

F.R.I. PROJECT RECORD

NO. 2386

PERMANENT SAMPLE PLOT SURVEY

RADIATA PINE REGIONAL ANALYSIS

K.R.N. LAW

REPORT NO. 15

MARCH 1990

Note : Confidential to Participants of the Stand Growth Modelling Programme
: This material is unpublished and must not be cited as a literature reference

**PERMANENT SAMPLE PLOT SURVEY
RADIATA PINE REGIONAL ANALYSIS**

K.R.N. Law

CONTENTS

- 1.0 BACKGROUND
- 2.0 REGIONAL ANALYSIS
 - 2.1 Northland
 - 2.2 Auckland
 - 2.3 Central North Island
 - 2.4 East Coast/Hawkes Bay
 - 2.5 Southern North Island
 - 2.6 Nelson/Marlborough
 - 2.7 West Coast
 - 2.8 Canterbury
 - 2.9 Otago/Southland
- 3.0 SUMMARY
- 4.0 ACKNOWLEDGEMENTS
- 5.0 REFERENCES

APPENDIX

Appendix 1 : PSP Survey form

1.0 BACKGROUND

Over the last seven years an average of 5,800 permanent sample plots (PSPs) have been measured each year. The majority of these plot measurements are stored on the Ministry of Forestry's PSP system. Six hundred plots are not on the PSP system, most of which are owned by NZFP Forests Ltd. Two types of plots are identified in this database:

- (1) experimental plots, where treatments differ from the surrounding stand. Data from these enable the models to estimate what growth would be if current practices were to change.
- (2) growth plots, which monitor current practice. The data from these plots can be used in growth models to predict growth in existing stands.

Members of the FRI/Industry Growth Modelling Co-operative decided that 'a strategy to install and maintain permanent sample plots was needed to co-ordinate effort, minimise duplication and to ensure that no gaps exist in the database.' A sub-committee was set up to redevelop, on an industry wide basis:

- (a) the current and foreseeable growth data requirements.
- (b) the rationale for priority of PSP establishment and remeasurement.

Computerised forms were sent out to all PSP controllers to enable the pooling of historical data across New Zealand. A copy of the form is attached in Appendix 1.

It took up to a year to receive all the completed forms and to check the data for errors. Each PSP was required to fit into a county as defined by the Regional/United and County Council Boundary Maps. See Figures 1a and 1b. The data in these counties were then merged into nine different regions - five in the North Island and four in the South Island (as shown in Maps). These regions have been called:

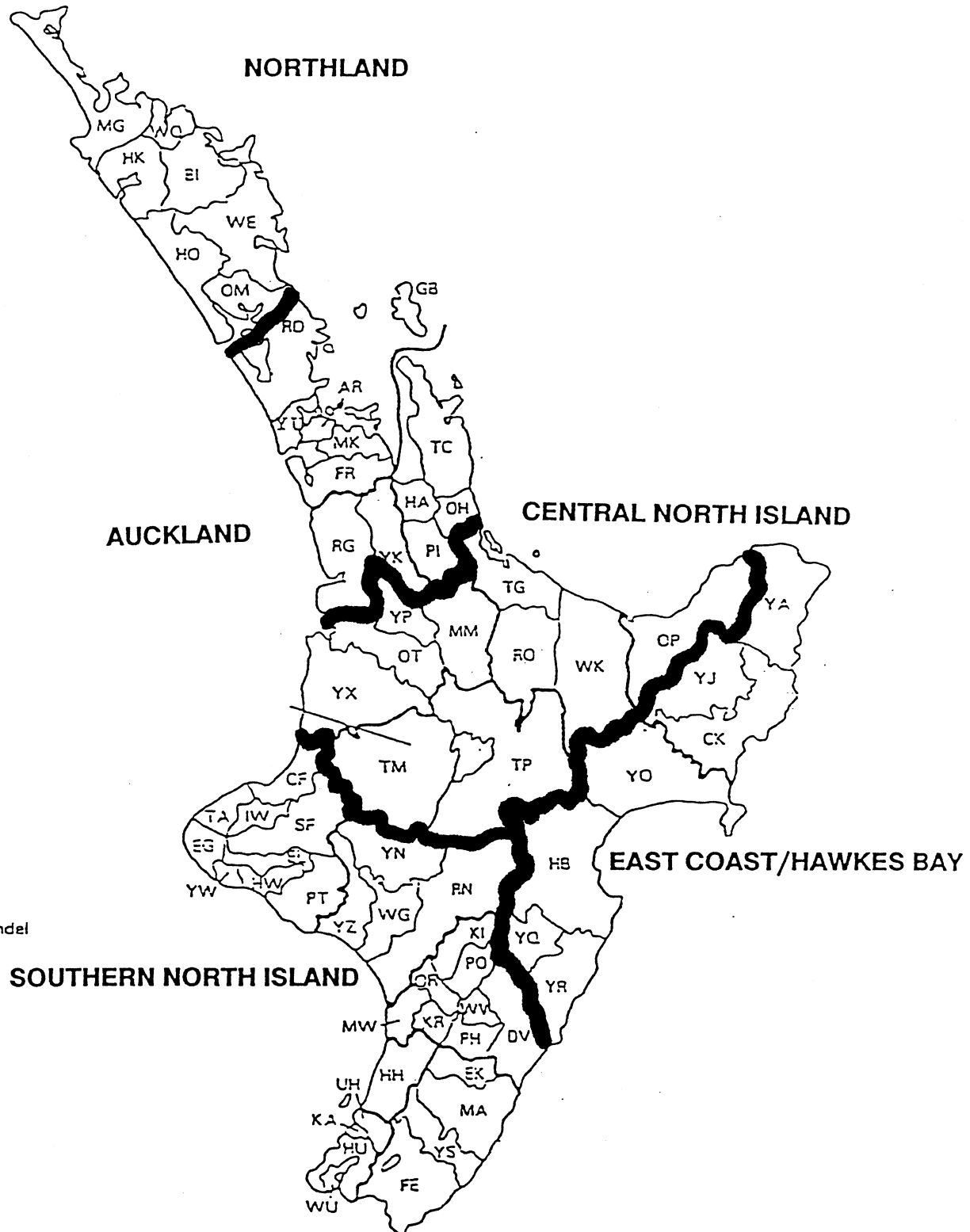
Northland
Auckland
Central North Island
East Coast/Hawkes Bay
Southern North Island
Nelson/Marlborough
West Coast
Canterbury
Otago/Southland

REGIONAL/UNITED COUNCIL AND TERRITORIAL AUTHORITY BOUNDARIES - SOUTH ISLAND

Fig. 1a

CODES

AR	Auckland Regl. Authty.
BI	Bay of Islands
CF	Clifton
CK	Cook
DV	Dannevirke
EG	Egmont
EK	Exetahuna
EL	Eltham
FE	Featherston
FR	Franklin
GB	Great Barrier
HA	Hauraki Plain
HB	Hawkes Bay
HH	Horowhenua
HK	Hokianga
HO	Hobson
HU	Hutt
HW	Hawera
IW	Inglewood
KA	Kaiti (Borough)
KI	Kiwitea
KR	Kairanga
MA	Masterton
MG	Mangonui
MK	Manukau (City)
MM	Matamata
MW	Manawatu
OH	Ohinemuri
OP	Opotiki
OM	Otamatea
OR	Oroua
OT	Otorahanga
PH	Pahiatua
PI	Piako
PO	Ponangina
PT	Patea
RD	Rodney
RG	Raglan
RN	Rangitikei
RO	Rotorua
SF	Stratford
TA	Taranaki
TC	Thames-Coromandel
TG	Tauranga
TM	Taumararui
TP	Taupo
UH	Upper Hutt (City)
WE	Whangarei
WG	Wanganui
WK	Whakatane
WO	Whangaroa
WU	Wgtn. Urban
WV	Woodville
YA	Waiaou
YJ	Waikohu
YK	Waikato
YN	Waimarino
YO	Wairoa
YP	Waipa
YQ	Waioawa
YR	Waipukurau
YS	Wairarapa S.
YU	Waitemata City
YW	Waimate W.
YX	Waitema
YZ	Waiohara



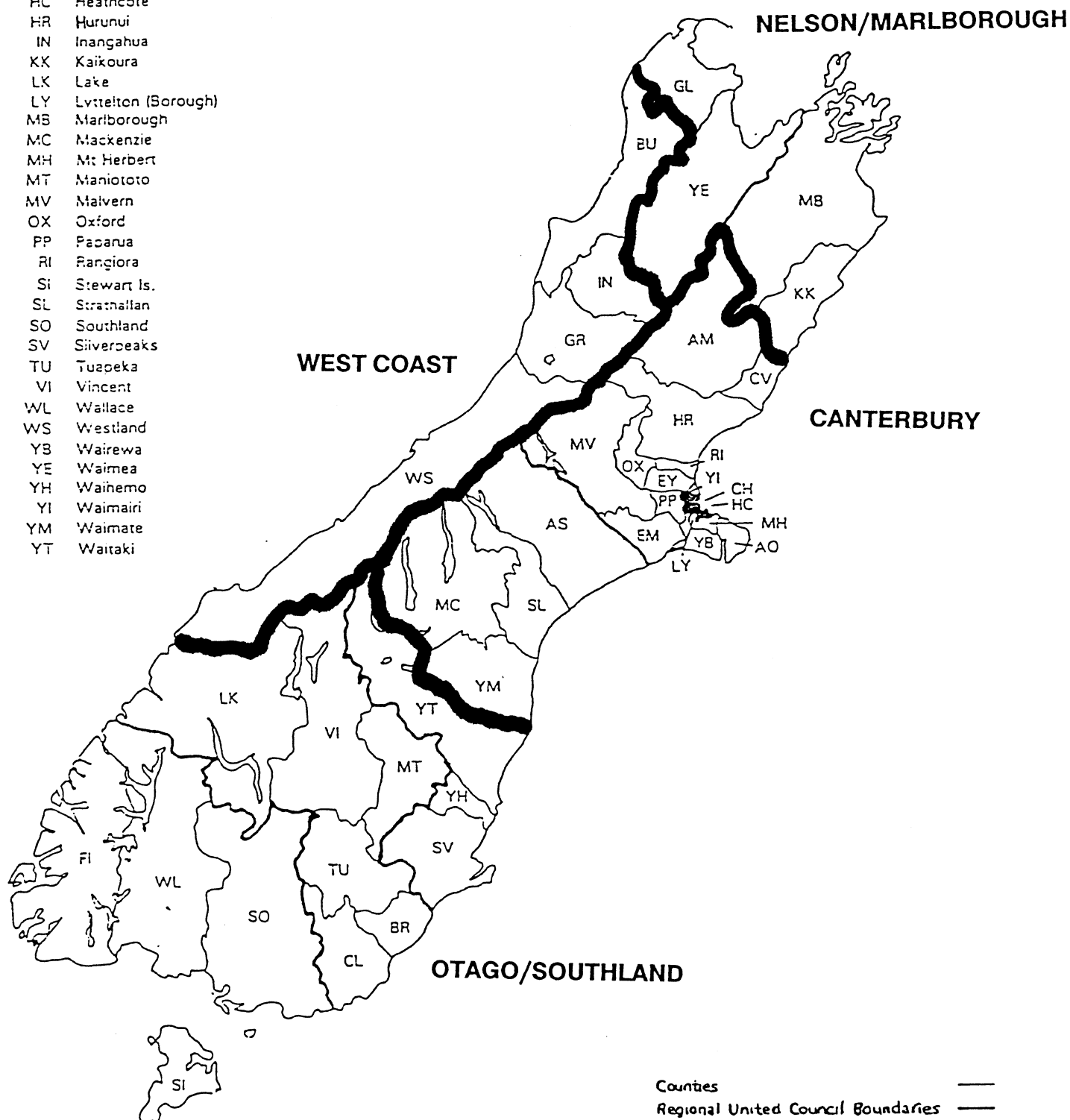
Counties
Regional United Council Boundaries

REGIONAL/UNITED COUNCIL AND TERRITORIAL AUTHORITY BOUNDARIES - SOUTH ISLAND

CODES

AM	Amuri
AO	Akaroa
AS	Ashterton
BR	Bruce
BU	Buller
CH	Christchurch
CL	Clutha
CV	Cheviot
EM	Eilesmere
EY	Eyre
FI	Fiord
GL	Golden Bay
GR	Grey
HC	Heathcote
HR	Hurunui
IN	Inangahua
KK	Kaikoura
LK	Lake
LY	Lyttelton (Borough)
MB	Marlborough
MC	Mackenzie
MH	Mt Herbert
MT	Maniototo
MV	Malvern
OX	Oxford
PP	Papanua
RI	Rangiora
SI	Stewart Is.
SL	Strathallan
SO	Southland
SV	Silverpeaks
TU	Tuapeka
VI	Vincent
WL	Wallace
WS	Westland
YB	Wairewa
YE	Waimea
YH	Waihemo
YI	Waimairi
YM	Waimate
YT	Waitaki

Fig. 1b



The National Exotic Forest Description database (Novis et al. 1989) was obtained, from the Ministry of Forestry, to compare the productive forest area with the number of permanent sample plots. Table 1 shows the percentage of PSPs in each region as compared to the percentage of total forest area in each region. *Pinus radiata* is the single species looked at in this study so far.

Table 1. Percentage of PSPs and forest area by region

Region	No. plots	% plots	Hectares	% Hectares
Northland	828	12	116 703	11
Auckland	1060	16	68 014	6
Cent Nth Island	1867	28	411 914	38
East Cst/H Bay	944	14	115 501	11
Sthern Nth Island	344	5	79 351	7
Nels/Marlborough	651	10	113 985	11
West Coast	390	6	23 629	2
Canterbury	287	4	51 439	5
Otago/Southland	319	5	91007	9
Total	6690	100	1 071 543	100

Regions such as Northland, Nelson/Marlborough and Canterbury show a very similar percentage of forest area and permanent sample plots. There are, however, quite large differences in regions such as Auckland, Central North Island and the West Coast. Auckland, in particular, has a much higher proportion of PSPs (16%) than it does of forest area (6%).

It is interesting to note that, at the time the survey forms were sent out, there were about 9000 PSPs. The survey itself has prompted controllers to assess each PSP and as a result abandon approximately 2000 plots.

The remainder of this report looks at the radiata pine 'growth' plots which make up 58% of the total number of growth and experimental plots. This is done in conjunction with the National Exotic Forest Description (NEFD) database so that both sets of data can be analysed and compared on a regional basis.

2.0 REGIONAL ANALYSIS

As mentioned earlier the PSP survey database has been split into nine separate regions, according to the location of each PSP. The corresponding NEFD data is extracted from the main database and is used to show the percentage of total forest area in a region compared to the percentage of total growth PSPs in the same area.

The NEFD data includes a silvicultural tending code which, for each crop type, is either:

- T for intensive tending with production thinning
- I for intensive tending without production thinning
- Z for minimum tending with production thinning
- M for minimum tending without production thinning

From this information the percentage of forest area under each of the four regimes (for all nine regions) was calculated.

Each plot in the PSP data is defined by a management regime code (MoF 1988) so that it was a straightforward task to split the data into four similar groups as in the NEFD data. Thinning however has been lumped together, whether production or waste.

Five graphs and one table are shown for each region. The first graph in each region illustrates how the total number of PSPs in the area are distributed across the ageclasses. Alongside this the proportion of net stocked forest area in each ageclass is graphed for every region. Each histogram represents a percentage of total forest area in that particular region or a percentage of the total number of PSPs in that region.

The other four graphs each represent a sub-group of the first graph. For every region the data is split according to the management regime of each plot and forest area. There are four different groups:

1. Unpruned and Unthinned
2. Pruned and Unthinned
3. Unpruned and Thinned
4. Pruned and Thinned

Following each set of graphs there is a table which illustrates how the PSPs in each region are distributed across the final crop stocking and site index classes. The final crop stocking codes are used straight from the survey data and are defined as follows:

- (0) 50-100 stems/ha
- (1) 100-200 stems/ha
- (2) 200-300 stems/ha
- (3) 300-500 stems/ha
- (4) 500+ stems/ha
- (5) unthinned

For those plots on the Ministry of Forestry's system, site indices were calculated by the PSP system, otherwise the site index for each plot was estimated by the respective owner.

The final crop stocking of each PSP is the *expected* stocking after thinning, whereas the management regime describes the *present* status of the stands and PSPs. This explains the difference shown between the tables and the graphs of unthinned regimes in West Coast and Canterbury.

The following sub-sections list the main points illustrated by the graphs and tables.

2.1 Northland

Total

65% of the NEFD area is within the 0-10 year ageclass.

75% of the PSPs are spread evenly across the 0-10, 10-15, and 15-20 year ageclasses.

As age increases there is a smaller number of PSPs and a smaller area of net stocked forest, not always in the same proportion.

Unpruned and Unthinned

Over 70% of the forest area and the PSPs are within the 0-10 year ageclass.

Nearly all the remainder of PSPs (16%) are in stands between 10-15 years old which is a greater proportion than forest area in this ageclass.

There is very little forest area and hardly any PSPs in the older ageclasses.

Pruned and Unthinned

All PSPs (100%) are in stands younger than 10 years old.

67% of the forest area is in this 0-10 ageclass.

16% of the forest area is between 10 and 15 years old.

There is less than 10% of forest area in each of the other ageclasses.

Unpruned and Thinned

This shows an almost normal distribution of PSPs across all the ageclasses.

74% of the forest area is in the 0-10 ageclass with very little forest over 10 years old.

Pruned and Thinned

75% of the forest area is within the 0-10, 10-15 year ageclasses.

45% of the PSPs are within the 0-10, 10-15 year ageclasses.

All ageclasses are well represented by PSPs, other than the very old (30+ yrs) where there is very little area also.

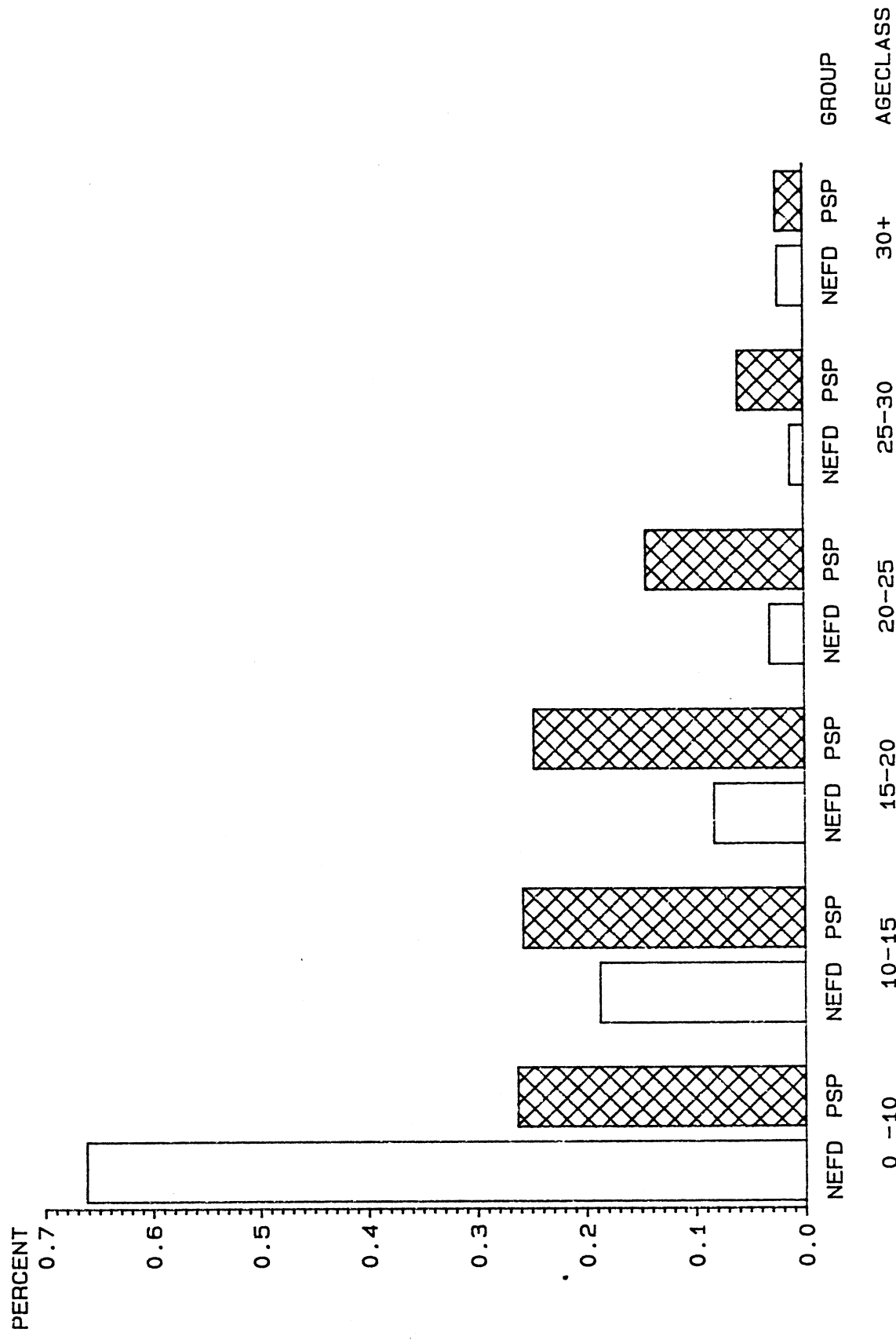
Table

The majority of plots show a site index within 25-30 metres and a final crop stocking between 200 and 500 stems/ha.

There is a relatively large number of plots with site indices between 25 and 30 metres, in an unthinned regime.

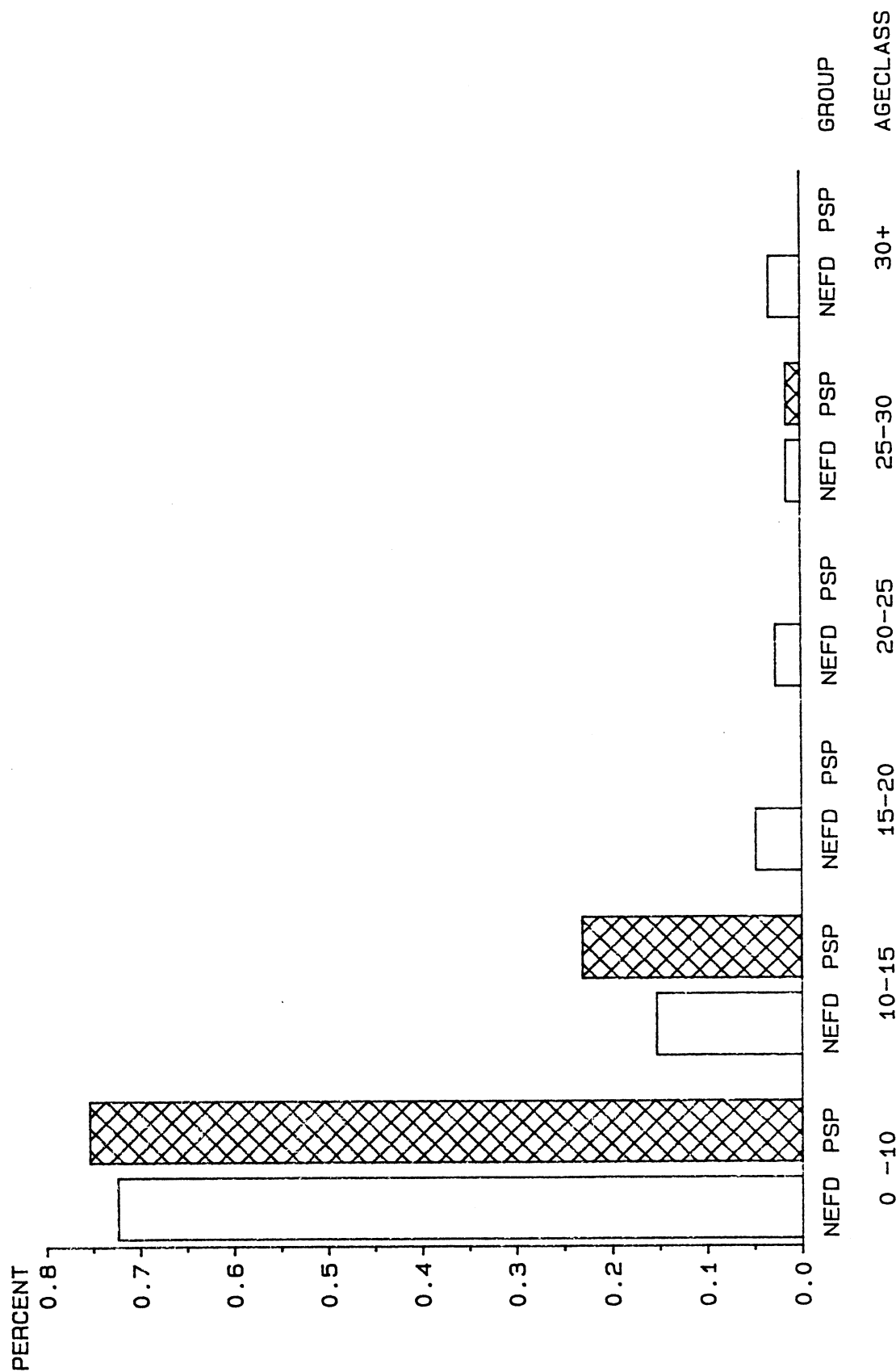
PSP SURVEY (Growth Plots)

