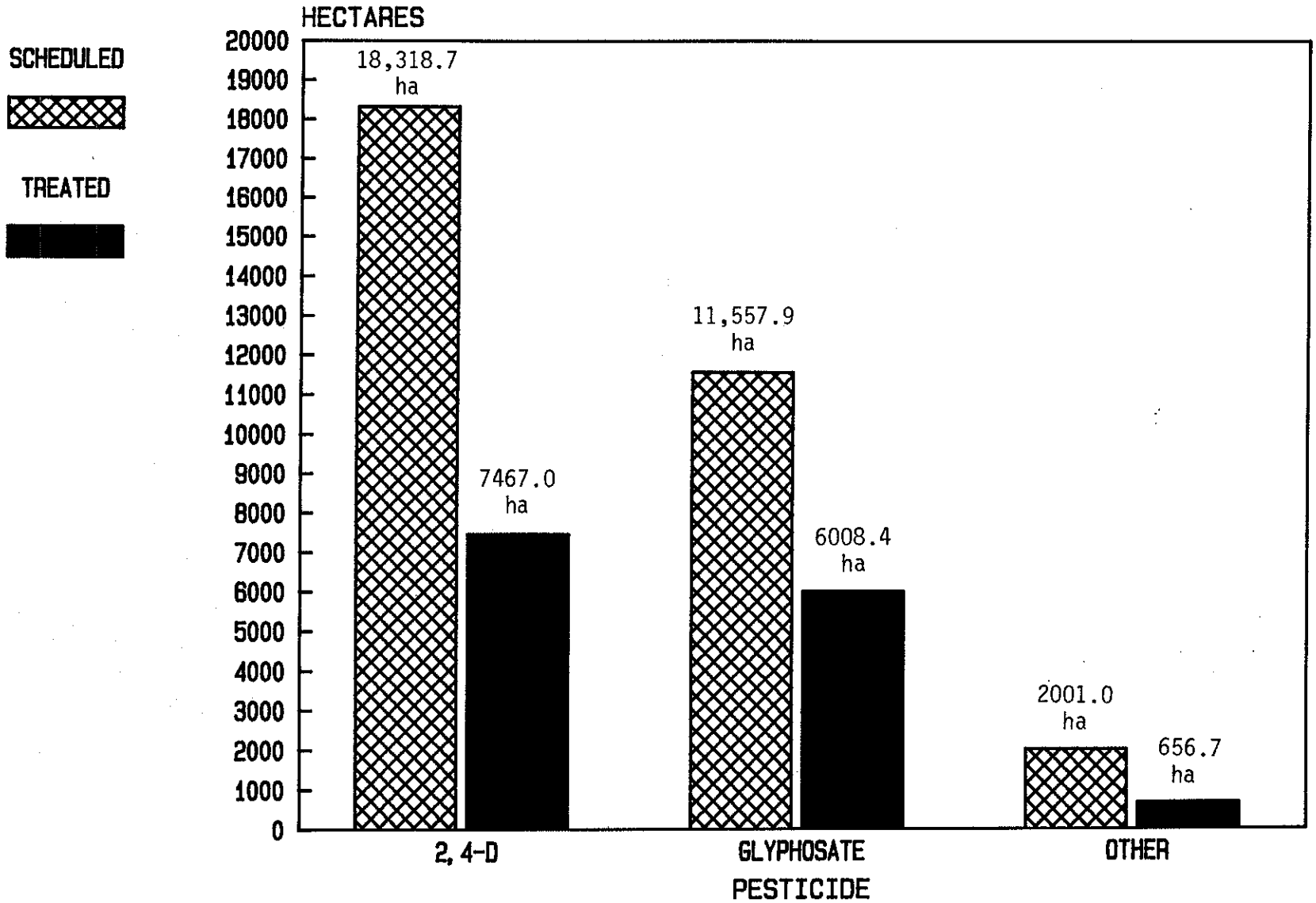


TABLE IX. COMPARISON OF AREAS SCHEDULED FOR PESTICIDE TREATMENT WITH AREAS ACTUALLY TREATED, 1984

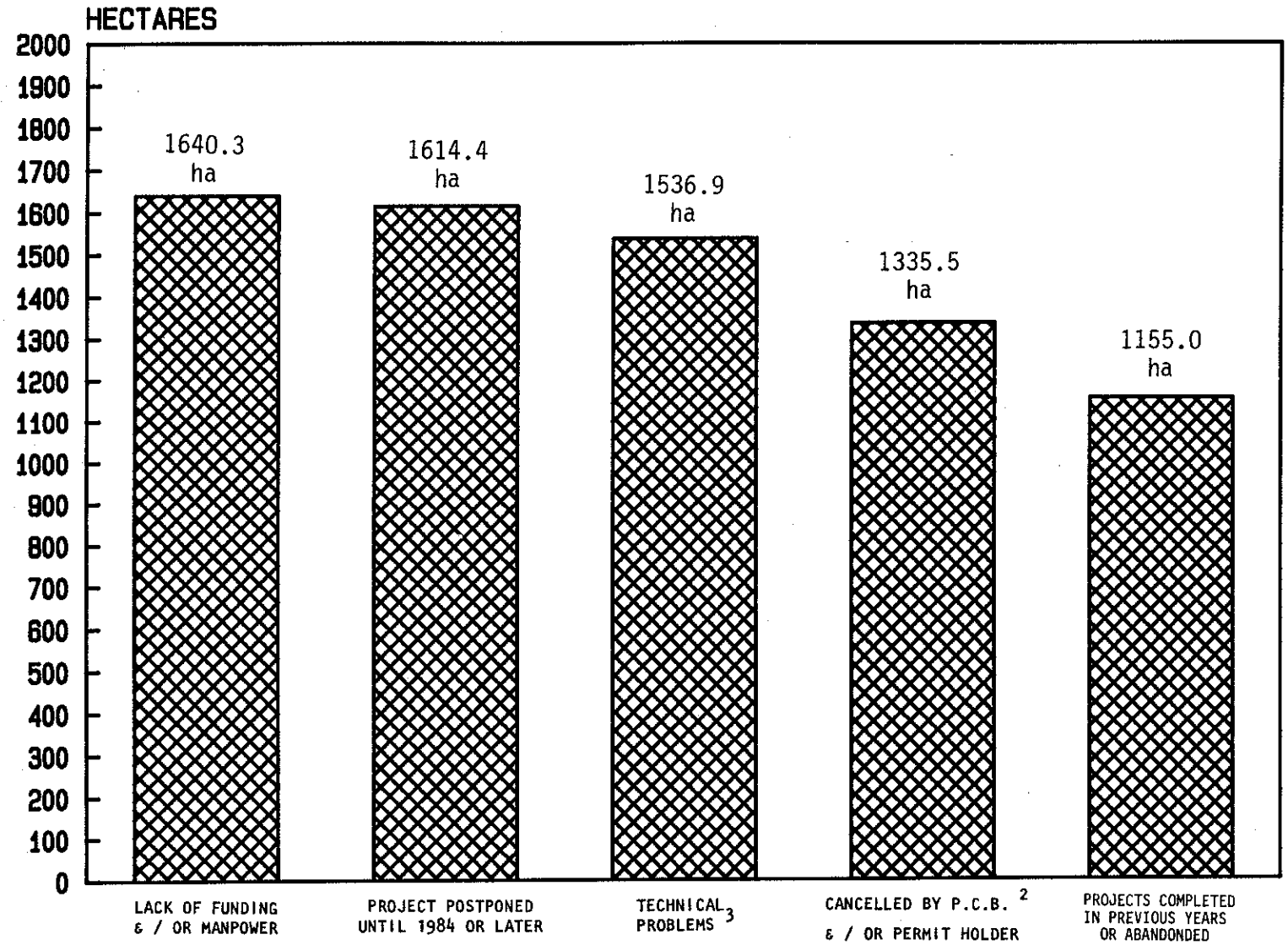
PESTICIDE	B.C. FOREST SERVICE		FOREST INDUSTRY	
	Hectares scheduled for treatment	Hectares actually treated	Hectares scheduled for treatment	Hectares actually treated
GLYPHOSATE	4925.5	3520.5	6632.4	2487.9
2,4-D	6830.8	2438.5	11,487.9	5028.5
OTHERS	1453.2	428.9	547.8	227.8
TOTALS	13,209.5	6387.9	18,668.1	7744.2

FIGURE 9. COMPARISON OF AREA SCHEDULED FOR PESTICIDE TREATMENTS WITH AREA ACTUALLY TREATED, 1984 [1]