Northland



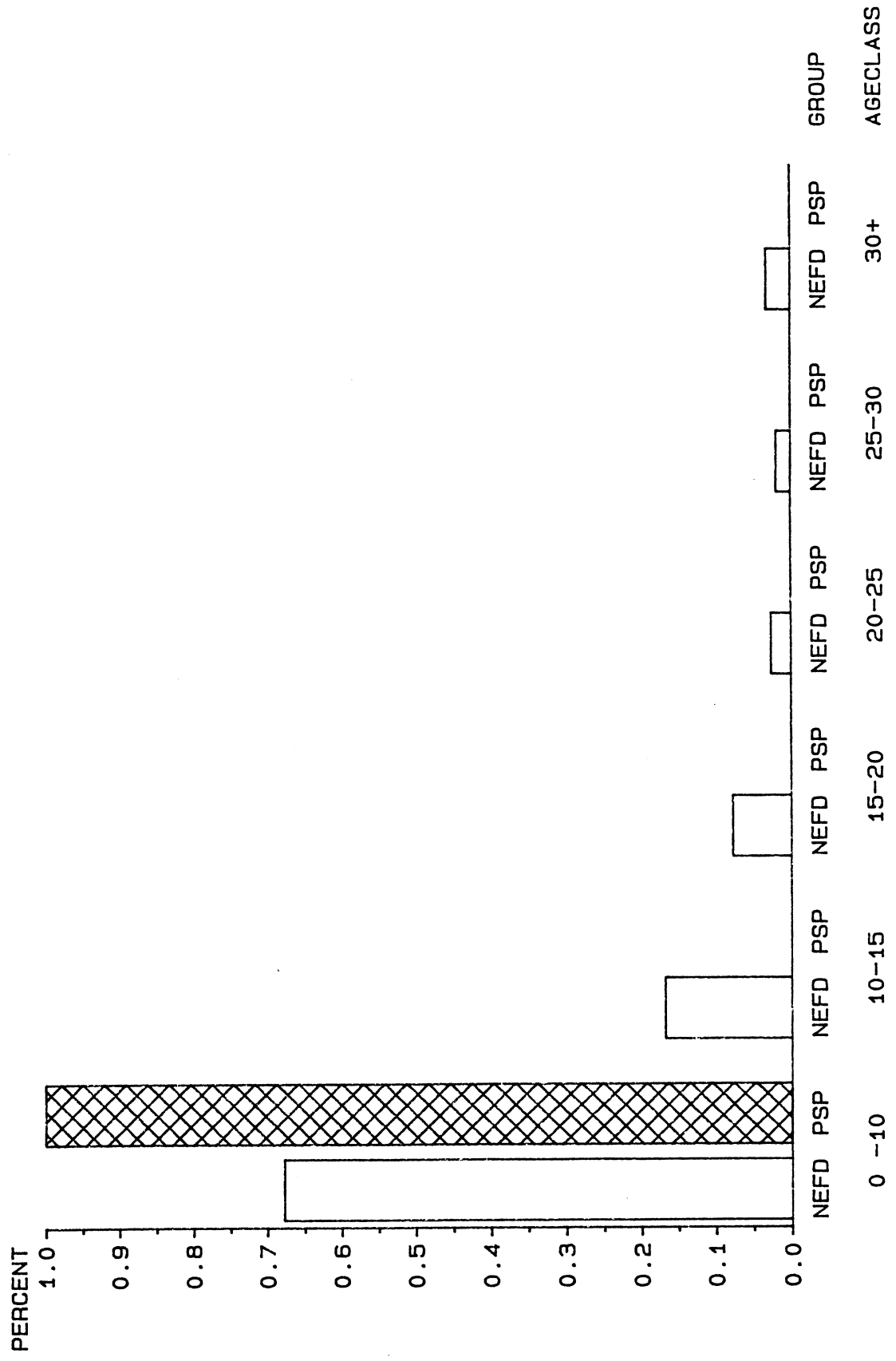
PSP SURVEY (Growth Plots)

Northland
Unpruned & Unthinned



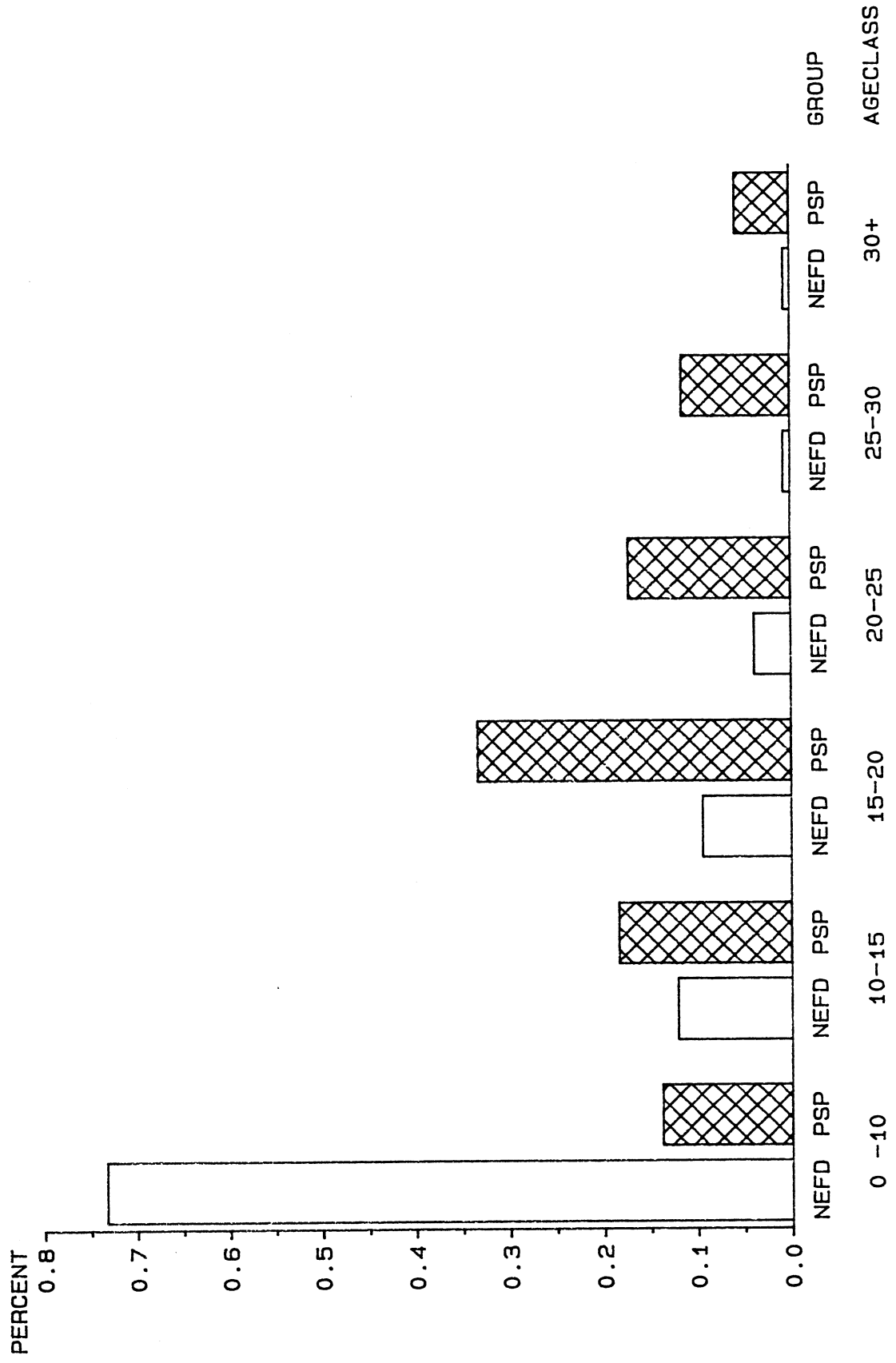
PSP SURVEY (Growth Plots)

Northland
Pruned & Unthinned



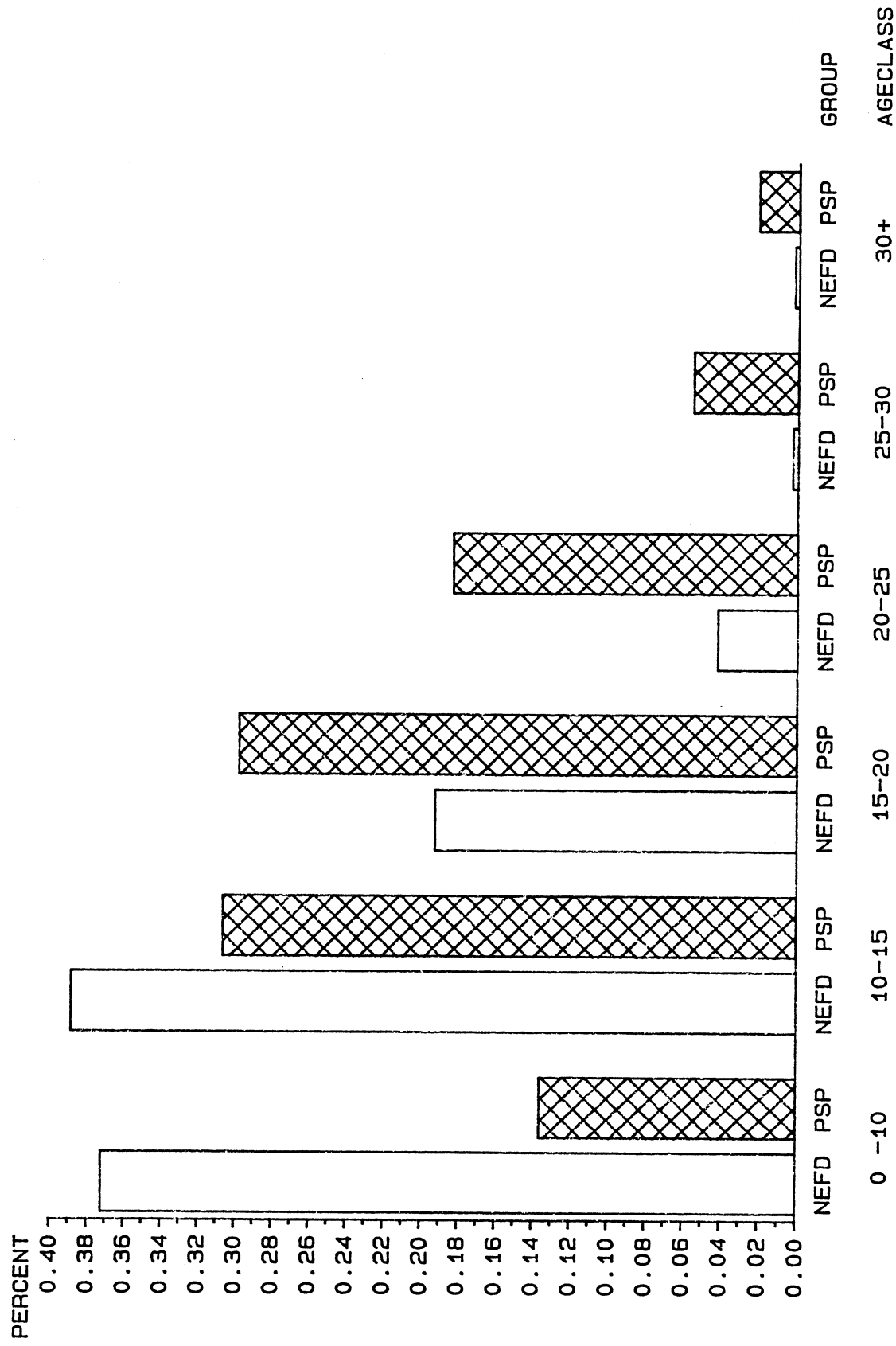
PSP SURVEY (Growth Plots)

Northland
Unpruned & Thinned



PSP SURVEY (Growth Plots)

Northland
Pruned & Thinned



NORTHLAND

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	10-14.9	15-19.9	20-24.9	25-29.9	30-34.9	35-39.9	TOTAL
	1	0	2	12	17	4	0	35
	2	0	7	40	39	31	1	118
	3	1	20	29	45	41	5	141
	4	0	6	11	18	15	0	50
	5	0	0	6	28	16	3	53
TOTAL		1	35	98	147	107	9	397

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.2 Auckland

Total

As the ageclasses become older the percentage of forest area decreases.
There is a fairly normal distribution of PSPs across the range of ageclasses.

Unpruned and Unthinned

25% of the PSPs are in the 0-10 year ageclass; 38% of the forest area is in this ageclass.

50% of the PSPs are in the 10-15 year ageclass; 33% of the forest area is in this ageclass.

The rest of the PSPs occur between 20 and 30 years old.

Forest area decreases as age increases.

Pruned and Unthinned

PSPs occur in only two ageclasses; 62% of the PSPs are in the 0-10 year ageclass; the remaining 38% are in 25-30 year ageclass.

80% of the forest area is in the 0-10 year and 10-15 year ageclasses with the rest of the forest area spread across all the other ages.

Unpruned and Thinned

31% of the forest area is in the 0-10 year ageclass.

3% of the PSPs are in the 0-10 year ageclass.

There are no PSPs older than 30 years, but all ages between 10 and 30 years show a greater proportion of PSPs (4-12%) than forest area.

Pruned and Thinned

PSPs are spread relatively evenly across all ageclasses, with an unusually high percentage in the over 30 age group.

The majority of forest area is between 10 and 20 years old (60%).

Forest area ranges from 5-15% across the rest of the ageclasses.

Table

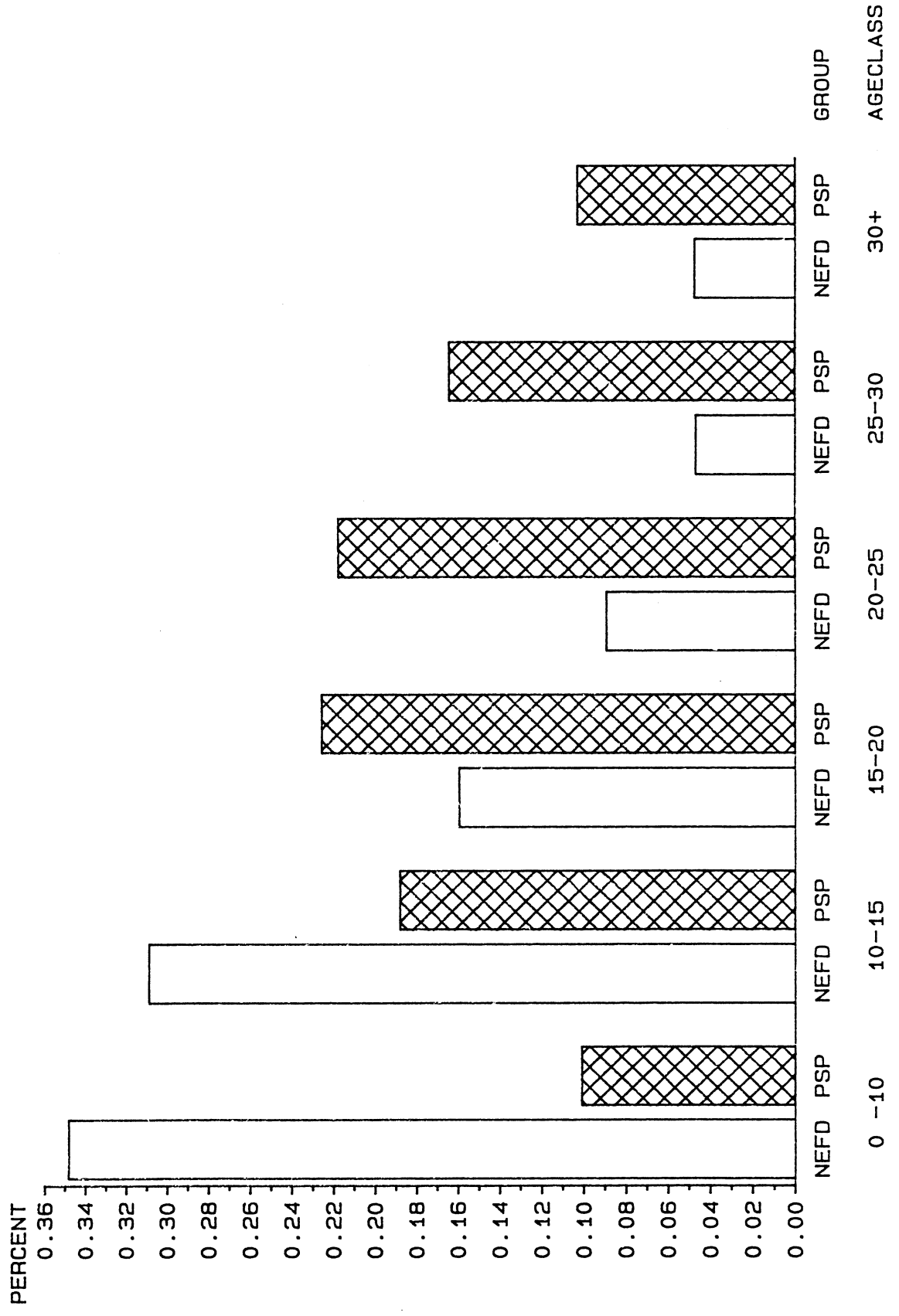
176 plots out of a total of 534 plots (33%) have a site index between 25 and 30 metres and a final crop stocking of 300-500 stems/ha.

The rest of the plots are distributed outwards from this centrally concentrated point to fewer plots representing other site indices and final crop stockings.

There are very few plots in unthinned regimes or site index greater than 35 metres.

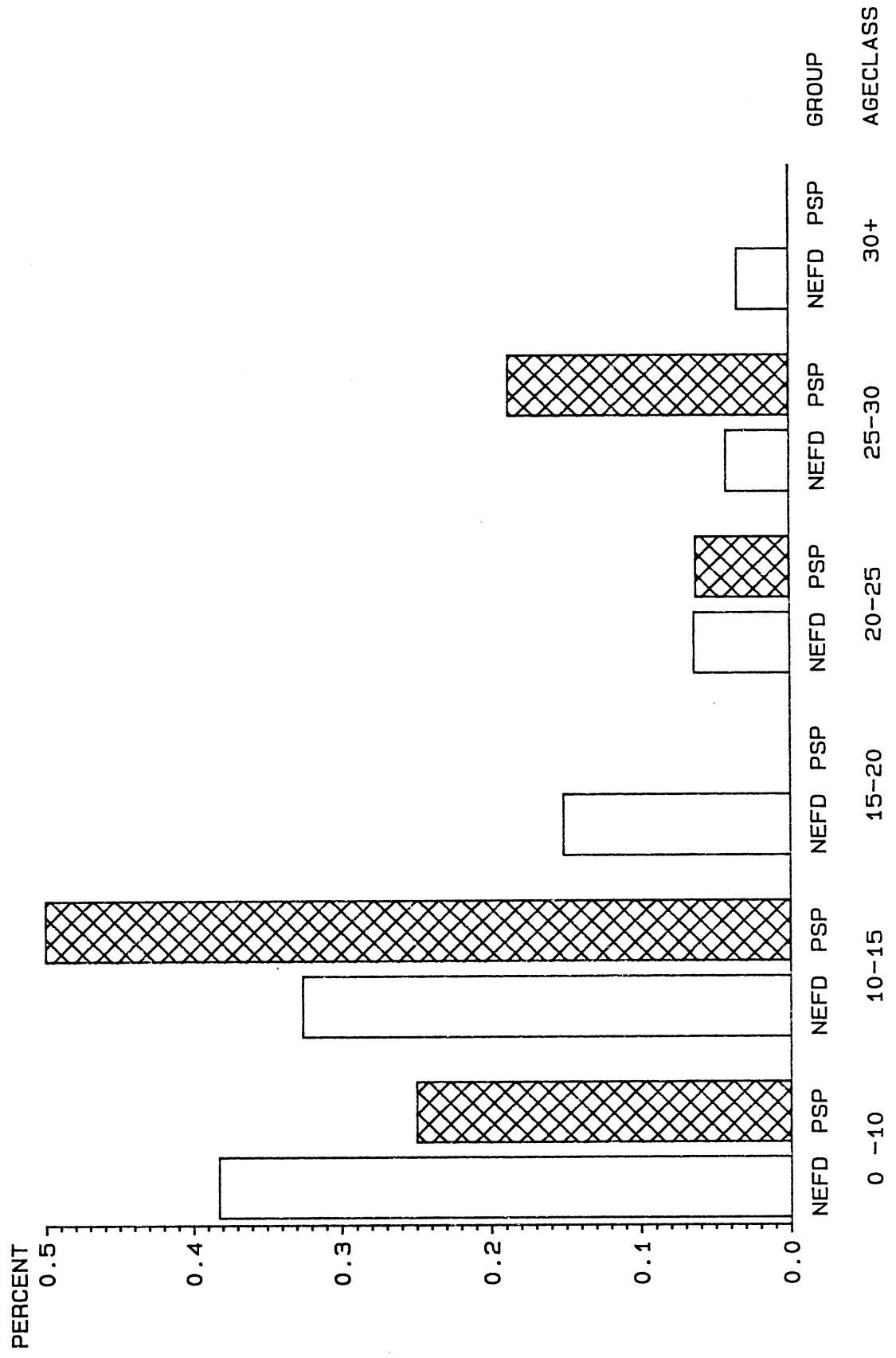
PSP SURVEY (Growth Plots)

Auckland



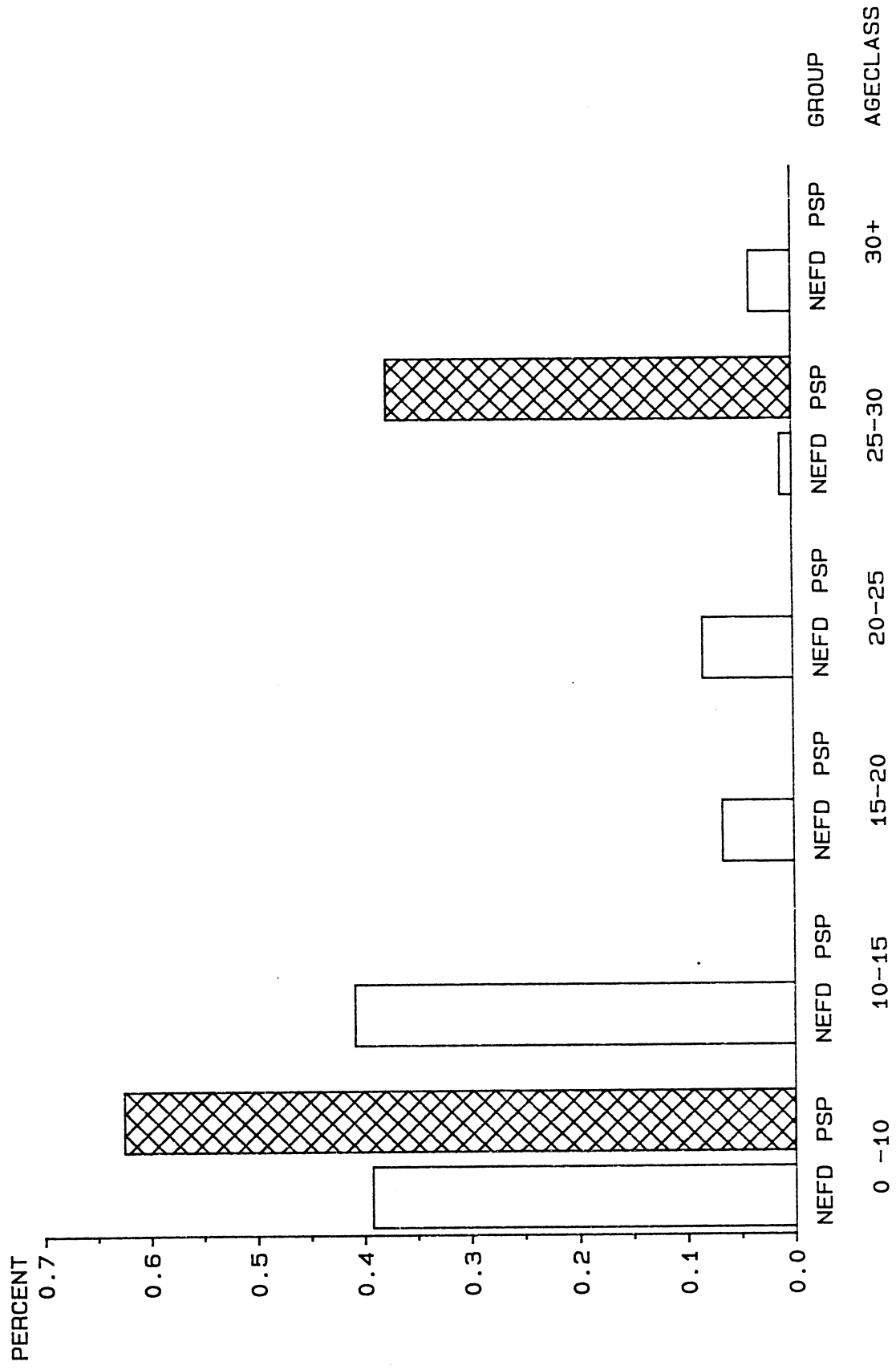
PSP SURVEY (Growth Plots)

Auckland
Unpruned & unthinned



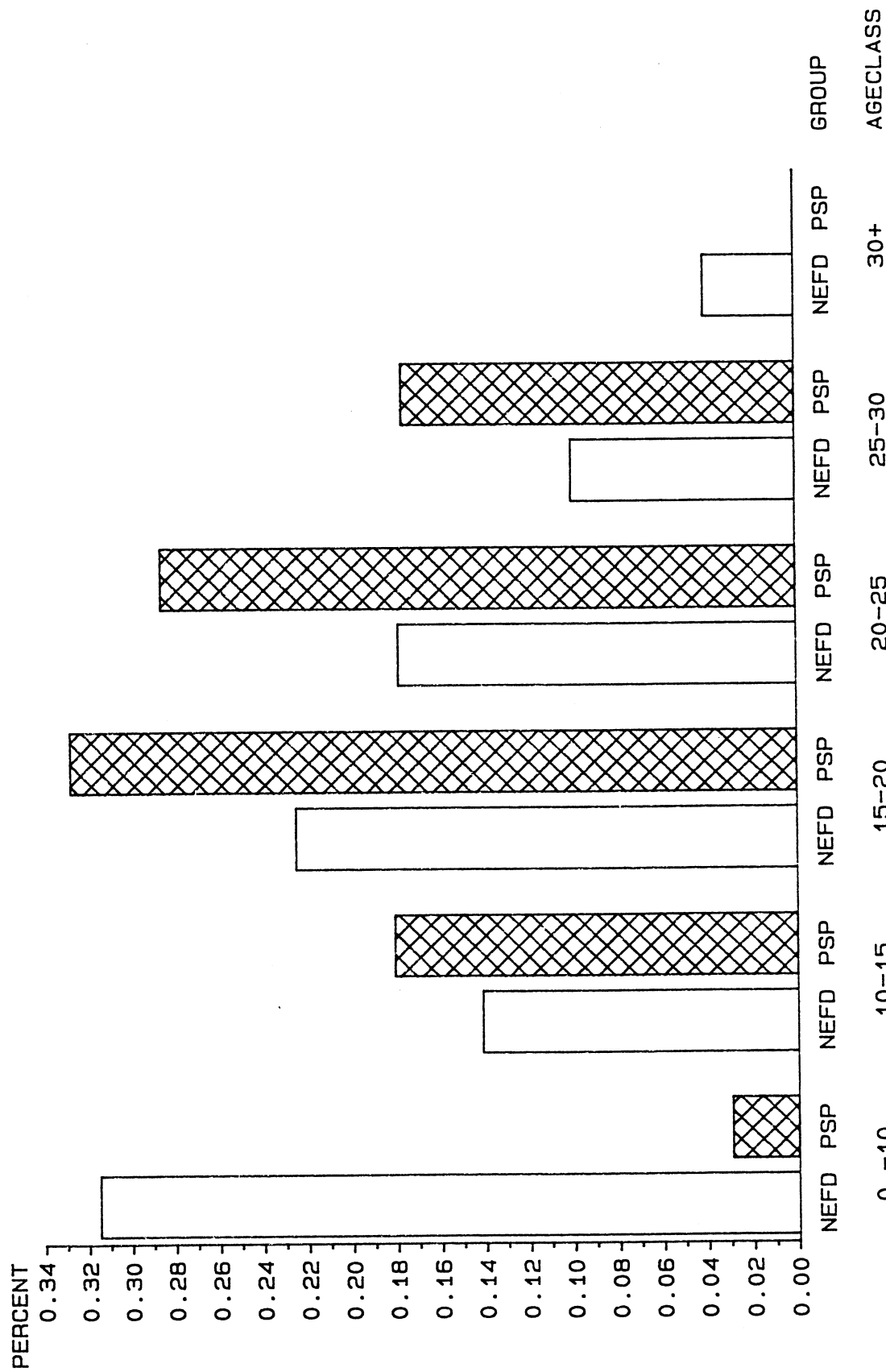
PSP SURVEY (Growth Plots)

Auckland
Pruned & Unthinned



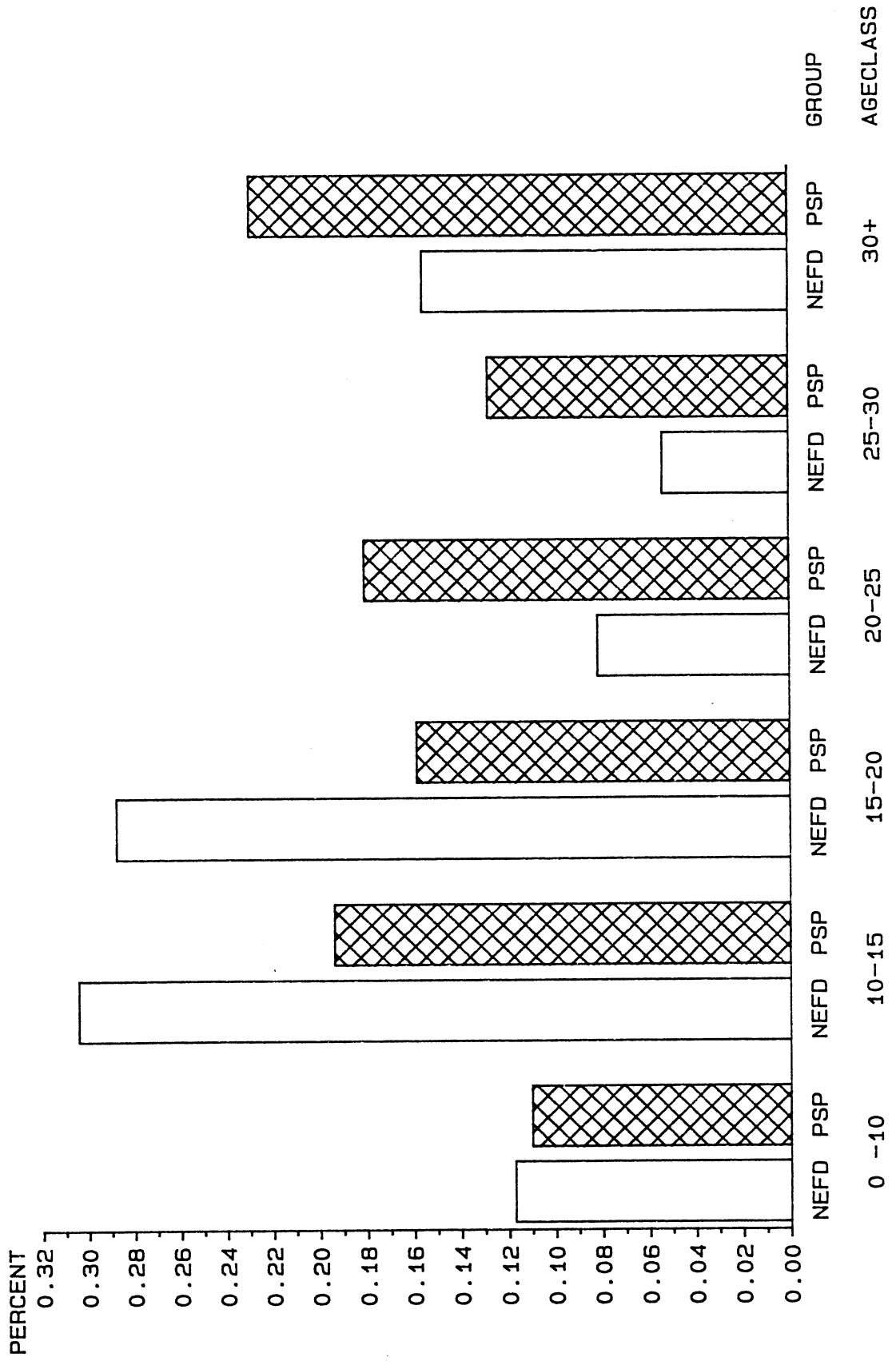
PSP SURVEY (Growth Plots)

Auckland
Unpruned & Thinned



PSP SURVEY (Growth Plots)

Auckland
Pruned & Thinned



AUCKLAND

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	10-14.9	15-19.9	20-24.9	25-29.9	30-24.9	35-39.9	TOTAL
	1	0	1	6	22	11	0	40
	2	1	2	26	77	28	1	135
	3	0	2	27	176	85	2	292
	4	0	1	1	28	10	0	40
	5	0	0	0	4	23	0	27
TOTAL		1	6	60	307	157	3	534

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.3 Central North Island

Total

40% of the forest area is in the 0-10 year ageclass.

Forest area decreases as age increases

The majority of PSPs (60%) are in the 10-15 and 15-20 year ageclasses.

18% of the PSPs are in the 25-30 year ageclass.

The rest of the PSPs are spread evenly across the other ages, although not in proportion to forest area.

Unpruned and Unthinned

Nearly 60% of the PSPs are in 15-20 year old stands.

The rest of the PSPs spread across the 0-10 year, 10-15 year and 20-25 year ageclasses with only a few over 25 years old.

Nearly 90% of the forest area is less than 20 years old (spread evenly across ageclasses).

There is only a small area of forest in the older ageclasses, with a similar proportion of PSPs in each.

Pruned and Unthinned

87% of the forest area is less than 15 years old.

4% of the PSPs are in the 0-10 year ageclass and there are no PSPs between 20 and 25 years old.

The remaining PSPs in the region range from 14-40% across the other age-classes, with a much greater proportion of PSPs than forest area.

Unpruned and Thinned

47% of the forest area is in the 0-10 year ageclass whereas only 1% of the PSPs are in this ageclass.

35% of the PSPs are in the 10-15 year ageclass with this percentage gradually decreasing as age increases.

Between ages 10 and 30 years the percentage of forest area is much smaller than the percentage of PSPs.

Pruned and Thinned

There is a very similar percentage (~35%) of PSPs and forest area between ages 10 and 15 years.

There are 18% fewer PSPs in the 0-10 year ageclass than percentage of forest area.

There are about 10% more PSPs in the 15-20 and 25-30 year ageclasses than percentage of forest area.

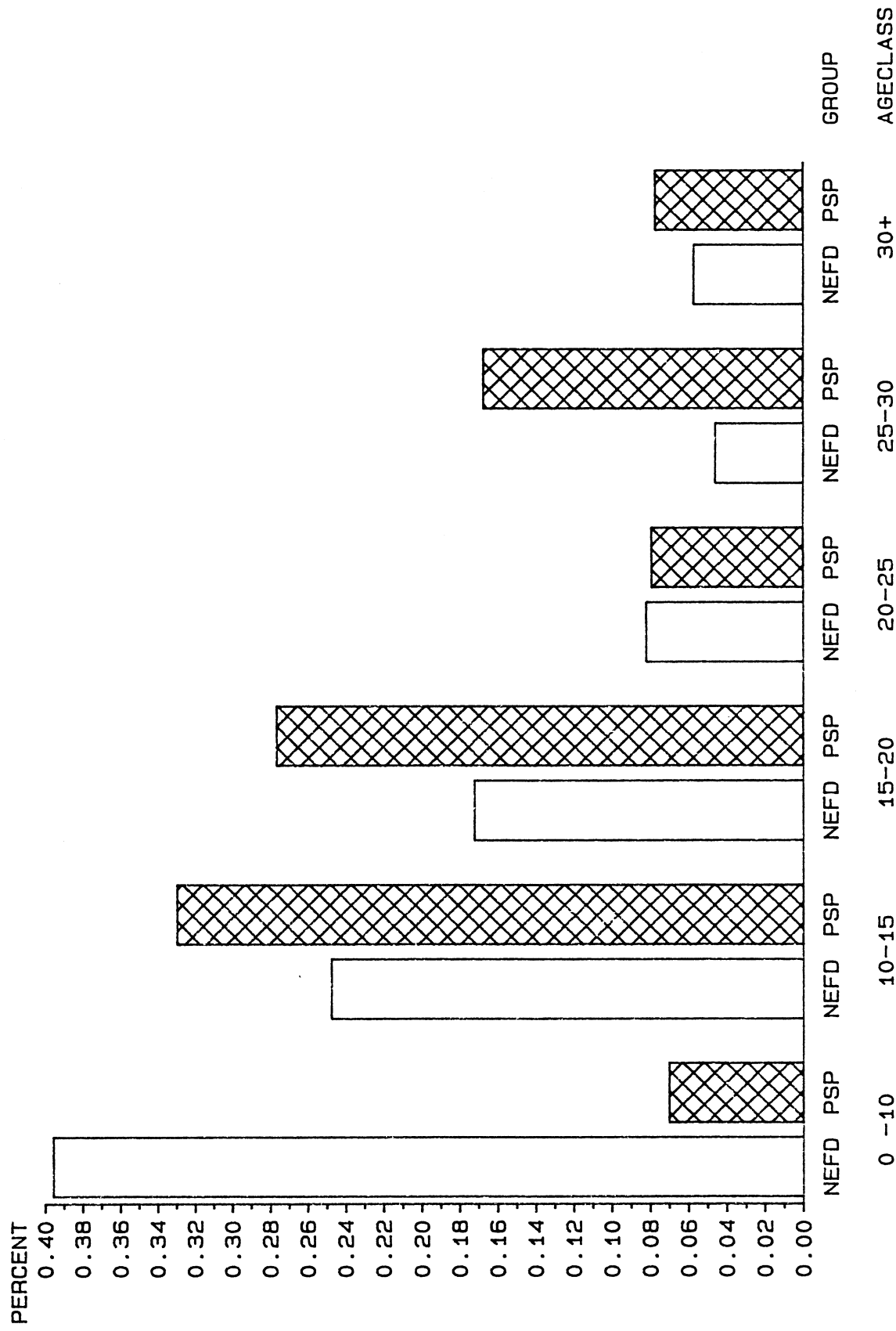
Table

The majority of PSPs have a site index between 25 and 35 metres and a final crop stocking from 200-500 stems/ha.

There are an unusually high number of PSPs with site indices higher than 40 metres.

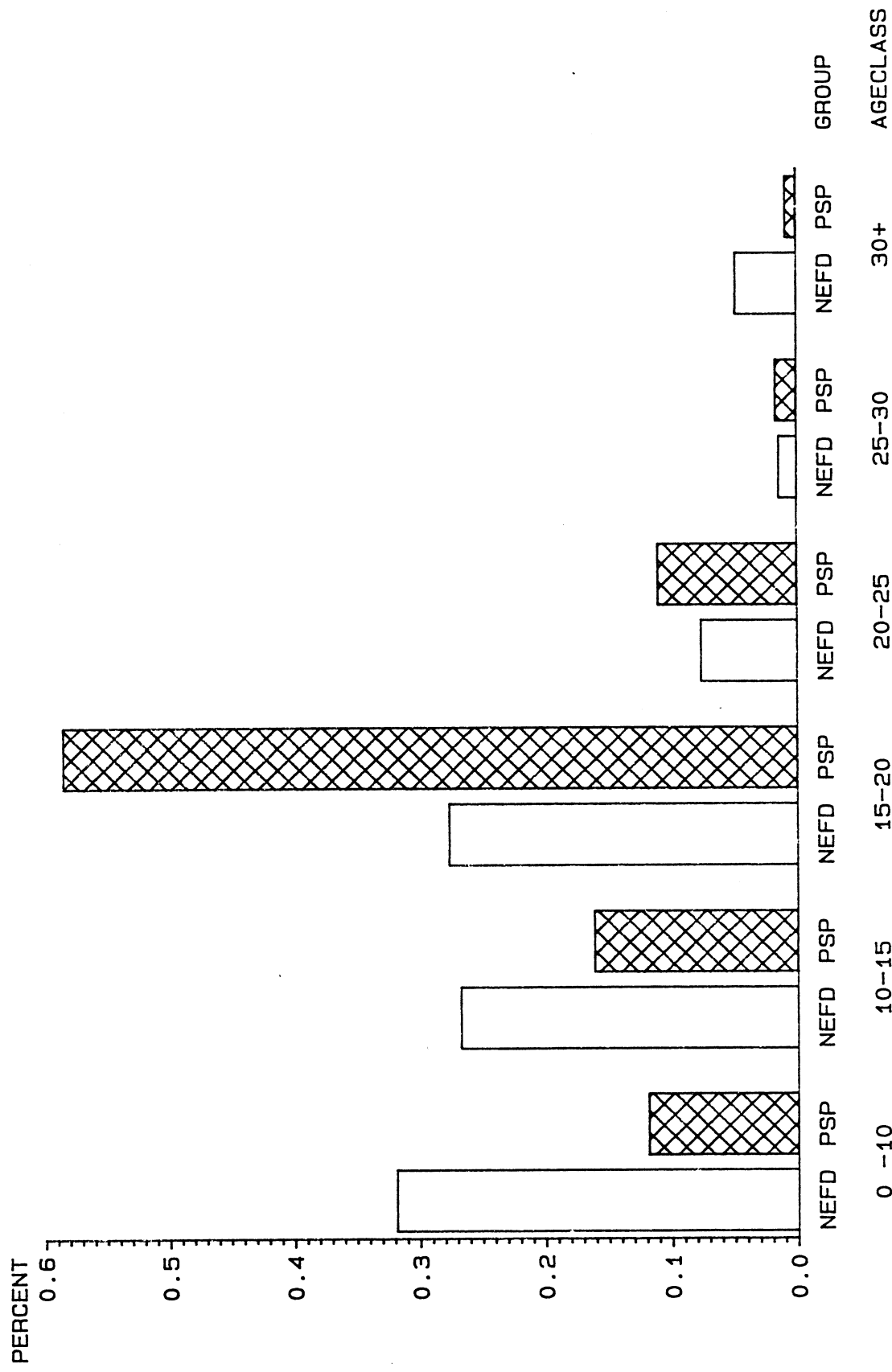
PSP SURVEY (Growth plots)

Central North Island



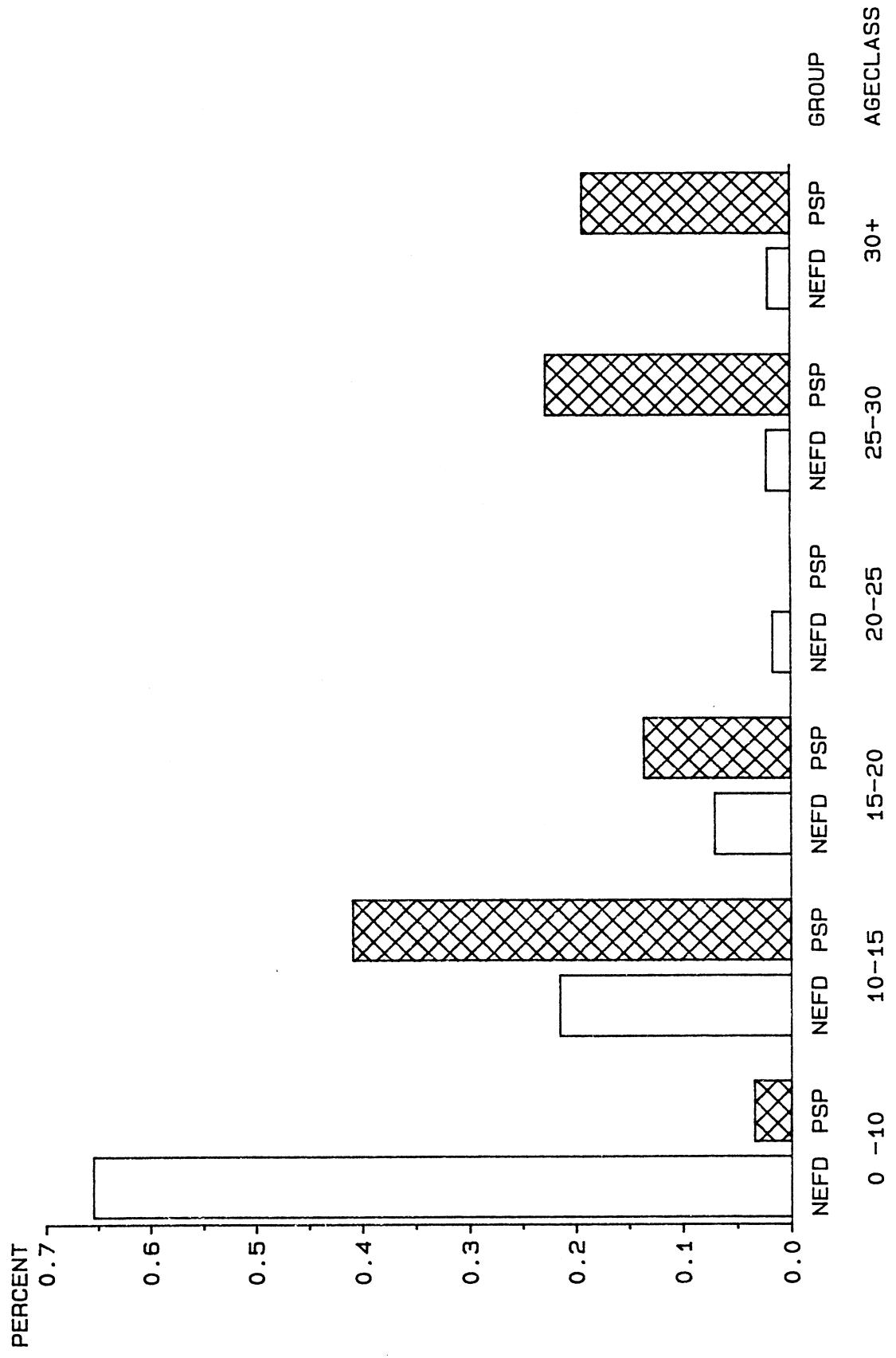
PSP SURVEY (Growth plots)

Central North Island
Unpruned & unthinned



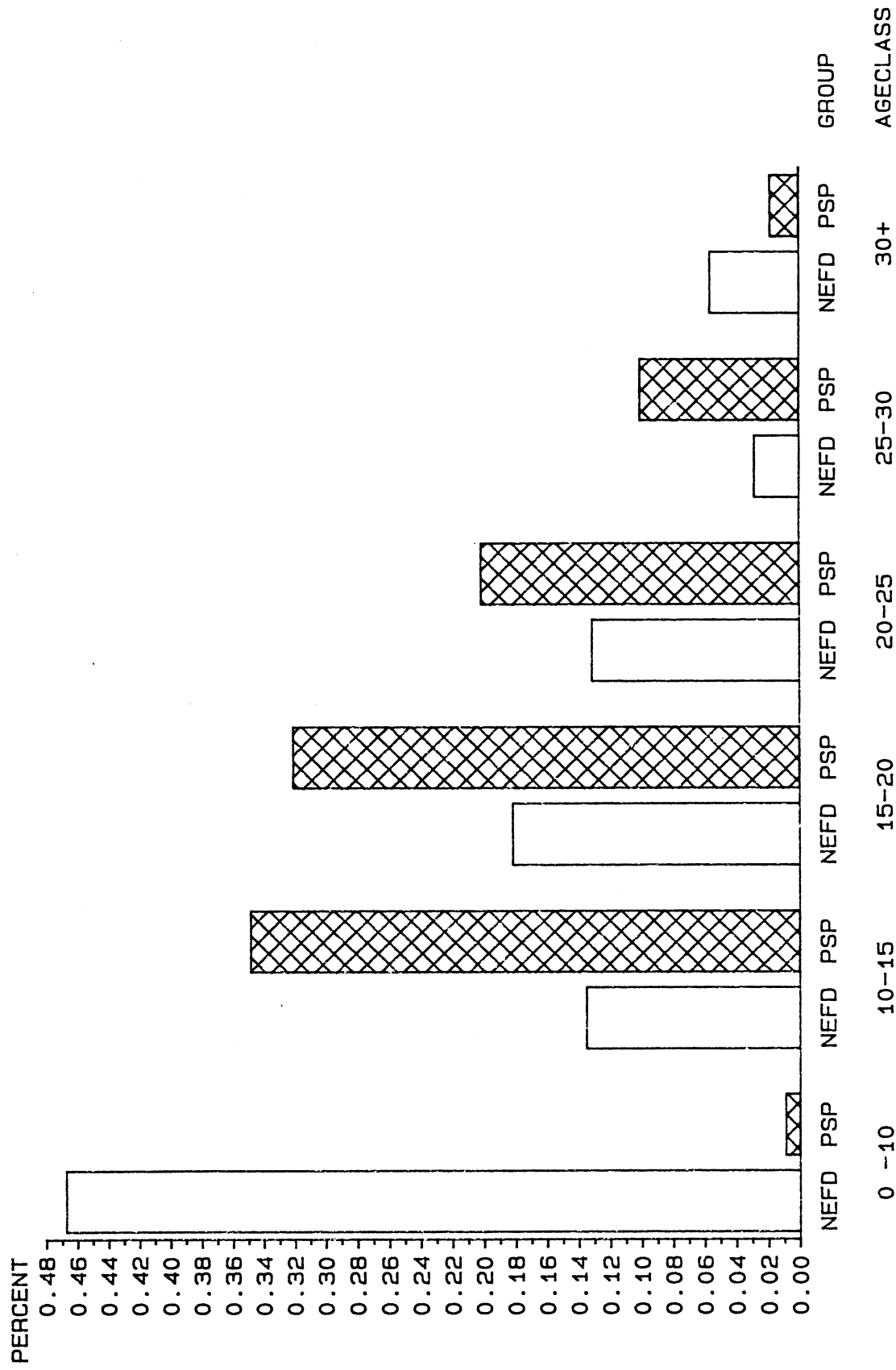
PSP SURVEY (Growth plots)

Central North Island
Pruned & Unthinned



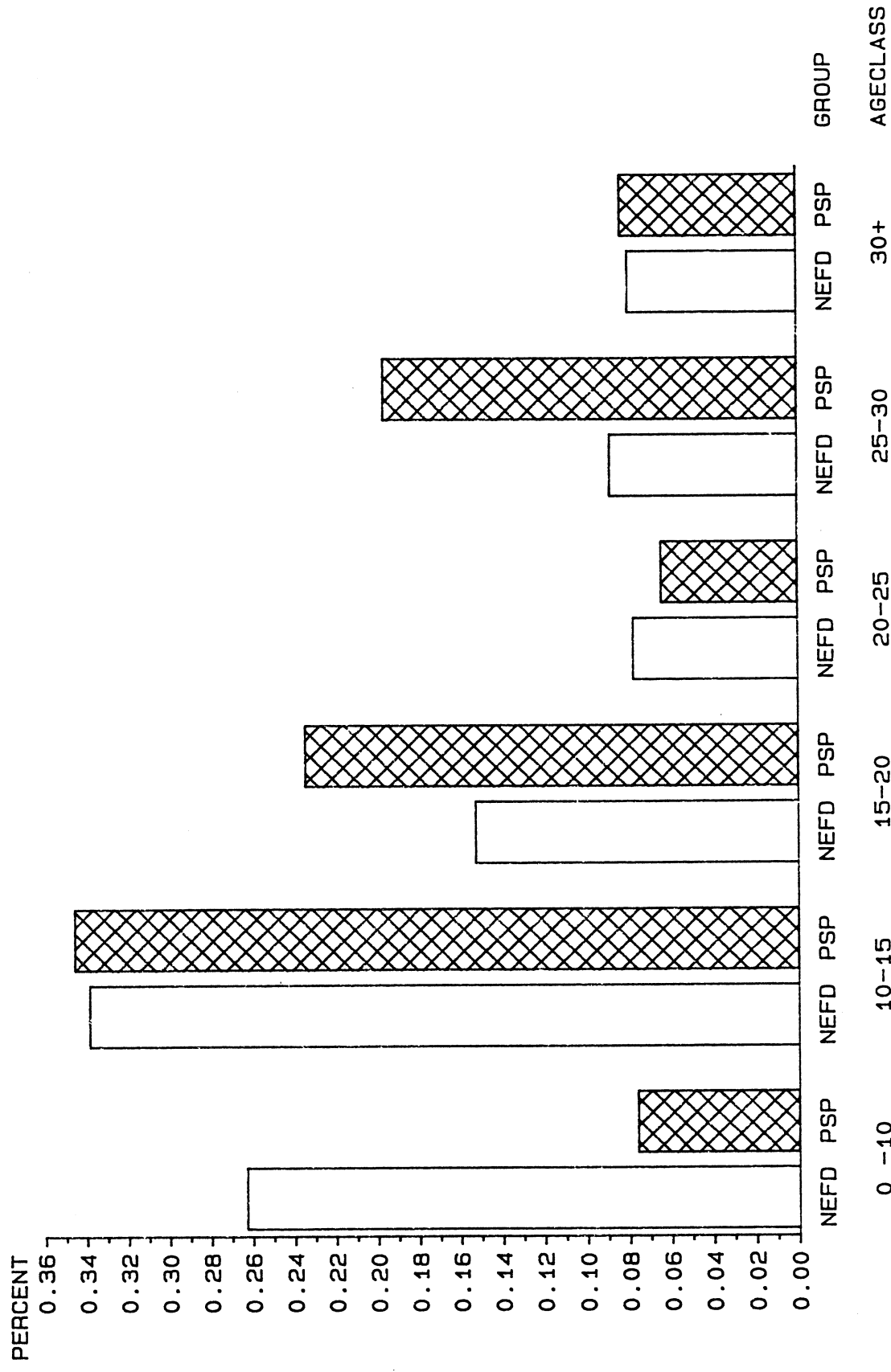
PSP SURVEY (Growth plots)

Central North Island
Unpruned & thinned



PSP SURVEY (Growth plots)

Central North Island
Pruned & thinned



CENTRAL NORTH ISLAND

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	15-19.9	20-24.9	25-29.9	30-34.9	35-39.9	40-44.9	TOTAL
	1	1	2	24	57	7	0	91
	2	0	12	117	192	38	1	360
	3	1	17	204	83	34	26	365
	4	4	11	50	37	12	13	127
	5	0	0	11	30	14	0	55
TOTAL		6	42	406	399	105	40	998

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.4 East Coast/Hawkes Bay

Total

55% of the forest area is in the 0-10 year ageclass.