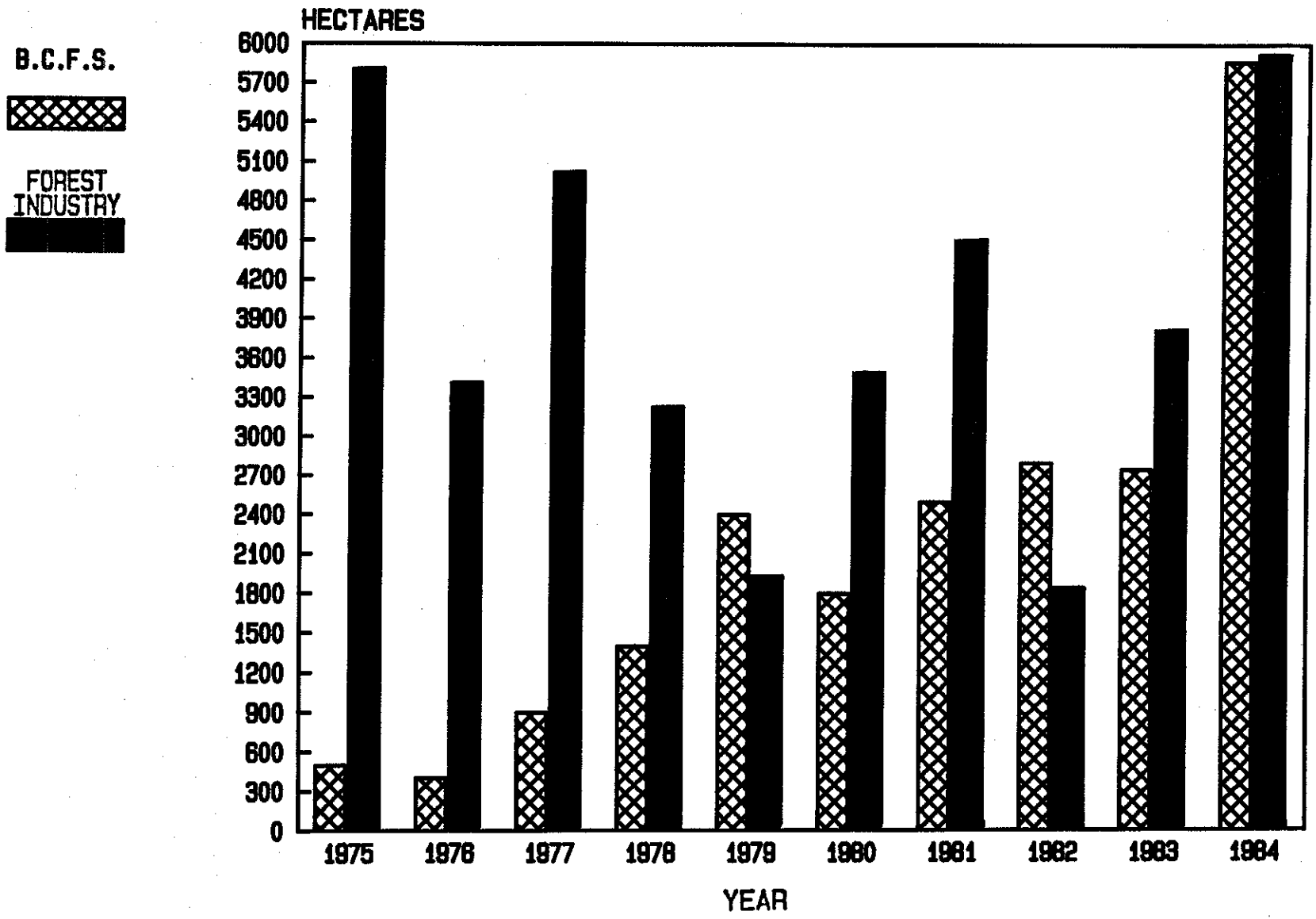
[1] B.C. FOREST SERVICE & B.C. FOREST INDUSTRY COMBINED

FIGURE 10. REASONS FOR PESTICIDE USE PERMIT NON-UTILIZATION BY AREA AFFECTED, 1984 [1]



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 11. TOTAL HECTARES OF LAND TREATED WITH HERBICIDES FOR FORESTRY PURPOSES, 1975-1984



DISCUSSION AND CONCLUSIONS

Pesticide, particularly herbicide, use in B.C. forestry seems to be following an upward trend.

Forestry pesticide use permits issued by the Pesticide Control Branch have roughly tripled since 1983, and overall areas treated with herbicides has approximately doubled.

This dramatic increase in herbicide use can be partially attributed to the registration of glyphosate which has widened the scope of vegetation management for B.C. foresters involved in stand tending and site preparation operations.

Other types of pesticides, such as insecticides and fungicides are still, and likely will continue to be, of minimal or sporadic use in B.C. forestry.

It is anticipated, however, that future annual pesticide use surveys will continue to reflect an increase in forestry herbicide use.

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