As age increases forest area decreases.

There is a similar percentage (~26%) of PSPs in ageclasses between 10 and 25 years.

With the exception of the youngest ageclass, there is a greater percentage of PSPs in each ageclass than forest area.

Unpruned and Unthinned

Most of the forest area (82%) and PSPs (86%) are in the younger ageclasses between 0 and 15 years.

There are very few PSPs or forest area in stands over 20 years old.

Pruned and Unthinned

There are no PSPs in the 0-10 year ageclass, whereas there is 57% of the forest area in this ageclass.

The opposite occurs in the 25-30 year ageclass, with 50% of the PSPs and 2% of the forest area.

The remainder of the PSPs are evenly distributed between the ageclasses 10 and 25 years.

There are no PSPs and a very small amount of forest area over 30 years old.

Unpruned and Thinned

There are no PSPs in ageclass 0-10 years, whereas a large amount (40%) of the forest area is in this ageclass.

The majority of the PSPs (62%) are in the 15-20 year ageclass.

There are no PSPs in stands over 30 years.

Pruned and Thinned

79% of the forest area in this region is in ageclasses between 0 and 15 years; 37% of the PSPs are in these ageclasses.

At ages greater than 15 years the percentage of PSPs is considerably greater than the percentage of forest area.

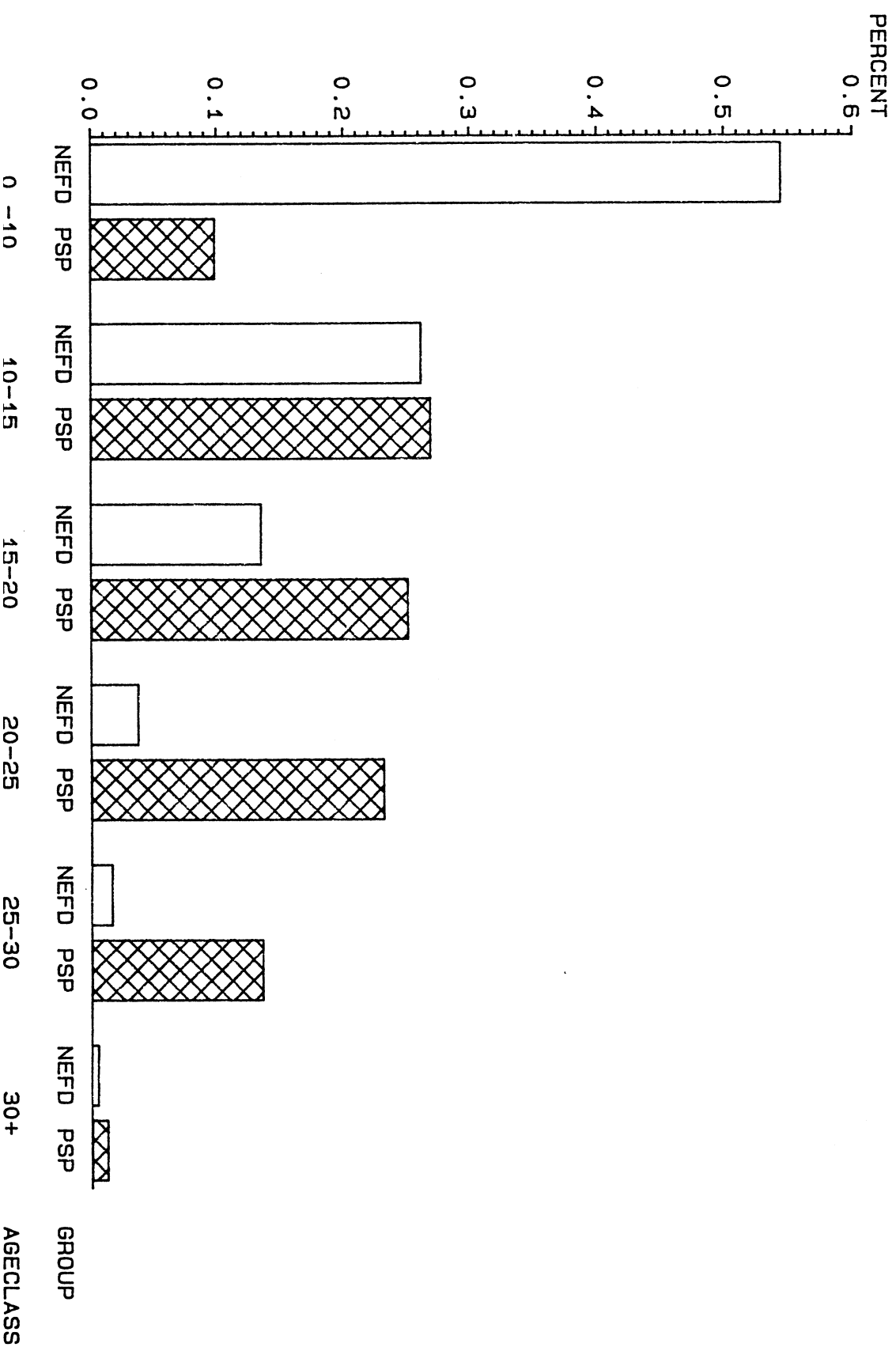
Table

The majority of plots have site indices between 25-35 metres and final crop stocking between 200 and 500 stems/ha.

One plot occurs with a final crop stocking less than 100 stems/ha and there are very few plots in unthinned stands.

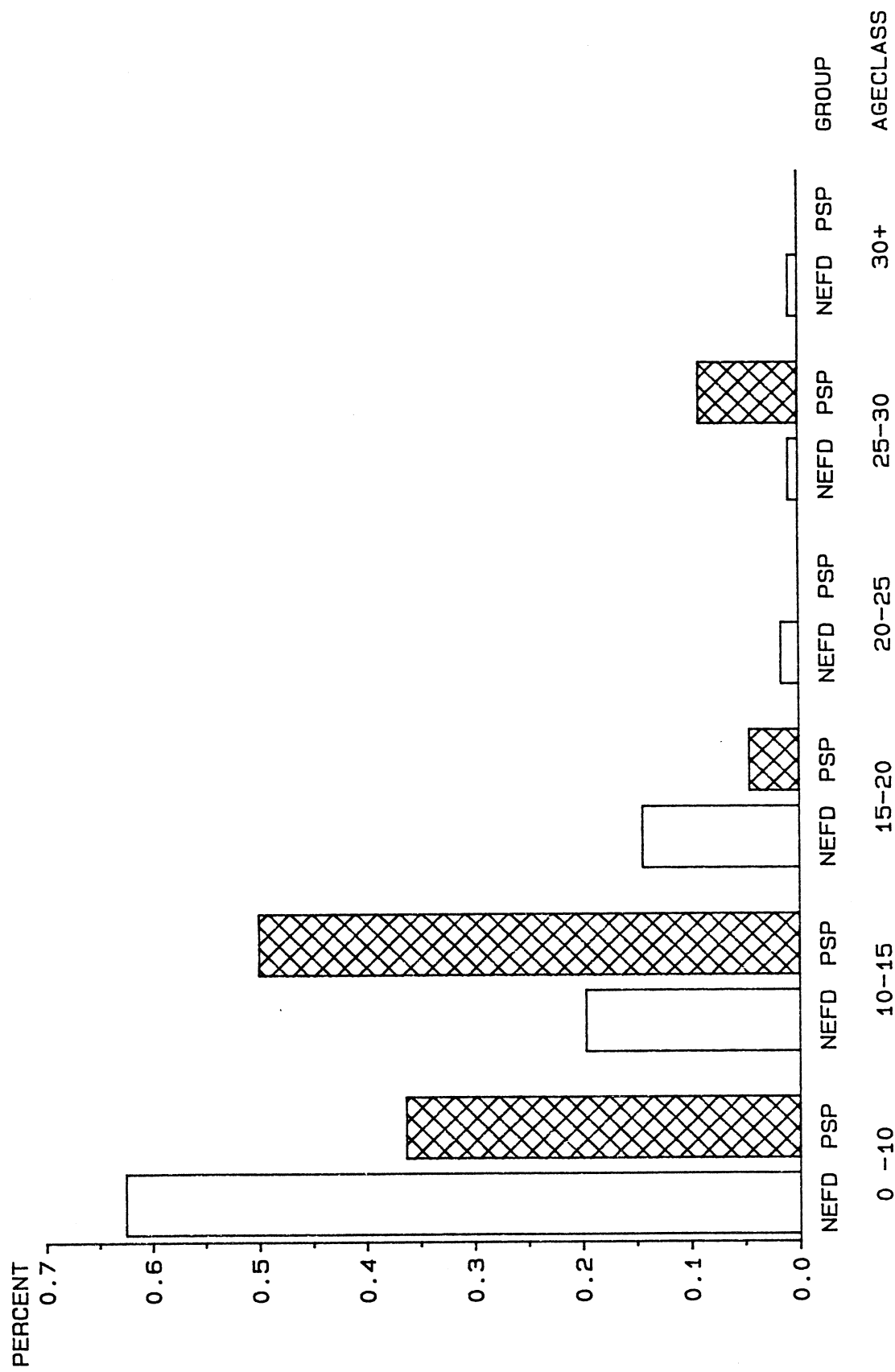
PSP SURVEY (Growth plots)

East Coast/Hawkes Bay



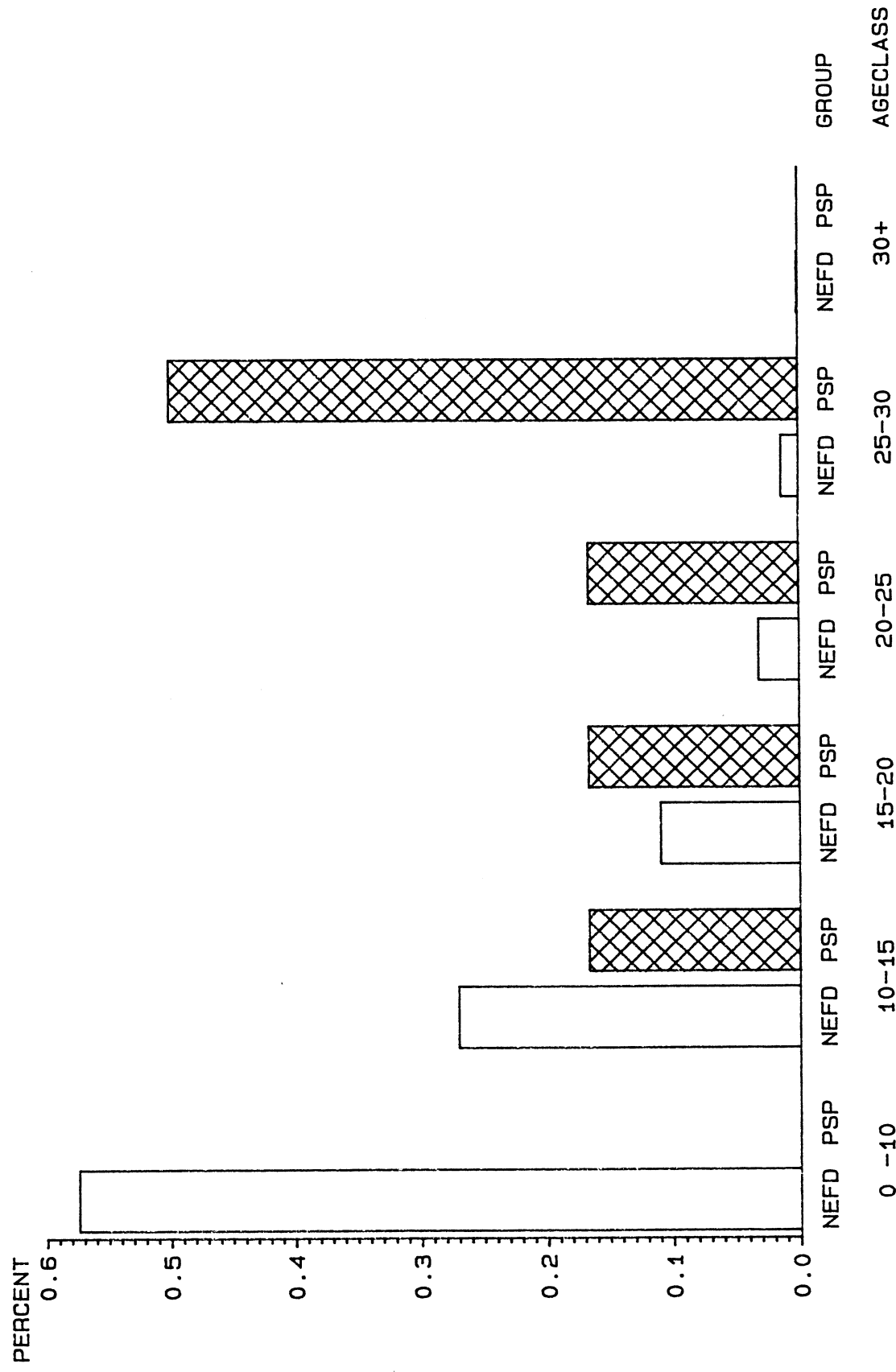
PSP SURVEY (Growth plots)

East Coast/Hawkes Bay
Unpruned & Unthinned



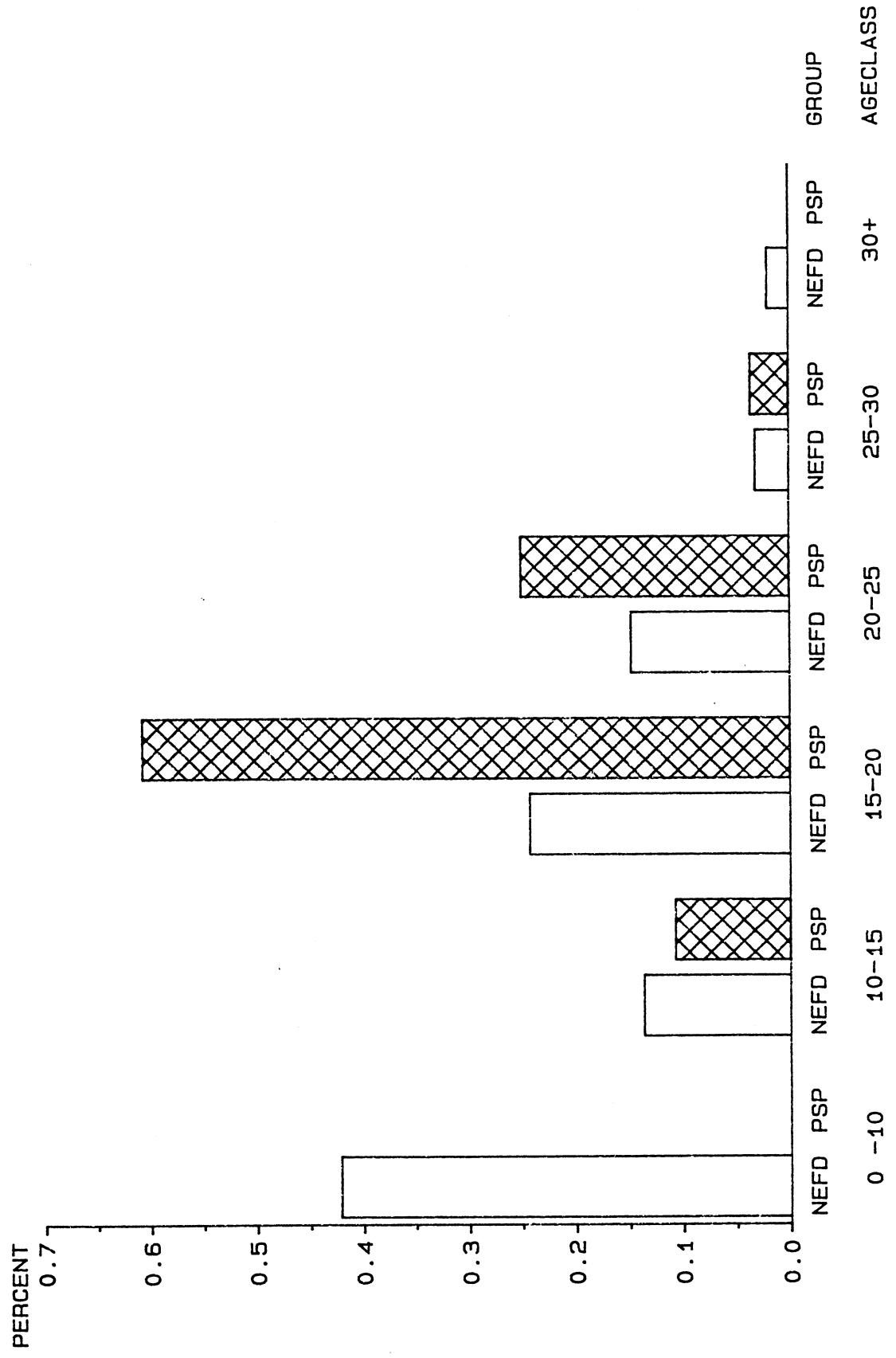
PSP SURVEY (Growth plots)

East Coast/Hawkes Bay
Pruned & Unthinned



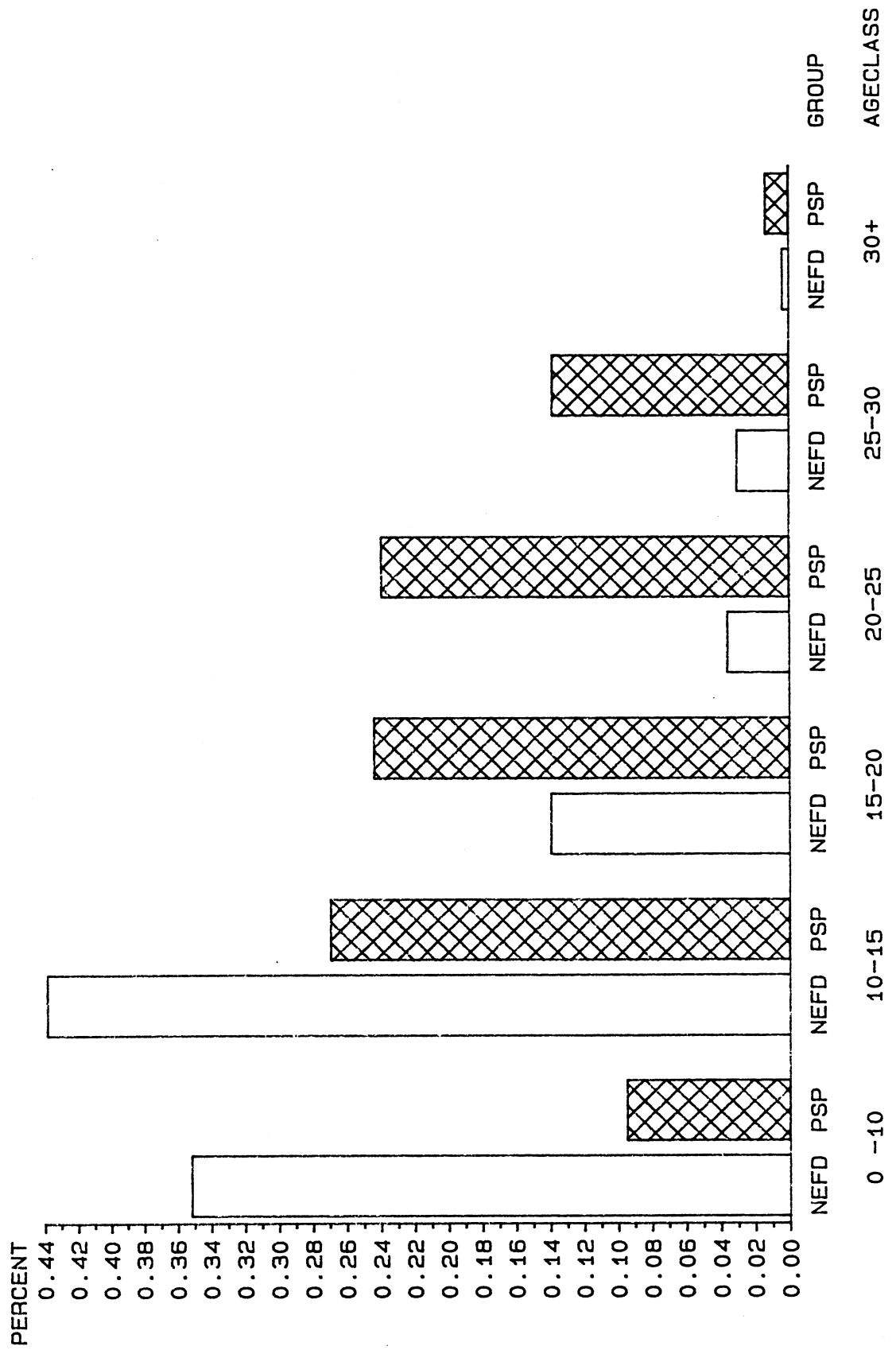
PSP SURVEY (Growth plots)

East Coast/Hawkes Bay
Unpruned & Thinned



PSP SURVEY (Growth plots)

East Coast/Hawkes Bay
Pruned & Thinned



EAST COAST/HAWKES BAY

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	10-14.9	15-19.9	20-24.9	25-29.9	30-34.9	35-39.9	40-44.9	TOTAL
	0	0	0	0	1	0	0	0	1
	1	0	2	13	56	46	10	0	127
	2	1	4	50	94	126	28	1	304
	3	0	2	29	86	83	11	0	211
	4	0	0	7	25	16	1	0	49
	5	0	4	5	12	7	0	0	28
TOTAL		1	12	104	274	278	50	1	720

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.5 Southern North Island

Total

50% of the forest area is in the 0-10 year ageclass; whereas only 6% of the PSPs are in this ageclass.

The PSPs are fairly evenly distributed across the other ageclasses.

There is a greater percentage of PSPs than forest area in ageclasses older than 15 years.

Unpruned and Unthinned

The percentage of PSP and forest area do not coincide at all.

50% of the PSPs are in the 15-20 year ageclass and 50% in the 25-30 year ageclass.

Only about 10% of the forest area is in these two ageclasses.

The majority of the forest area (66%) is in the 0-10 year ageclass and no PSPs occur here.

Pruned and Unthinned

55% of the PSPs are in the 25-30 year ageclass, whereas only 4% of the forest area is in this ageclass.

Forest area decreases evenly from 39% in the youngest ageclass to 2% in the oldest ageclass.

There are no PSPs in the 20-25 year or 30+ year ageclasses.

Unpruned and Thinned

70% of the forest area is in the 0-10 year ageclass and no PSPs are in this ageclass.

90% of the PSPs are in the 15-20 and 20-25 year ageclass.

There is a greater percentage of PSPs than of forest area from 15 years onwards.

Pruned and Thinned

38% of the forest area is in the 0-10 year ageclass, whereas only 6% of the PSPs are in this ageclass.

Forest area decreases as age increases.

The percentage of PSPs is greater than the percentage of forest area, by more than 10%, between the ages 15-30 years.

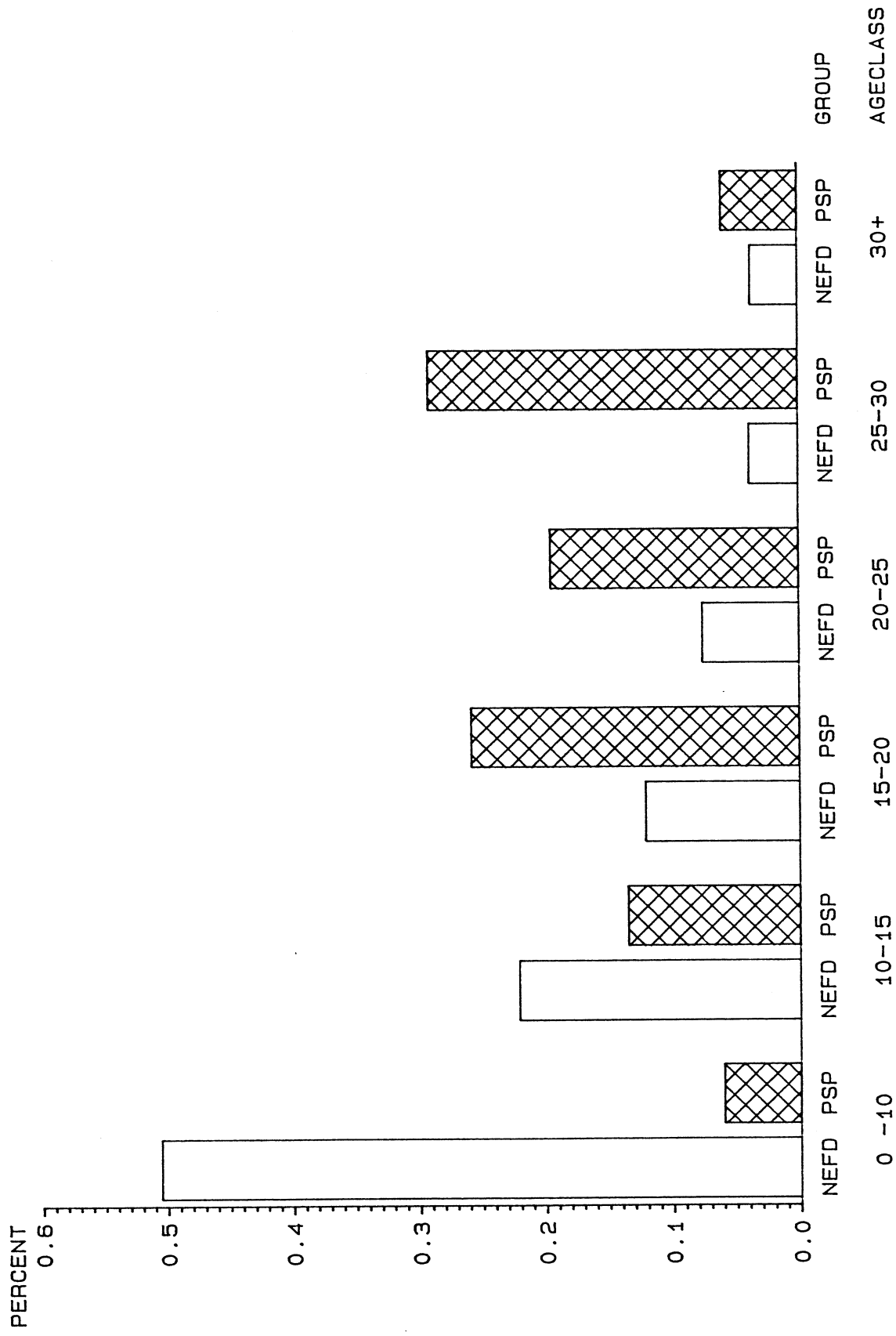
Table

The majority of plots have site indices between 25 and 30 metres and final crop stockings from 200-300 stems/ha.

Very few plots (4%) are unthinned or have site indices greater than 35 metres.

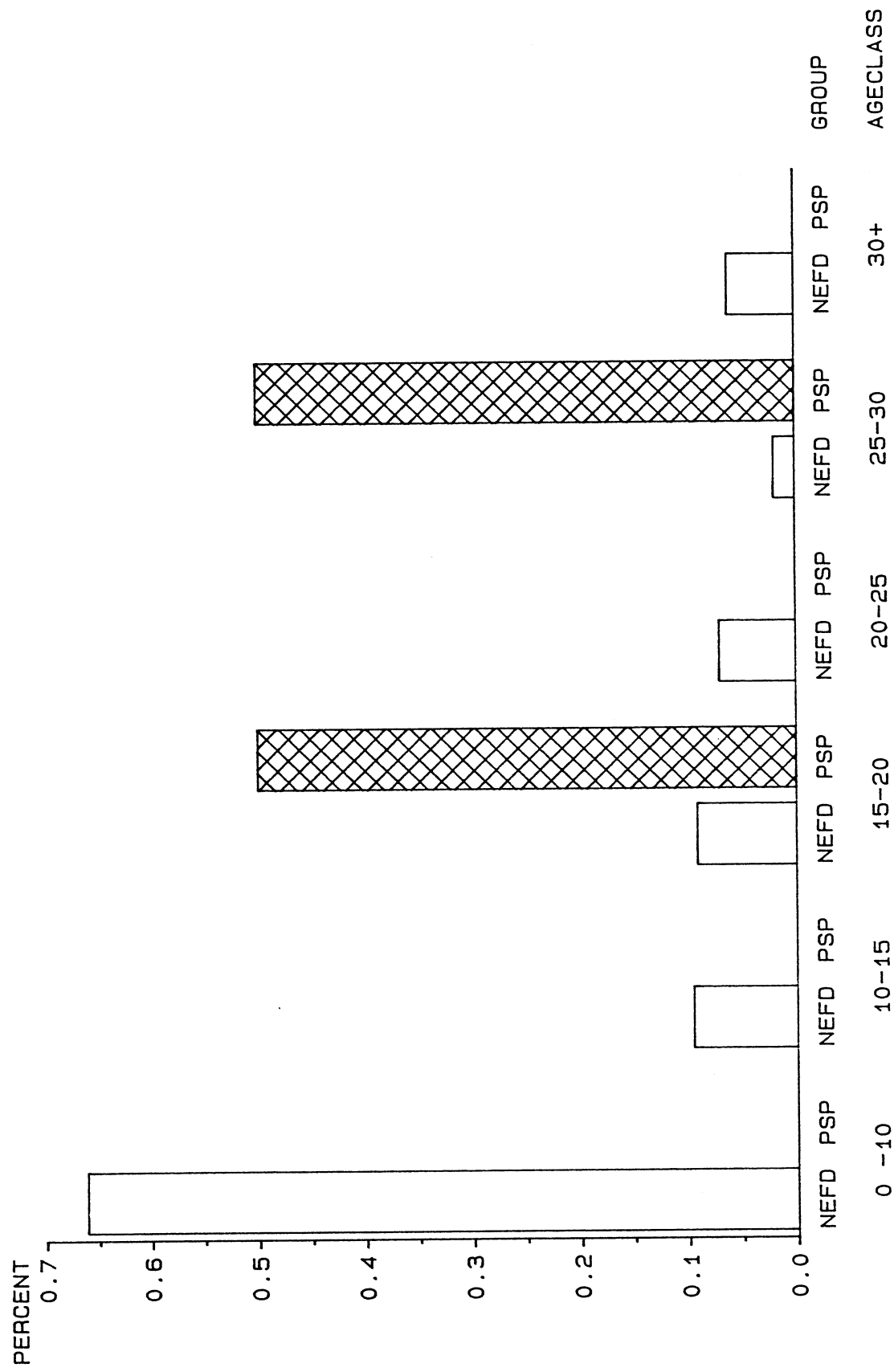
PSP SURVEY (Growth plots)

Southern North Island



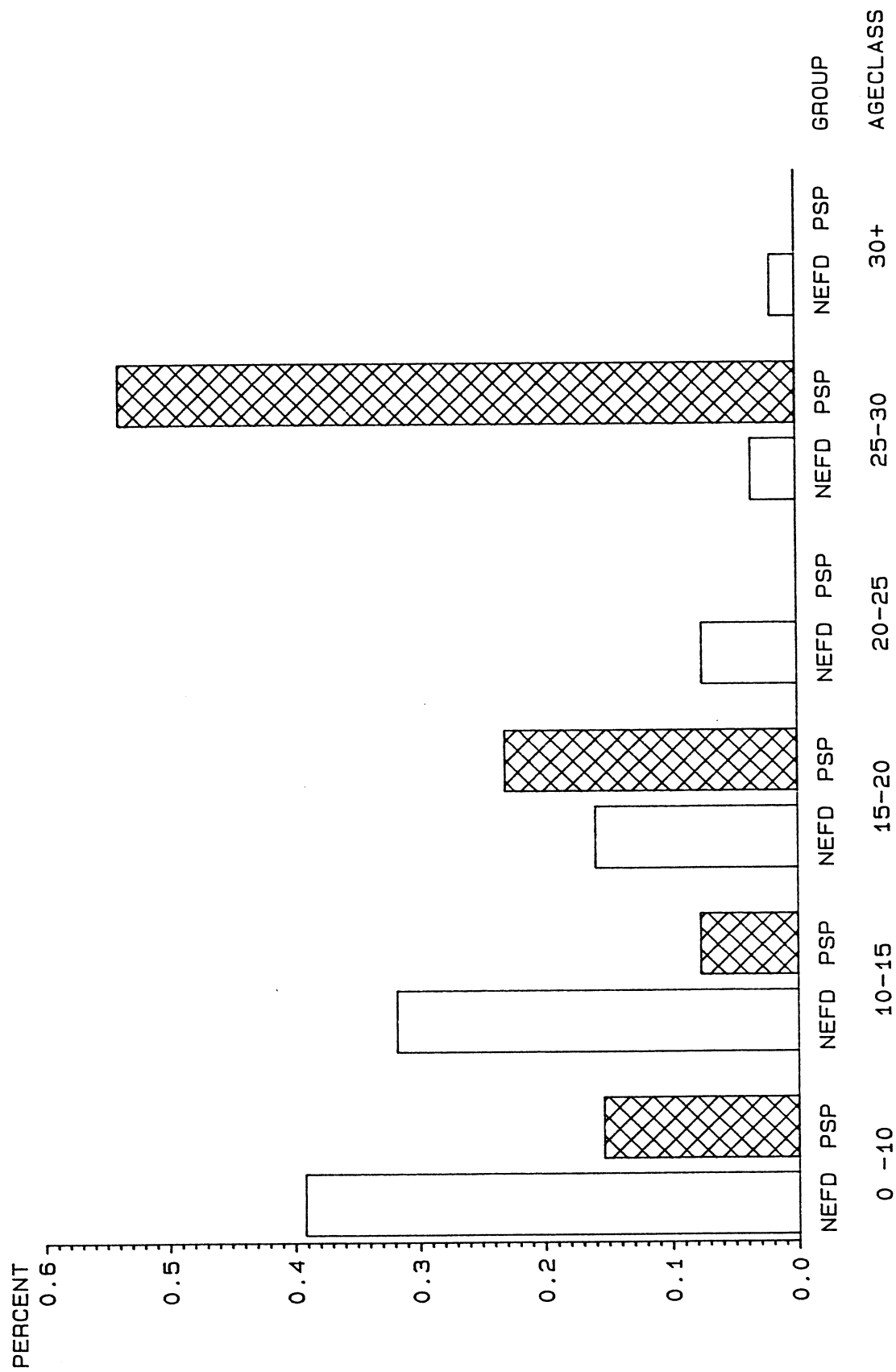
PSP SURVEY (Growth plots)

Southern North Island
Unpruned & Unthinned



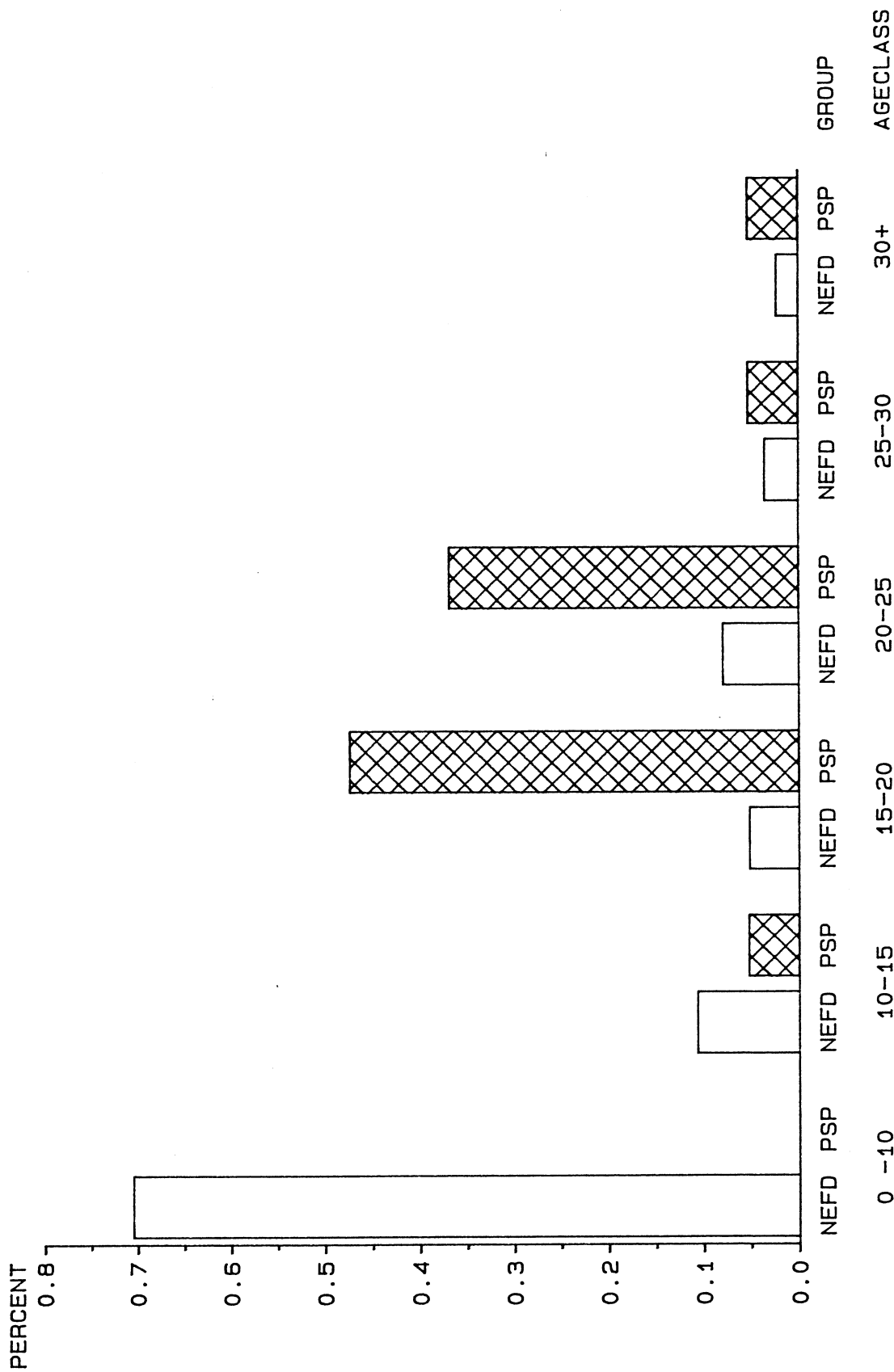
PSP SURVEY (Growth plots)

Southern North Island
Pruned & Unthinned



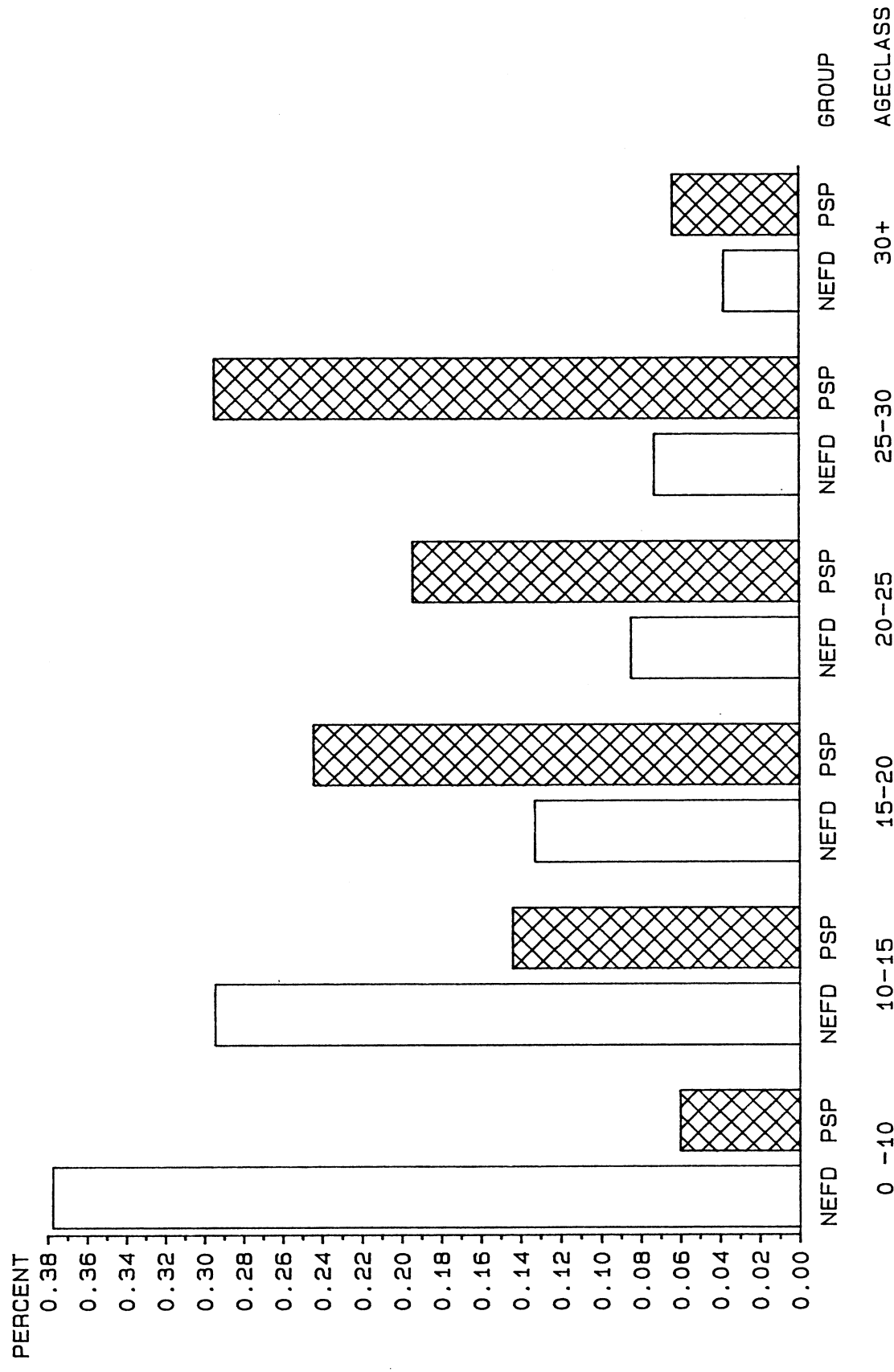
PSP SURVEY (Growth plots)

Southern North Island
Unpruned & Thinned



PSP SURVEY (Growth plots)

Southern North Island
Pruned & Thinned



SOUTHERN NORTH ISLAND

Final Crop Stocking vs Site Index

site index

		FREQUENCY							TOTAL	
		10-14.9	15-19.9	20-24.9	25-29.9	30-34.9	35-39.9	40-44.9		
F C S		1	0	1	5	17	5	0	1	29
		2	0	4	44	73	27	1	0	149
		3	4	13	28	36	20	1	0	102
		4	1	5	16	9	7	2	0	40
		5	2	5	2	0	4	0	0	13
TOTAL		7	28	95	135	63	4	1		333

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.6 Nelson/Marlborough

Total

40% of the forest area is in the 0-10 year ageclass, whereas only 5% of the PSPs are in this ageclass.

Forest area decreases as age increases.

At ages greater than 15 years the percentage of PSPs is greater than the percentage of forest area, with PSPs showing an almost normal distribution across the ageclasses.

Unpruned and Unthinned

45% of the forest area is in the 0-10 year ageclass, whereas only 7% of the PSPs are in this ageclass.

Forest area decreases as age increases.

42% of the PSPs are in the 20-25 year ageclass.

The remainder of PSPs are distributed across the other ageclasses.

Pruned and Unthinned

All the PSPs (100%) in this region are in the 0-10 year ageclass.

Forest area decreases evenly from 40% in the youngest ageclass to 2% in the oldest ageclass.

Unpruned and Thinned

There is a fairly normal distribution of PSPs across all ageclasses.

50% of the forest area and 33% of the PSPs are in the 15-20 year ageclass.

25% of the forest area is in the 0-10 year ageclass, whereas only 1% of the PSPs are in this ageclass.

Pruned and Thinned

There is a similar pattern for the percentages of both forest area and PSPs.

There is a low percentage of PSPs and forest area in the 0-10 year ageclass, then an increase to 43% of the forest area and 30% of the PSPs from ages 10-15 years.

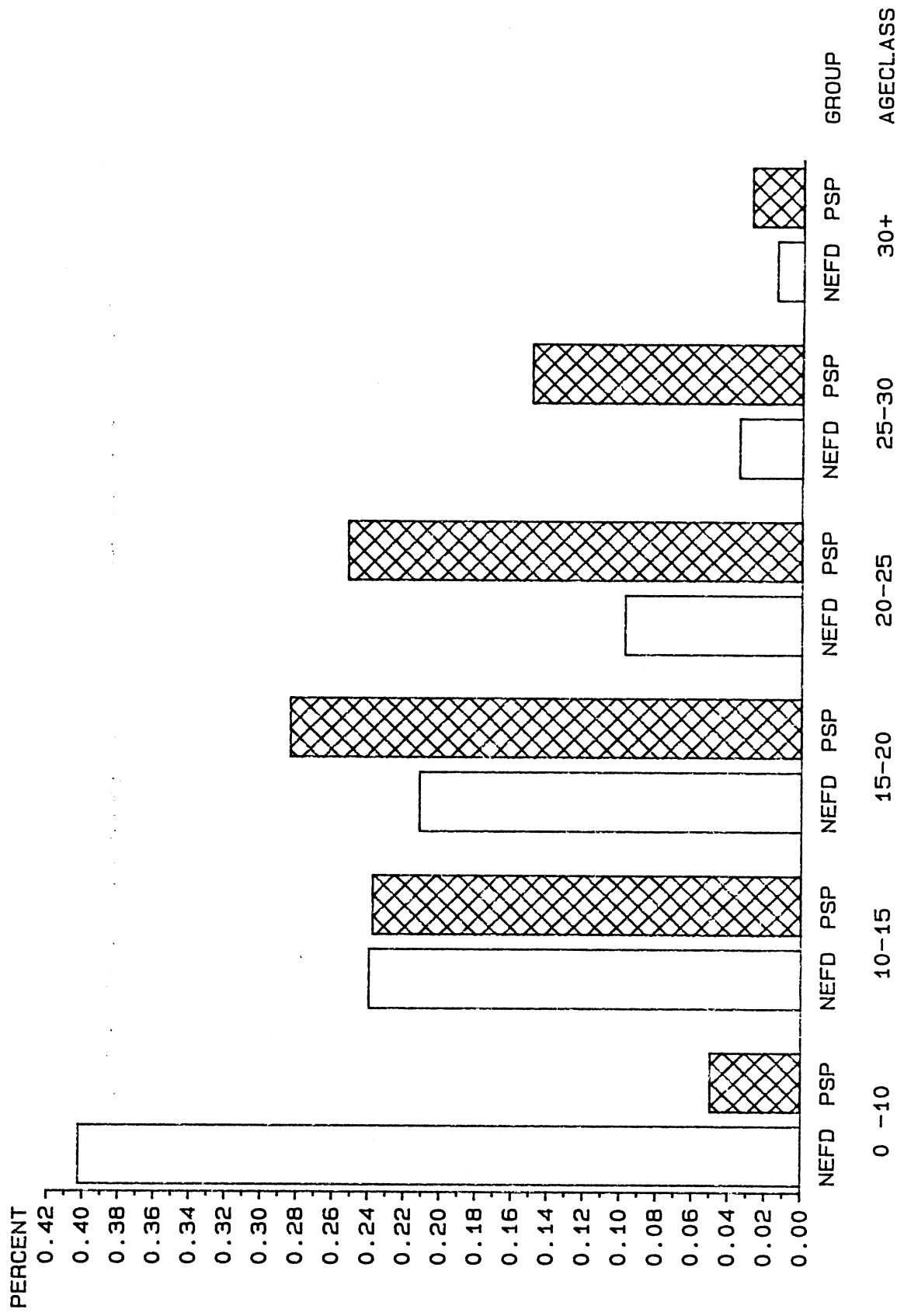
Table

The largest group of plots have site indices from 25-35 metres over a range of final crop stockings greater than 200 stems/ha.

Very few plots occur with site indices less than 20 metres or greater than 35 metres.

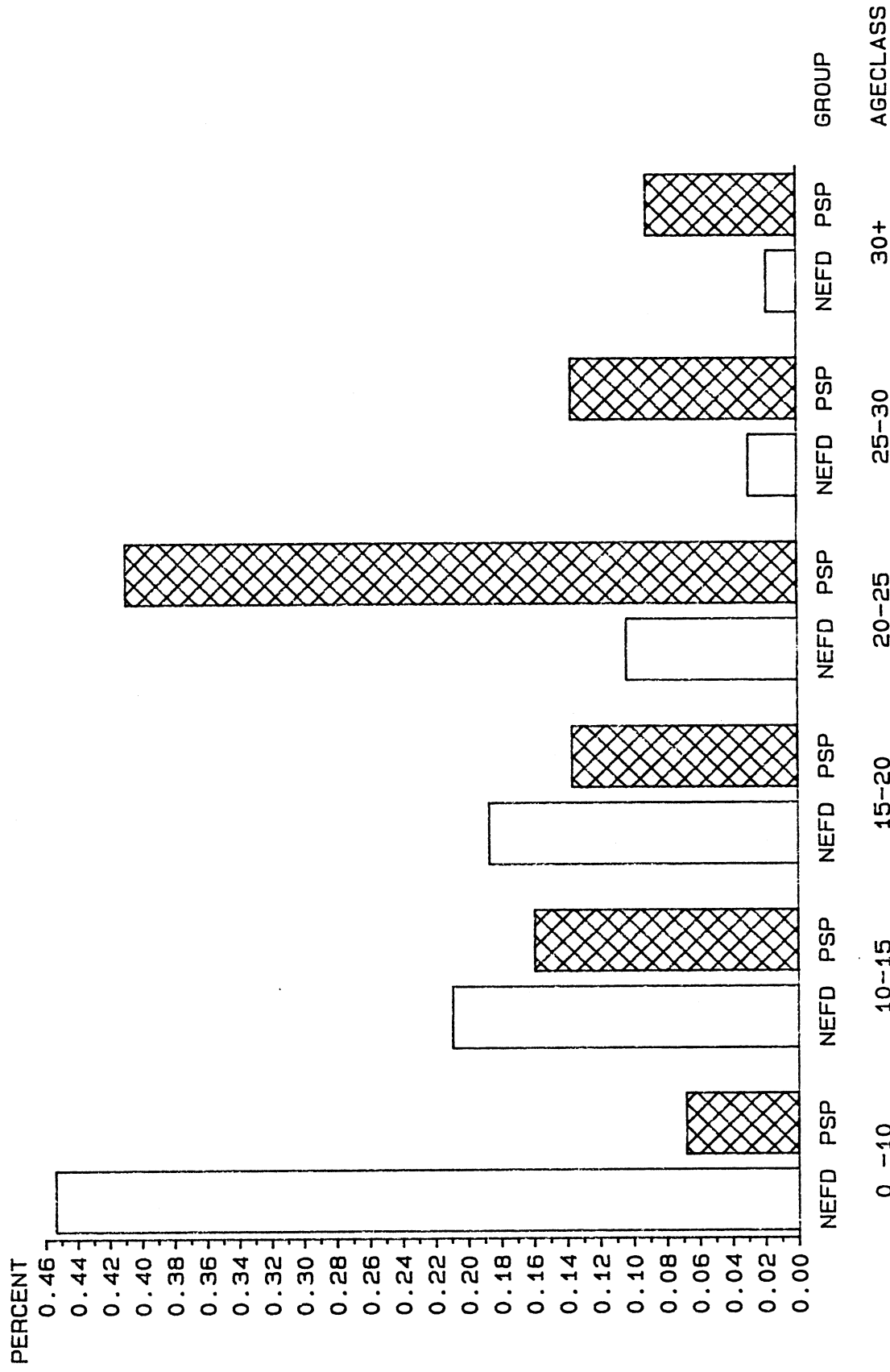
PSP SURVEY (Growth plots)

Nelson/Marlborough



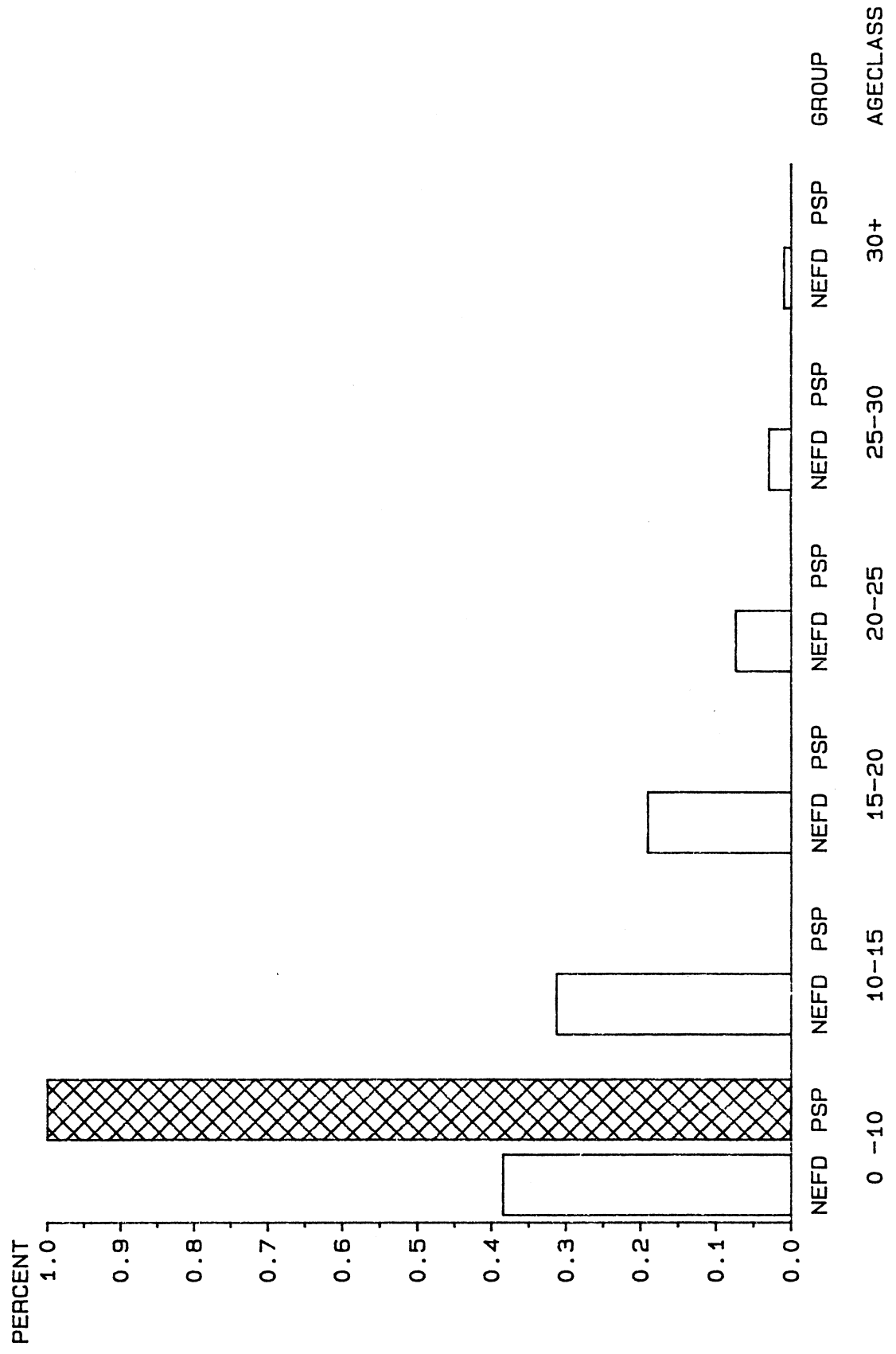
PSP SURVEY (Growth plots)

Nelson/Marlborough
Unpruned & Unthinned



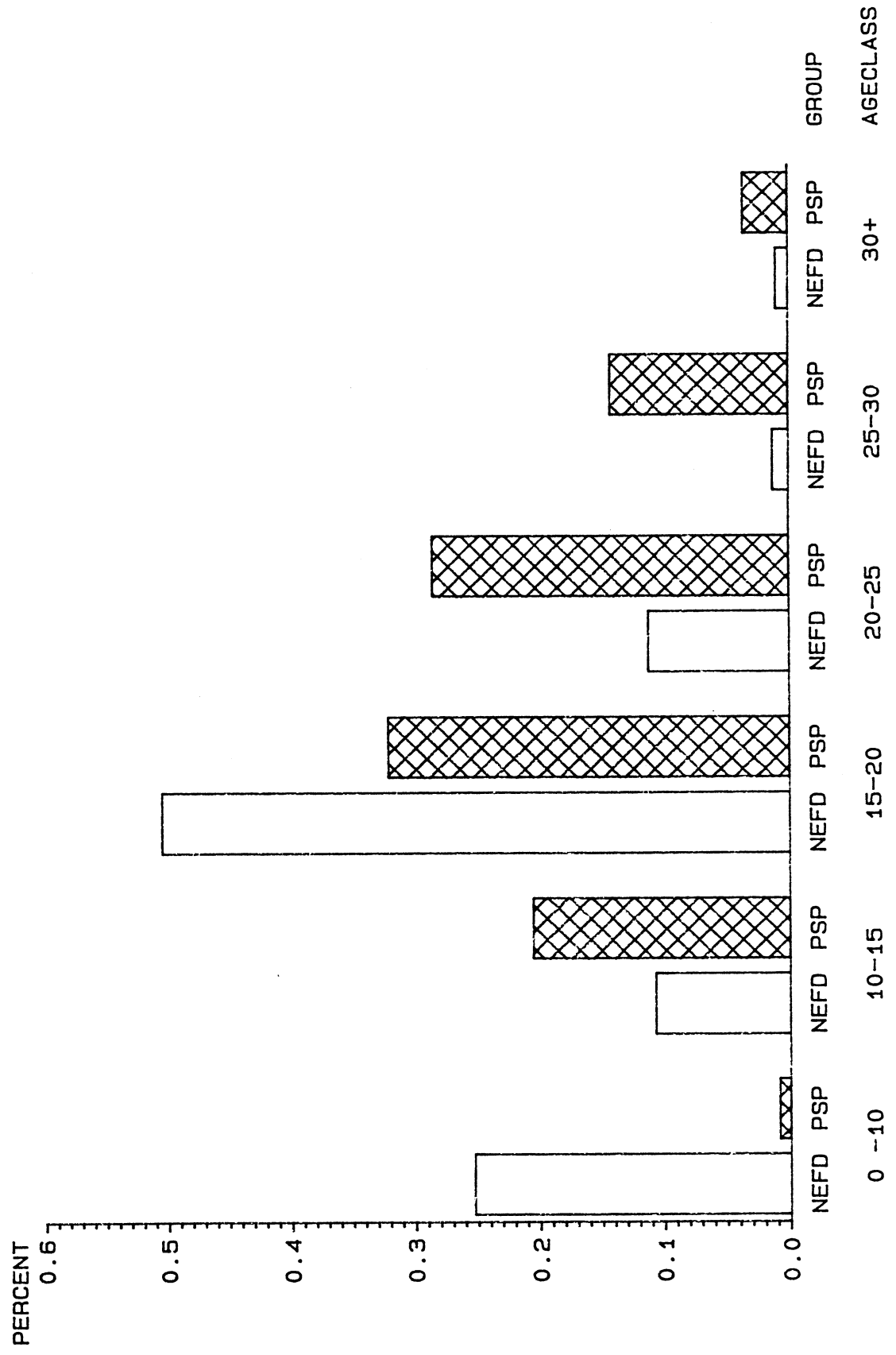
PSP SURVEY (Growth plots)

Nelson/Marlborough
Pruned & Unthinned



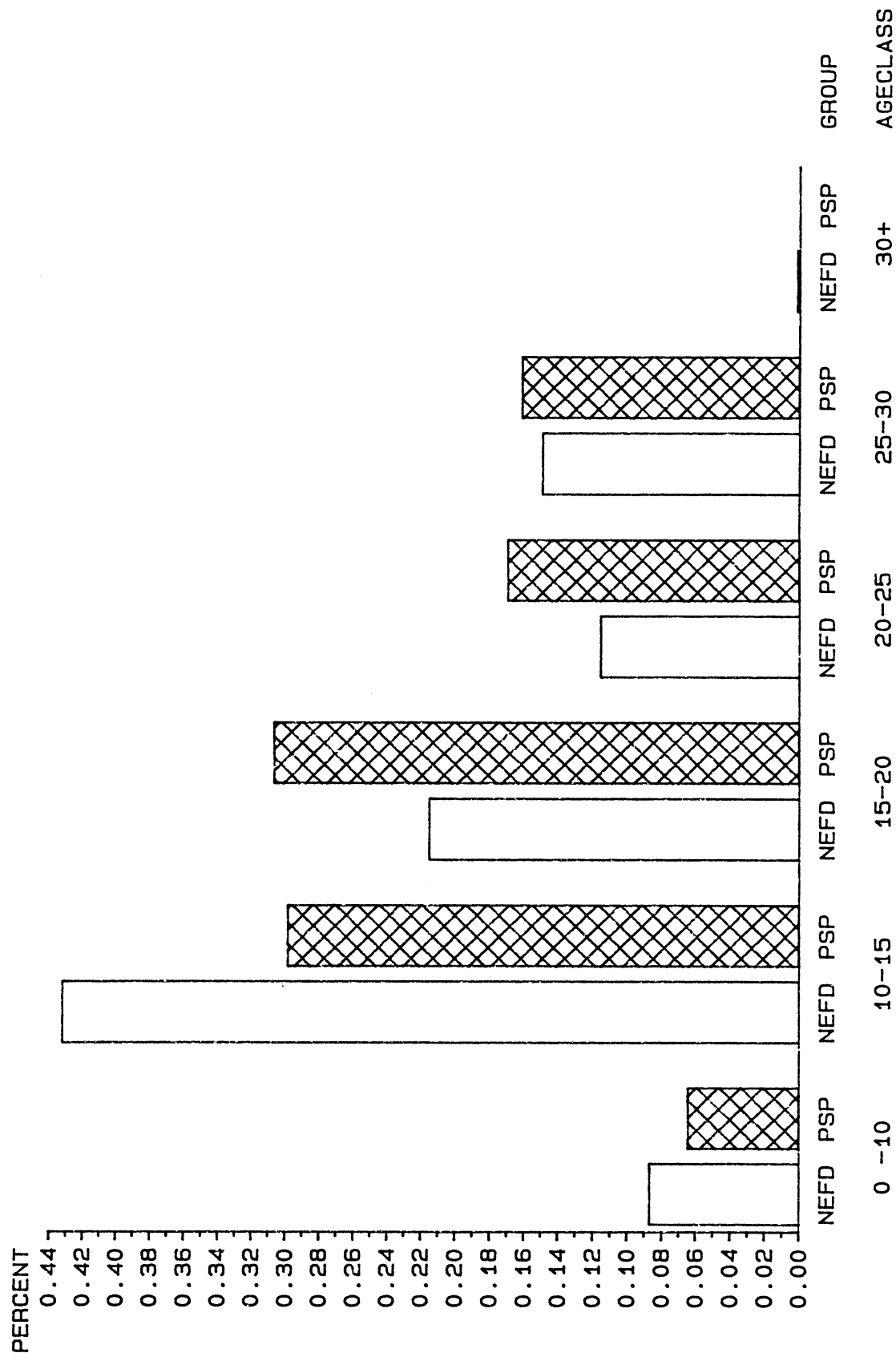
PSP SURVEY (Growth plots)

Nelson/Marlborough
Unpruned & Thinned



PSP SURVEY (Growth plots)

Nelson/Marlborough
Pruned & Thinned



NELSON/MALBOROUGH

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	15-19.9	20-24.9	25-29.9	30-34.9	35-39.9	TOTAL
	1	0	2	8	6	0	16
	2	0	5	50	26	0	81
	3	0	8	38	32	1	79
	4	1	10	33	18	1	63
	5	1	2	15	24	1	43
	TOTAL	2	27	144	106	3	282

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.7 West Coast

Total

44% of the forest area is in the 0-10 year ageclass which then decreases with age.

Only 19% of the PSPs are in the 0-10 year ageclass, whereas 51% of the PSPs are in the 10-15 year ageclass.

Unpruned and Unthinned

100% of the PSPs are in the 0-10 year ageclass.

Forest area starts at 59% in the 0-10 year ageclass and steadily decreases with increasing age.

There is no forest area over the age of 30.

Pruned and Unthinned

100% of the PSPs are in the 0-10 year ageclass.

13% of the forest area is in the 0-10 year ageclass.

After age 15 years the forest area decreases with age from 44% (10-15 years) to 1% (30+ years).

Unpruned and Thinned

100% of the PSPs and 96% of the forest area is in the 0-10 year ageclass.

3% of the forest area is in the 10-15 year ageclass and there is very little in the remaining ageclasses.

Pruned and Thinned

60% of the PSPs and 54% of the forest area is in the 10-15 year ageclass.

27% of the forest area is in the 0-10 year ageclass, whereas only 4% of the PSPs are in this ageclass.

The remaining percentage of PSPs and forest area decrease with age above 15 years.

Table

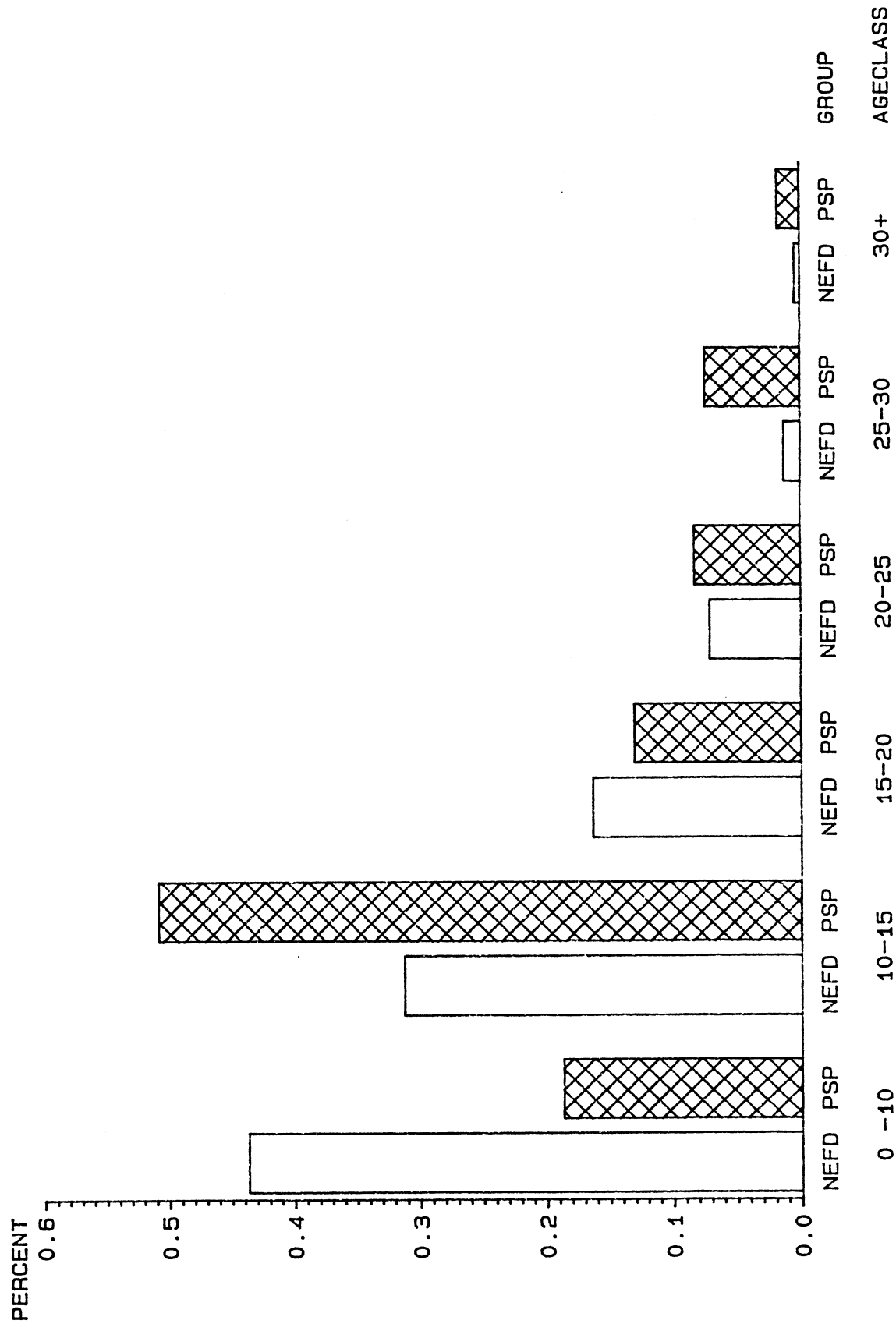
The majority of plots have site indices from 15-20 or 25-30 with final crop stockings from 200-300 stems/ha.

There are some very low site indices and none greater than 35 metres.

There are no plots in unthinned areas.

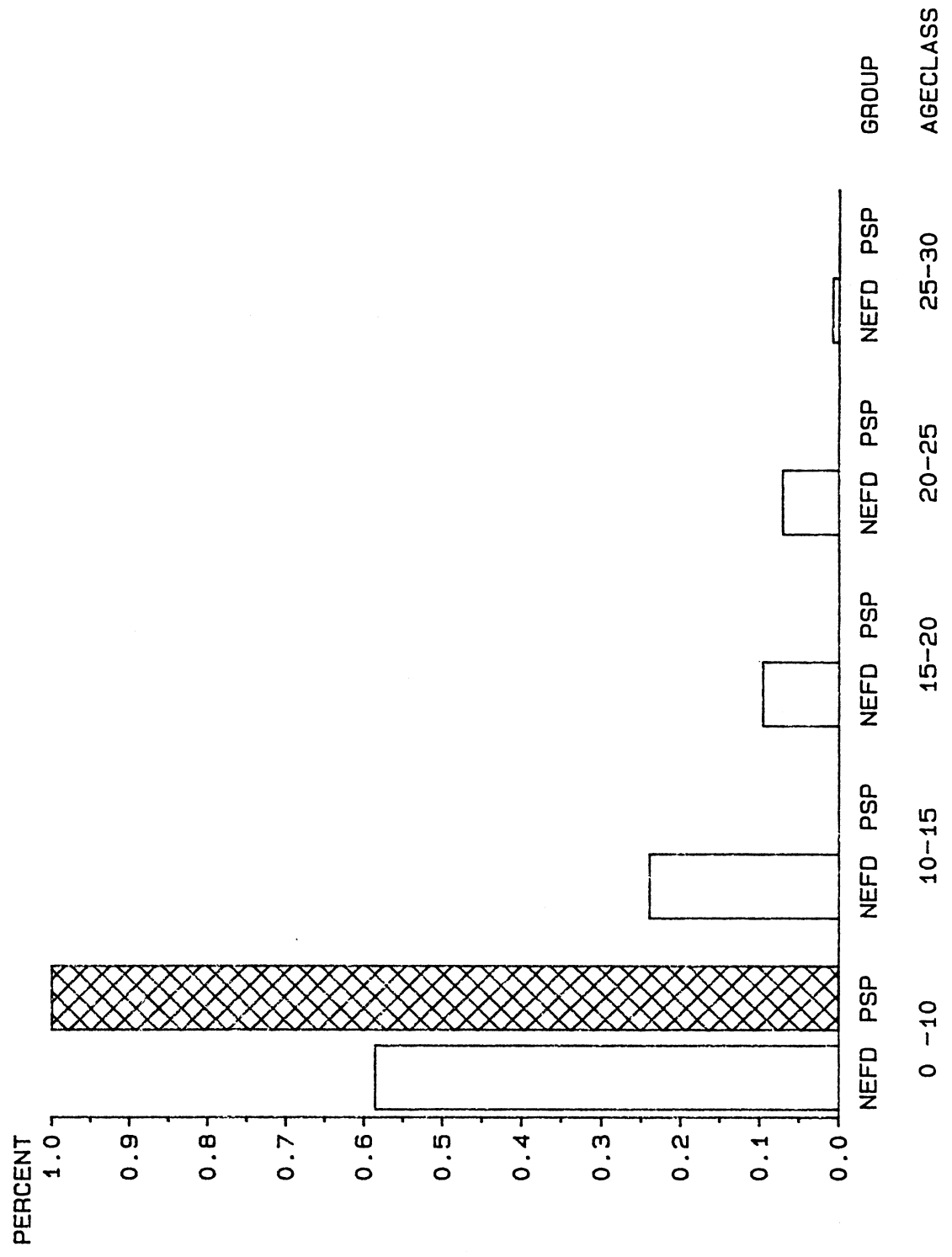
PSP SURVEY (Growth plots)

West Coast



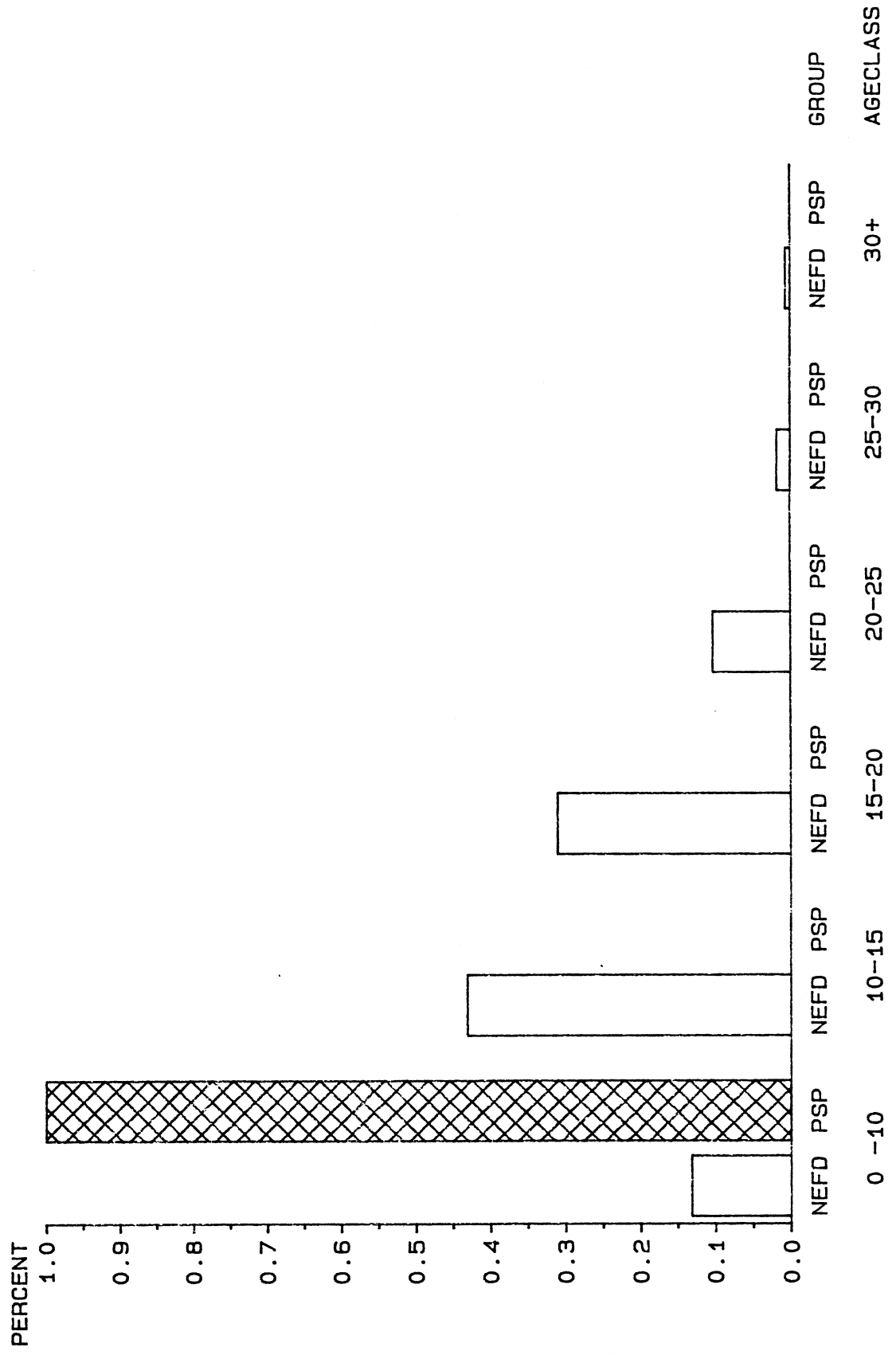
PSP SURVEY (Growth plots)

West Coast
Unpruned & Unthinned



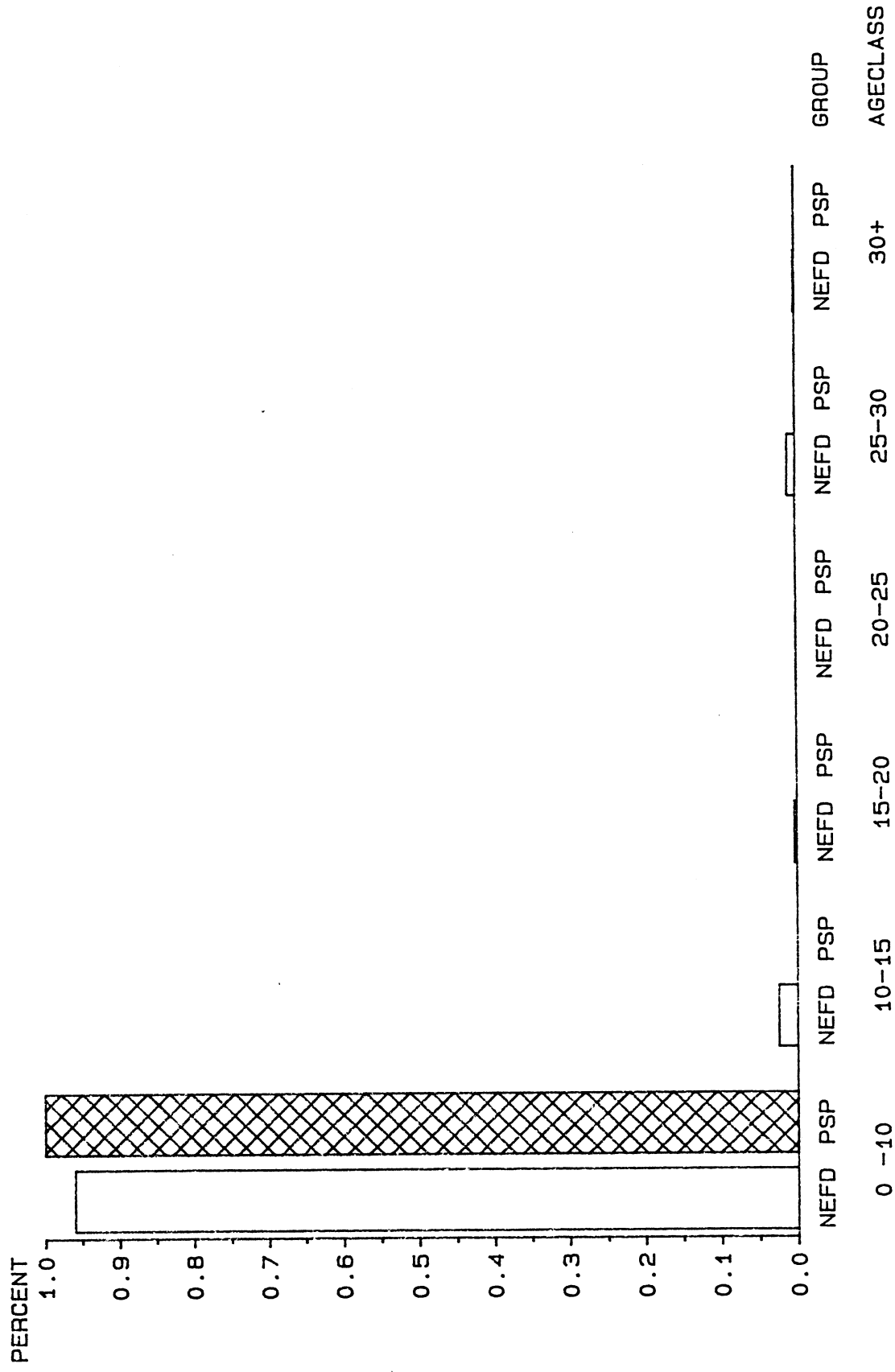
PSP SURVEY (Growth plots)

West Coast
Pruned & Unthinned



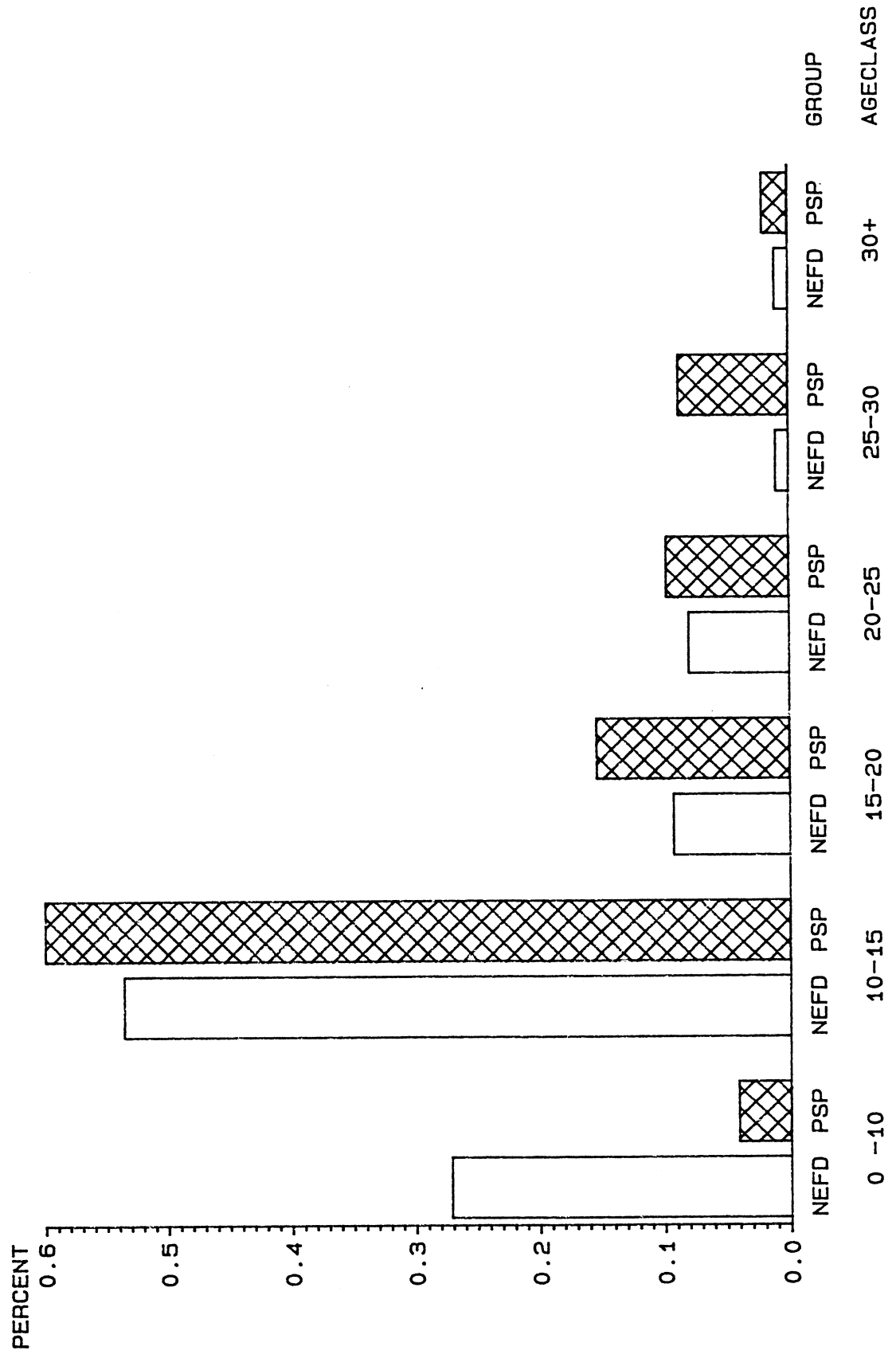
PSP SURVEY (Growth plots)

West Coast
Unpruned & Thinned



PSP SURVEY (Growth plots)

West Coast
Pruned & Thinned



WESTCOAST

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	10-14.9	15-19.9	20-24.9	25-29.9	30-34.9	TOTAL
	1	0	5	2	12	1	20
	2	11	51	25	67	6	160
	3	0	7	5	9	1	22
	4	0	23	2	1	2	28
TOTAL		11	86	34	89	10	230

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.8 Canterbury

Total

49% of the forest area is in the 0-10 year ageclass, whereas only 15% of the PSPs are in this ageclass.

The highest percentage (37%) of PSPs are in the 10-15 year ageclass which gradually decreases as age increases.

The percentage of forest area also decreases as age increases.

Unpruned and Unthinned

100% of the PSPs and 65% of the forest area is in the 0-10 year ageclass.

Forest area ranges from 2% to 19% across the other ageclasses.

Pruned and Unthinned

100% of the PSPs are in the 0-10 year ageclass, whereas 42% of the forest area is in this ageclass.

Forest area ranges from 5% to 26% across the other ageclasses.

Unpruned and Thinned

100% of the PSPs and 68% of forest area is in the 0-10 year ageclass.

68% of the forest area is in the 0-10 year ageclass.

The remainder of the forest area ranges from 12% to 1% in the older age classes.

Pruned and Thinned

The percentages of PSPs and forest area are very similar across the ageclasses.

The percentages are low in the 0-10 year ageclass and then increase to ~40% between the ages of 10 and 15 years.

After 15 years the percentage of both plots and forest area generally decrease as age increases.

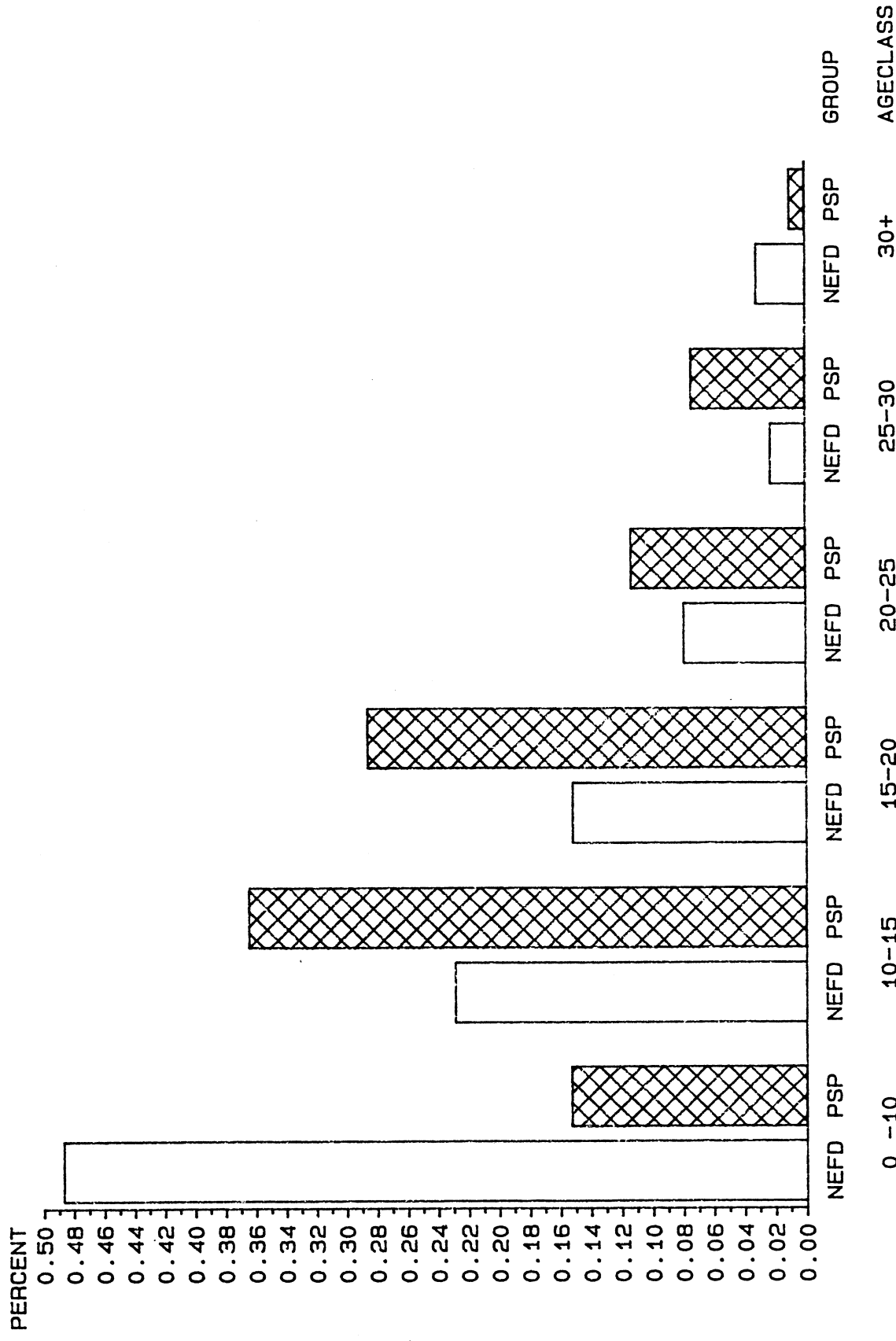
Table

The majority of plots have site indices between 20 and 25 metres with a final crop stocking of over 500 stems/ha.

There are no unthinned plots and no plots with very low or very high site indices.

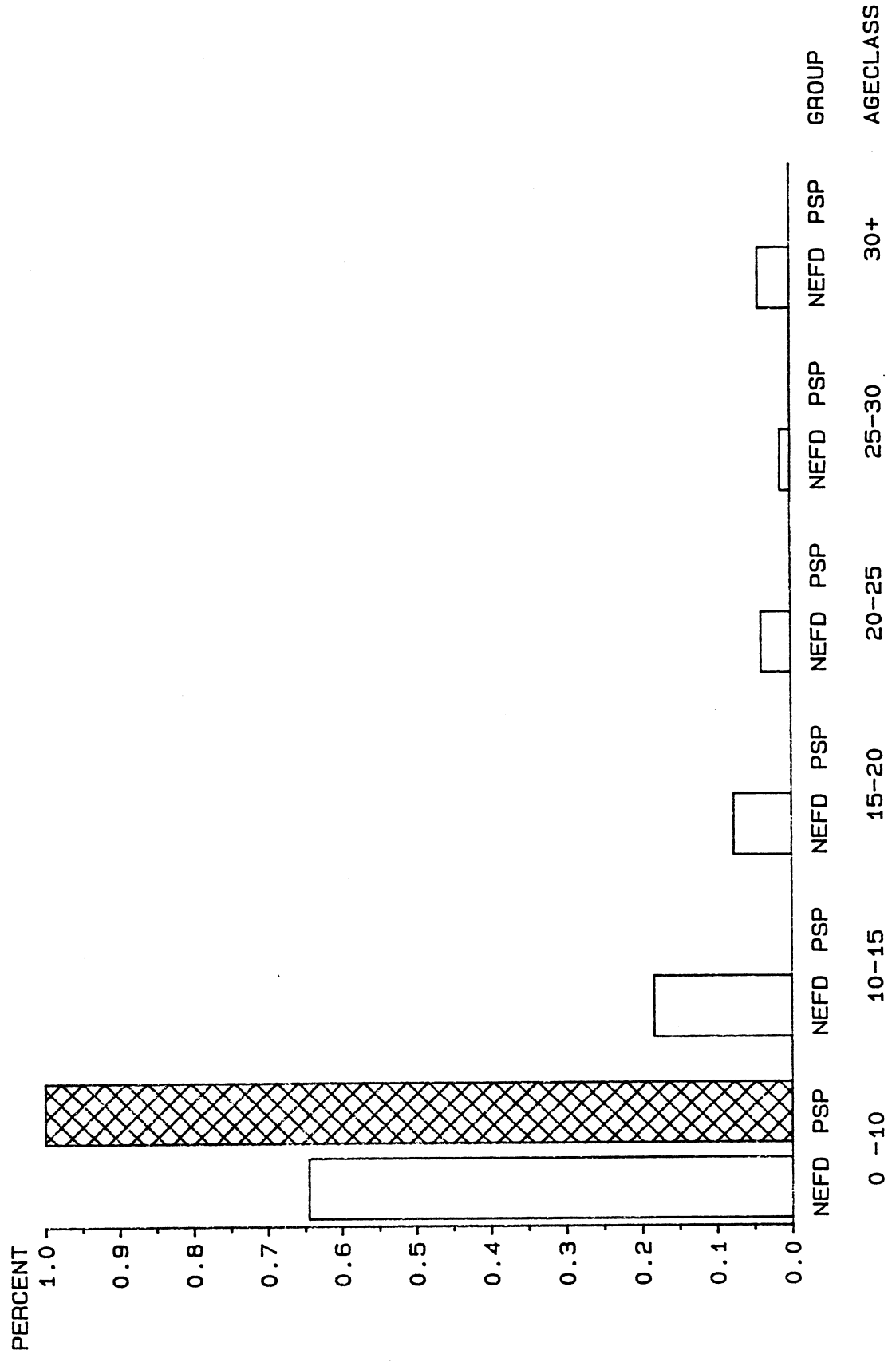
PSP SURVEY (Growth plots)

Canterbury



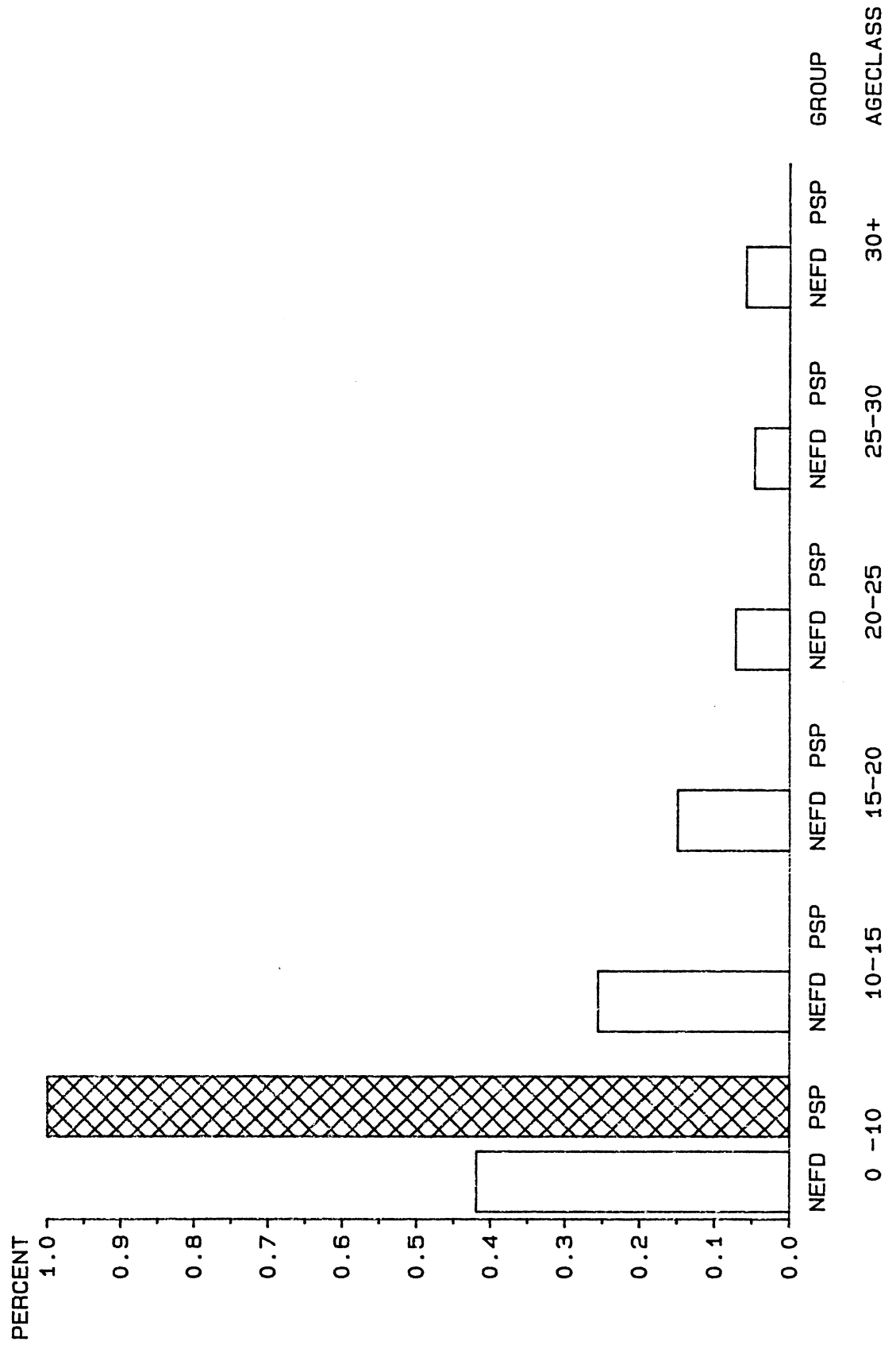
PSP SURVEY (Growth plots)

Canterbury
Unpruned & Unthinned



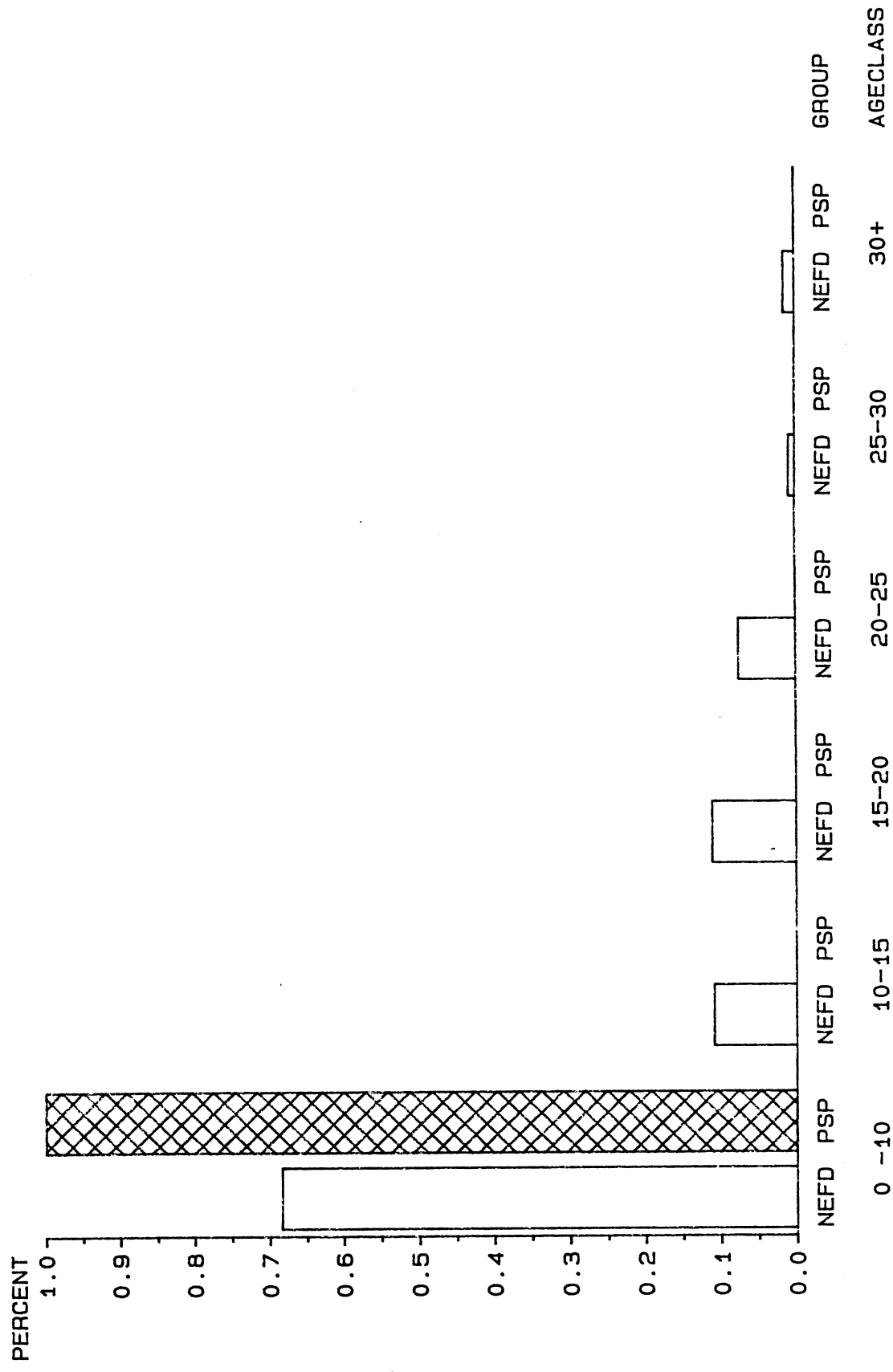
PSP SURVEY (Growth plots)

Canterbury
Pruned & Unthinned



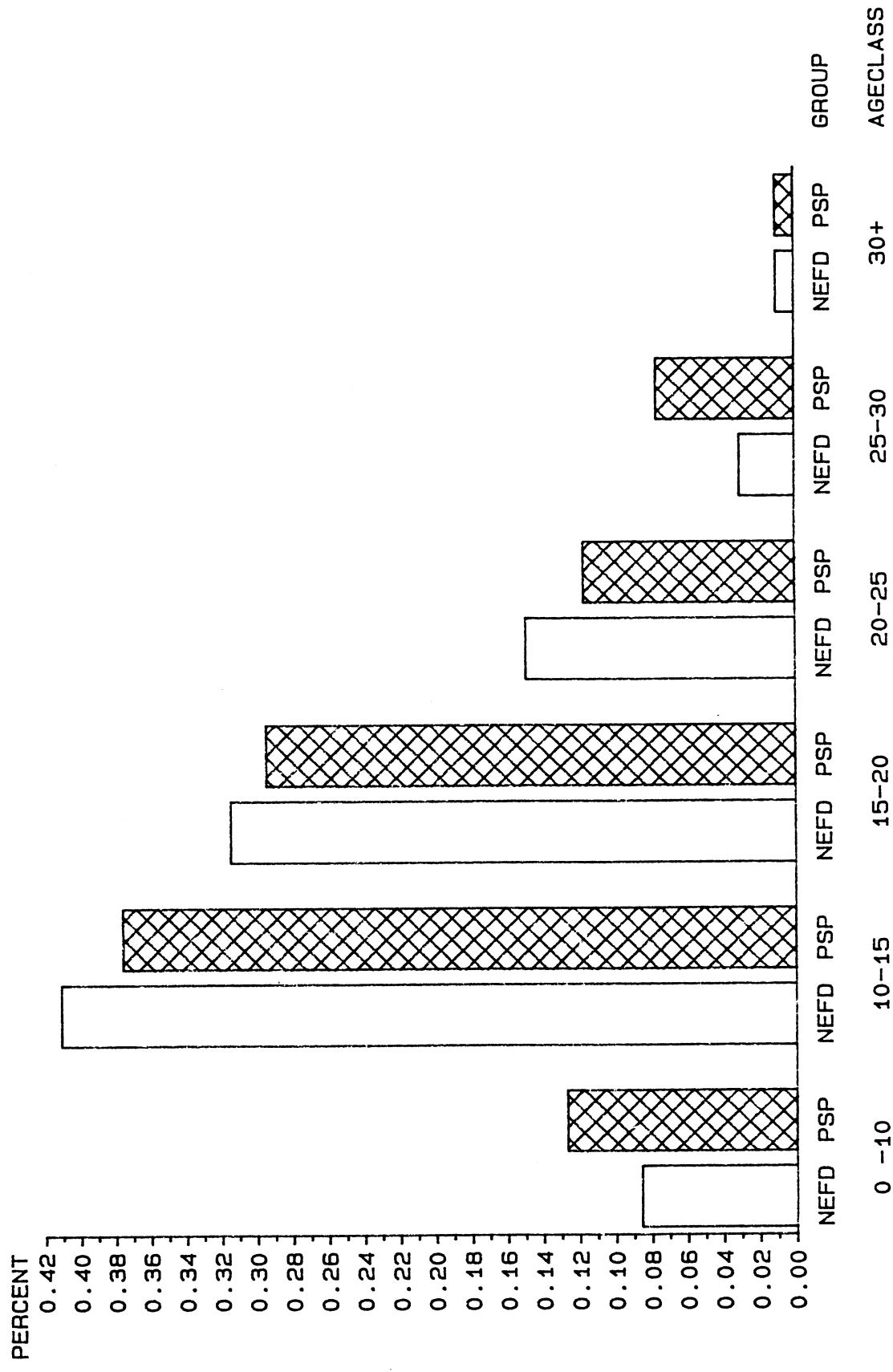
PSP SURVEY (Growth plots)

Canterbury
Unpruned & Thinned



PSP SURVEY (Growth plots)

Canterbury
Pruned & Thinned



CANTERBURY

Final Crop Stocking vs Site Index

		site index					
		FREQUENCY	15-19.9	20-24.9	25-29.9	30-34.9	TOTAL
F C S		1	0	2	2	0	4
		2	0	20	20	5	45
		3	0	29	11	1	41
		4	15	88	10	0	113
	TOTAL		15	139	43	6	203

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

2.9 Otago/Southland

Total

Forest area decreases as age increases, from 44% in the youngest stands to 3% over age 30 years.

65% of the PSPs fall in the ageclasses 15-20 years and 20-25 years.

Only 3% of the PSPs are in the 0-10 year ageclass, whereas there is 44% of the forest area in this ageclass.

Unpruned and Unthinned

There are no PSPs in this region under this regime.

Nearly 70% of the forest area is in the 0-10 year ageclass.

There are small percentages of forest area in each of the other ageclasses ranging from 13% down to 3%.

Pruned and Unthinned

45% of the PSPs are over 30 years old, whereas only 4% of the forest area is over 30 years old.

46% of the forest area is in the 0-10 year ageclass and only 22% of the PSPs are in this ageclass.

22% of the PSPs are in the 20-25 year ageclass and 11% of the PSPs are in the 10-15 year ageclass.

There are no PSPs in the 15-20 year or 25-30 year ageclasses.

Unpruned and Thinned

100% of the PSPs are in the 20-25 and 25-30 year ageclass.

76% of the forest area is in the 0-10 year ageclass, whereas there are no PSPs in this ageclass.

The rest of the forest area has a small percentage evenly distributed across the other ageclasses.

Pruned and Thinned

The majority of the PSPs (68%) are in ageclasses between 15 and 25 years.

Forest area peaks between ages 10 and 15 years, then gradually decreases to 2% at ages over 30 years.

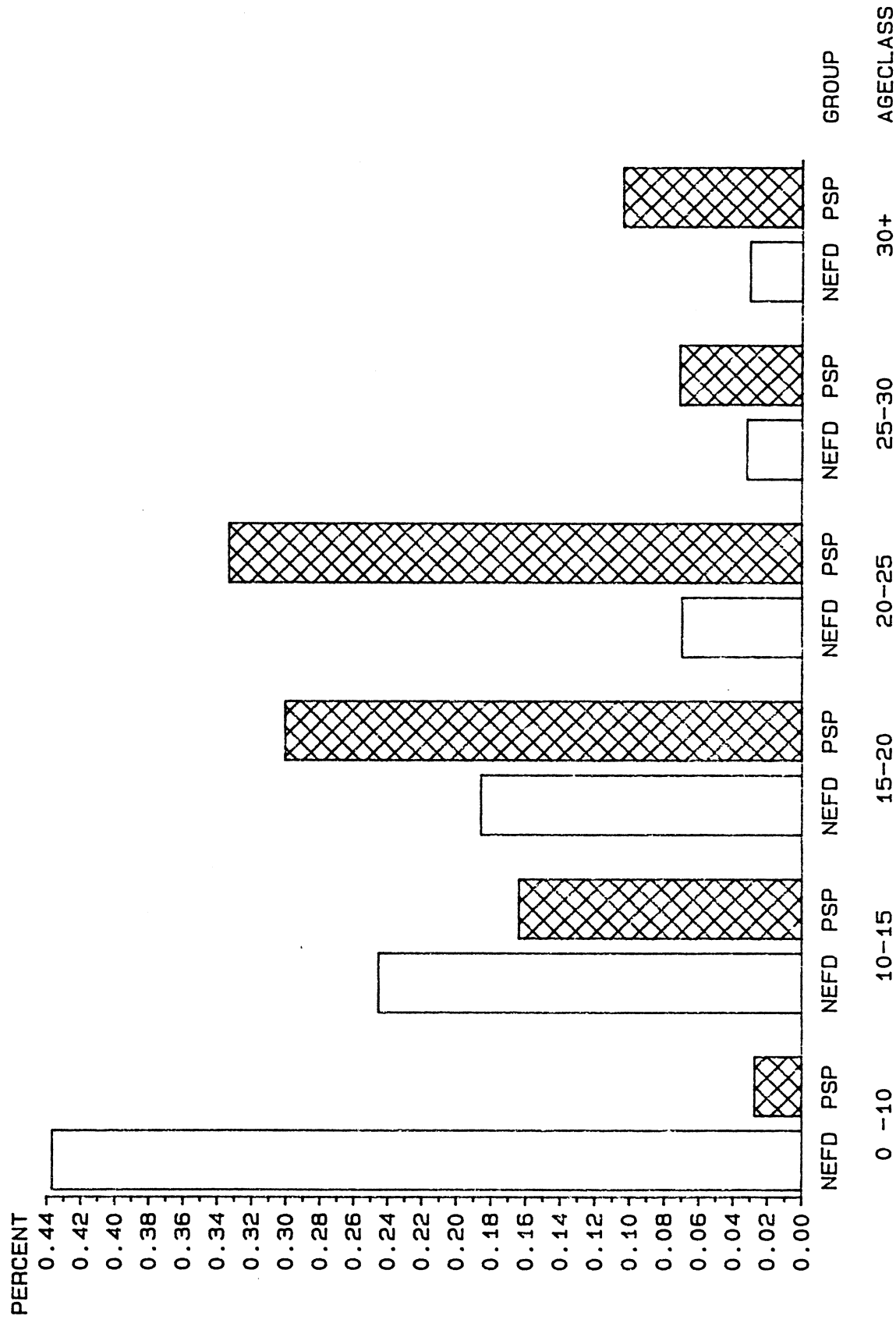
Table

The majority of PSPs have site indices between 20 and 30 metres and final crop stockings between 200 and 500 stems/ha.

There are only a few unthinned plots and only one plot with a site index greater than 30 metres.

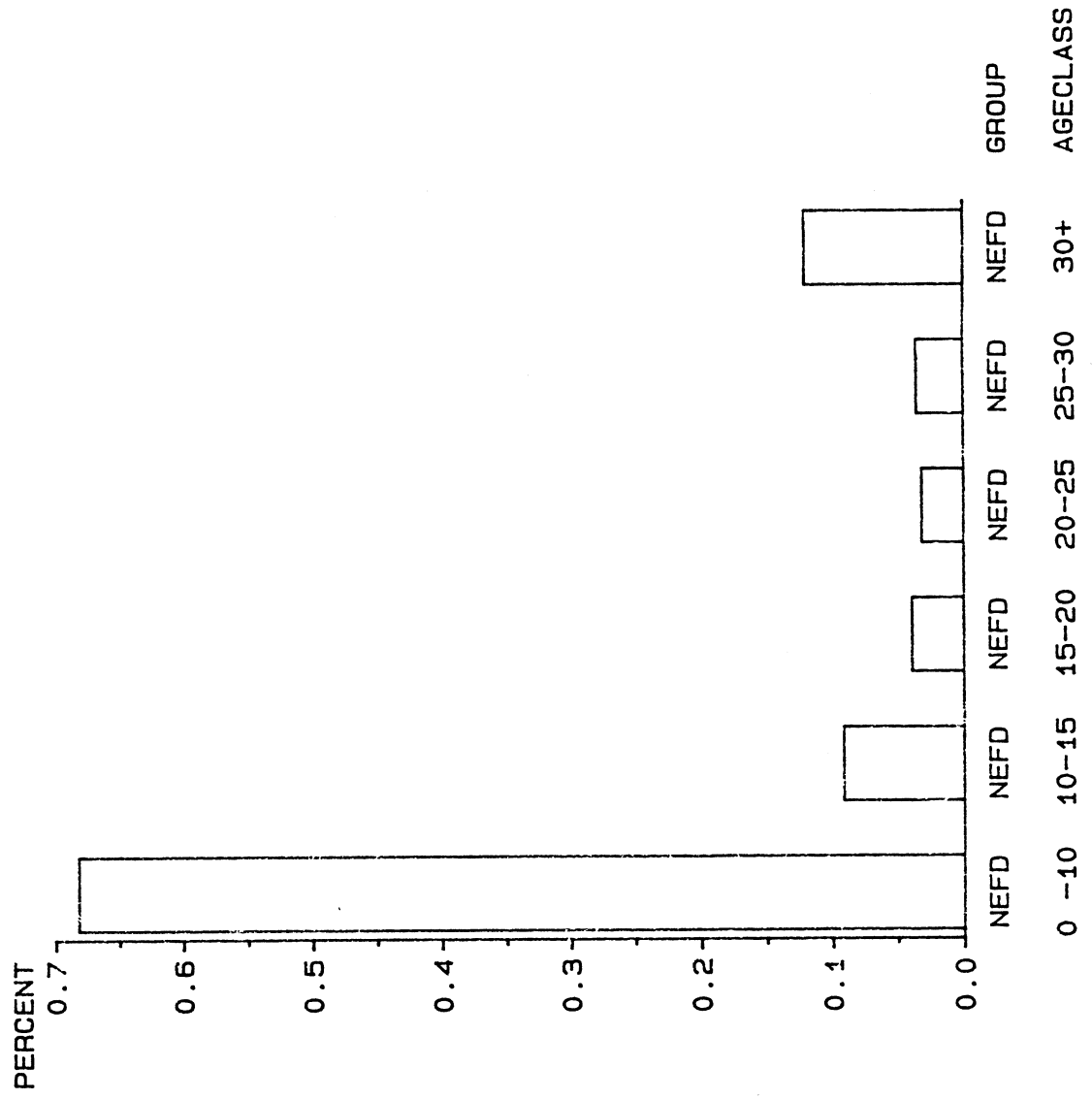
PSP SURVEY (Growth plots)

Otago/Southland



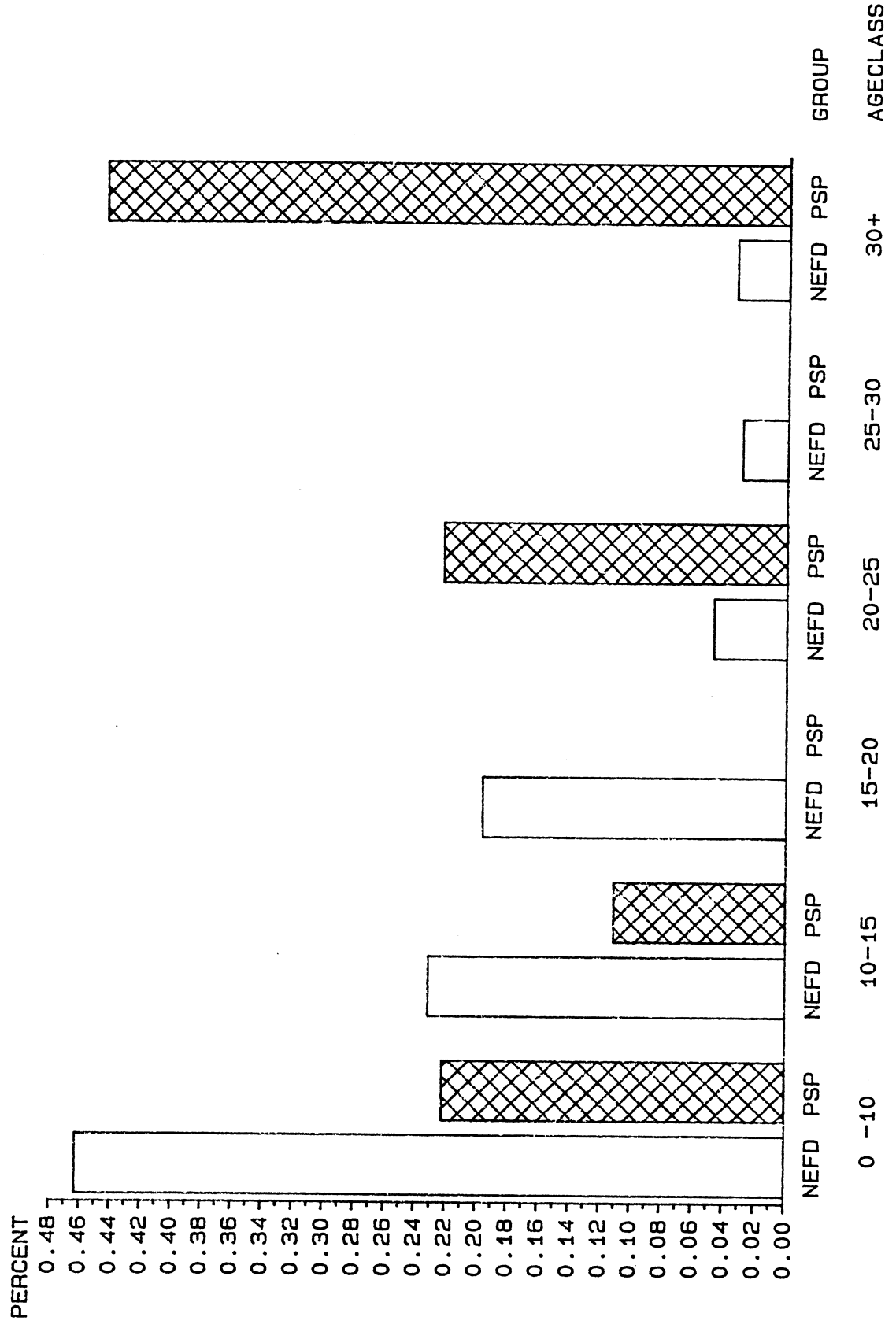
PSP SURVEY (Growth plots)

Otago/Southland
Unpruned & Unthinned



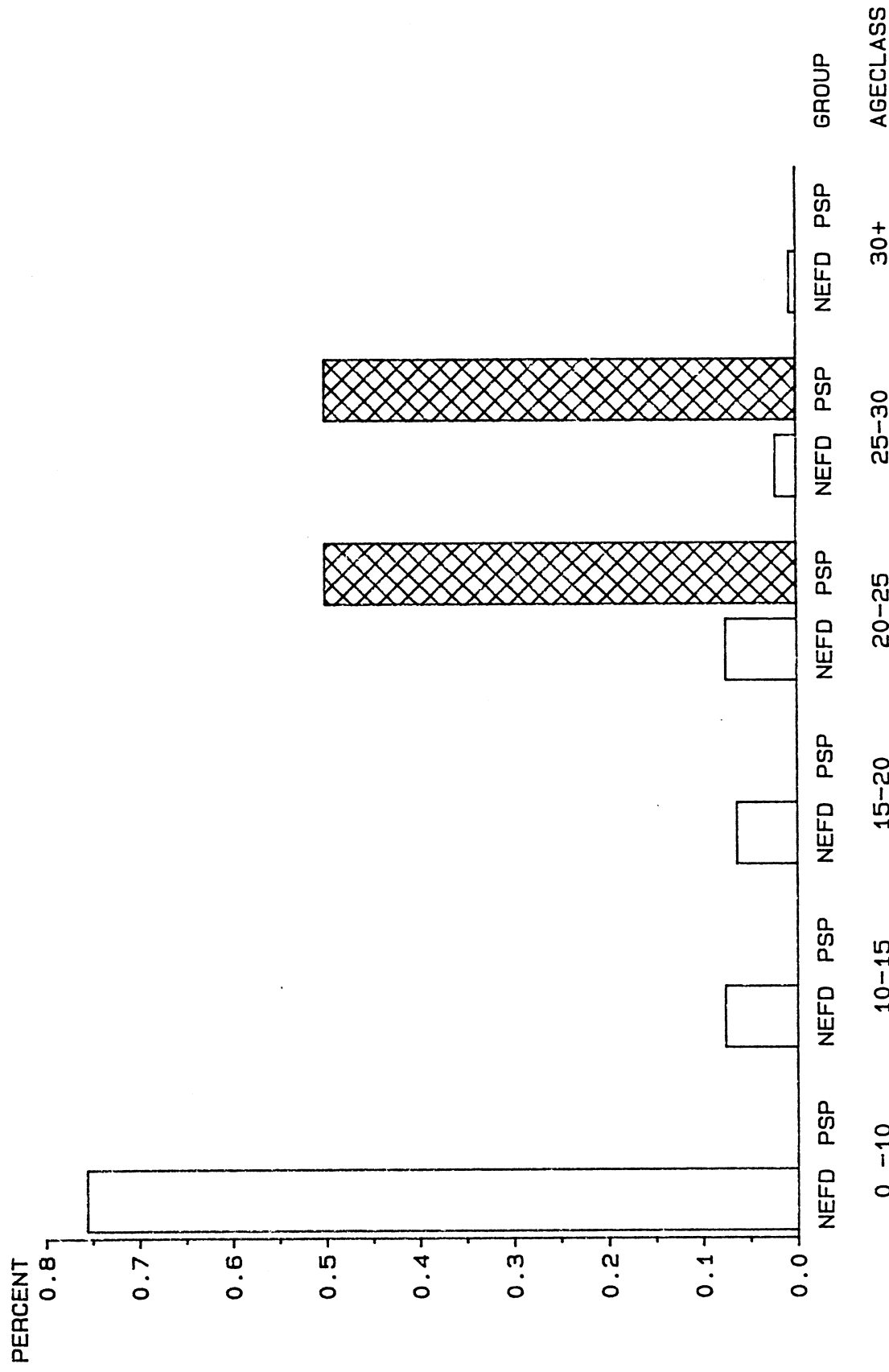
PSP SURVEY (Growth plots)

Otago/Southland
Pruned & Unthinned



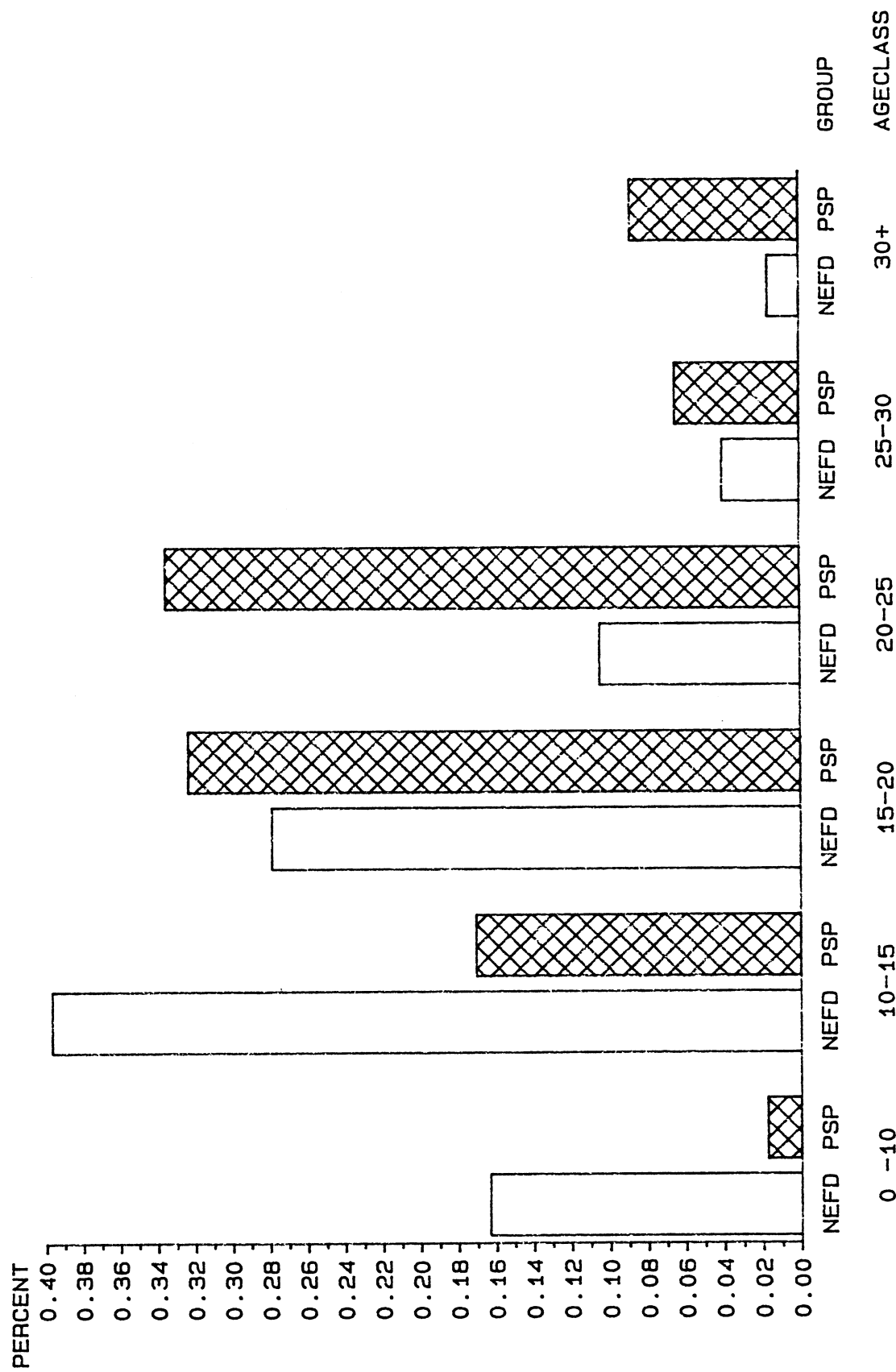
PSP SURVEY (Growth plots)

Otago/Southland
Unpruned & Thinned



PSP SURVEY (Growth plots)

Otago/Southland
Pruned & Thinned



OTAGO/SOUTHLAND

Final Crop Stocking vs Site Index

site index

F C S	FREQUENCY	10-14.9	15-19.9	20-24.9	25-29.9	30-34.9	TOTAL
	1	0	2	10	14	0	26
	2	1	13	56	30	1	101
	3	0	0	25	21	0	46
	4	0	2	0	1	0	3
	5	0	1	5	1	0	7
TOTAL		1	18	96	67	1	183

FCS (stems/ha)

- 0 = 0-100
- 1 = 100-200
- 2 = 200-300
- 3 = 300-500
- 4 = 500+
- 5 = unthinned

3.0 SUMMARY

The objective of this preliminary Permanent Plot Survey was to collate all the PSP information and illustrate it in a form whereby 'holes' or 'gaps' could be identified. To a limited extent this objective has been met. Overall, the coverage of radiata pine growth plots appears to be relatively good throughout the country. There is still further data analysis that may be done using, in particular, soil types and seedlots of each plot. To do this, however, the huge numbers of seedlot and soil types need to be condensed into more manageable and meaningful groups. This is a time consuming process.

The PSP sub-committee suggests that the next stage is a two step process:

1. To find out where plots are over represented.
2. To look at the measurement data of these individual plots.

The survey itself has proven useful, in that it has prompted PSP controllers to go through an initial rationalisation process when filling out their forms. As a consequence, approximately 2000 PSPs, mainly from the South Island, have been abandoned.

A strategy is now needed on how many plots are a representative number for each region, what characteristics should be measured and how to co-ordinate plot measurement.

4.0 ACKNOWLEDGEMENTS

The author wishes to thank all members of the Growth Modelling Co-operative for their time spent in completing the PSP survey forms. In some cases this was a huge task.

In particular the author would like to thank Mr Bill Hayward for his help throughout the data management and analysis stage.

The author is also grateful for the work of a number of FRI staff:

Mr Christian Pilaar who developed the computerised PSP survey form for the VAX to provide an easier task for Timberlands and FRI users in particular.

Mrs Judy Dunlop who has co-ordinated the data collection process and cleaned the database of errors. She has also helped with the analysis of the data.

5.0 REFERENCES

Ministry of Forestry 1988. Permanent Sample Plot System, Plot Classification Survey, Users Guide. PSP version 3.2, July 1988.

Novis J., Turland J. Collins J. 1989; A national exotic forest description as at 1 April 1988, Ministry of Forestry, Wellington, January 1989.

Stand Growth Modelling Co-operative Minutes, 1986-1990.

Ministry of Forestry

[illegible]