

**WORKPLAN for TRIALS with
GENETICALLY IMPROVED RADIATA PINE
PLANTED between 1978 and 1994**

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REPORT No 103

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NOTE : Confidential to participants of the Stand Growth Modelling Cooperative.
: This is an unpublished report and must not be cited as a literature reference.

***Forest Research* /INDUSTRY RESEARCH COOPERATIVES**

EXECUTIVE SUMMARY

This workplan is intended to update a group of workplans covering various projects and tasks into a single cohesive workplan. The objectives are to:

- To ensure that trials supported by the Stand Growth Modelling Cooperative (SGMC) are maintained and remeasured up to a minimum 30 years.
- To quantify genetic gain in growth and yield of Radiata pine with increasing genetic worth through measurements of established PSPs.
- To allow the assessment of stem and wood quality attributes at clearfell in respect to site, silviculture and genetics.

The revised SGMC Research Strategy (Feb 2001) is for measurements in these trials to focus on growth and quality aspects, with the data representing both site, stocking and planting stock. Data from this complete series will contribute to all themes and projects of the SGM Cooperative.

This document includes a list of all plots established in the 1978-1984 Genetic Gain Trials, the 1987-1991 Silviculture/Breed Trials and the 1992 and 1994 Special-Purpose Breeds Trials. Detailed plot location maps describing treatments and seedlots are included in Appendix 1.

WORKPLAN for TRIALS with GENETICALLY IMPROVED RADIATA PINE PLANTED between 1978 and 1994

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- To quantify genetic gain in growth and yield of radiata pine with increasing genetic worth through measurements of established PSPs.
- To allow the assessment of stem and wood quality attributes at clearfell in respect to site, silviculture and genetics.

Introduction:

Between 1978 and 1980, the Genetics and Tree Improvement group (GTI) planted a series of Genetic Gain trials throughout the country for the purpose of providing demonstrations of gains from tree improvement research, as well as, relative rankings of seedlots from differing seed orchards. In 1986, permanent sample plots (PSPs) were established and assessed in a subset of seedlots and sites in this trial series. This included GF7 and GF14 seedlots in all plantings and a GF8 (long internode seedlot) in the 1979/80 plantings. In 1991, additional PSPs were established and assessed to include the GF2 and GF22 seedlots in the 1978 plantings.

GTI planted another trial at one site (Kaingaroa) in 1984 to test seedlots that approximate the composition of seed from future orchards. PSP plots were first established at this site in 1990.

Between 1987 and 1991, another series of trials (Silviculture/Breed) were planted to test the response of improved breeds at varying levels of final crop stocking and site quality. PSP plots were first established in 1992. In 1992 and 1994, a further series of Special Purpose Breeds trials were planted to test the response to variations in stand density and compare the performance across regions. PSP plots were first established in 1999 and will continue to be established in 2000/01.

PSPs in all these trials, now under the umbrella of the Stand Growth Modelling Cooperative, are categorised into three groups: Genetic Gain; Silviculture/Breed; Special-Purpose Breeds. The trial designs are well documented in SGMC Report No.100 (Hayes, 2001).

This workplan is intended to update a group of workplans covering various projects and tasks into a single cohesive workplan.

A list of the previous workplans is as follows:

SGMC Category	Workplan No.	Date	Purpose
Genetic Gain	20212	1978	Planting seed orchard stock from controlled pollination to predict performance of future seed orchards
	20284	1983	Evaluate genetic improvement from orchard seed and cuttings produced by the radiata pine breeding programme
	1448	1986	Establish and assess growth plots in trials planted 1978-80
	2071	1991	Establish and assess plots in additional seedlots in trials planted 1978-80
	2297	1994	To broaden the range of silvicultural regimes with genetic comparisons in the 1984 Genetic Gain trial
Silviculture / Breed	1585	1987	Test the response of improved breeds at varying levels of final crop stocking and site qualities
	1633	1988	Test the response of improved breeds at varying levels of final crop stocking (silvicultures) and site qualities
	1633 Addend.	1989	As above, but with variations in seedlots, nursery sources and silviculture treatments
	1633 Addend.	1990	As above, but to extend the range of bio-geoclimatic regions
	1980	1991	Establish a comprehensive range of trials comparing genetically improved Radiata pine
Special-Purpose Breeds	2151	1992	Establish special-purpose breeds trials to measure performance of wood density and uninodal breeds across regions
	2295	1994	Establish special-purpose breeds trials to measure performance of wood density and uninodal breeds across regions

The PSPs established in these trials have been managed and supported by the Stand Growth Modelling Cooperative since 1986 with the following objectives in mind:

- to quantify the increase in yield with genetic improvement,
- to validate the ability of existing models to predict yield of improved stock,
- to establish the relationship between increase in yield and GF rating, and
- to be utilised for measurements of stem form to identify external characteristics (e.g. PhotoMARVL) and/or any other measurements as seen appropriate in the future.

Research Strategy:

Prediction of forest growth is an integral part of sound forest management. It is important that growth models accurately predict growth of genetically improved seedlots.

In the late 1980's, the existing growth models were based principally on data from stands planted with unimproved seedlots. Data collected from a limited range of resources indicated that improved radiata breeds grew faster relative to unimproved radiata. There was a requirement for growth models to be modified to account for this genetic gain. At that time, the 1978-80 genetic gain trials represented a substantial proportion of the information which could be collected on 'older' genetically improved trees, and in particular, were the only trials where information was available on seedlots less than GF7 and greater than GF18.

The Stand Growth Modelling Cooperative Research Strategy (1998) said that:

- the genetic gain trials would provide data on the long-term growth trends of genetically improved radiata pine breeds for research into the effects of genetic improvement and for developing growth modelling methodology.
- The data would be used to review and update the estimates of the growth rate genetic gain multipliers for growth models as more data becomes available.

The objectives were revised in the Stand Growth Modelling Cooperative Research Strategy (2001) to include a theme on Data Provision, to ensure that:

- The necessary data are available to all other themes with respect to modelling the effects of site, stocking and planting stock on growth.

SGMC Long Term Trials:

Support of trials designed to quantify growth and yield gains from improved radiata pine (see SGMC Report Nos. 24, 40, 70 and 100) has been on-going and substantial from the inception of the SGM Cooperative in 1986. PSPs in these trials represent a wide range of regions and sites, as well as, comparisons among seedlots and silvicultural treatments. Detailed trial maps for all sites showing plot orientation, seedlots and treatments are included in Appendix 1.

The design of the trials falls into three categories:

1. Genetic Gain - plots superimposed on large-block trials (1978-80, 1984) with many replications on a few sites.
2. Silviculture/Breed - trials designed with a wide range of spacing treatments (1987-91) planted specifically for the provision of genetic gain data for growth models, known as Silviculture/Breed trials; block plots with few replications on many sites.
3. Special-purpose Breeds - trials designed with two treatments and many replications over a range of seedlots to measure performance of wood density and uninodal breeds (1992 and 1994).

PSPs have been superimposed on the large-block Genetic Gain trials (Table 1), current plots now totalling 239 over seven forests – Aupouri, Kaingaroa, Mohaka, Golden Downs, Waimate, Longwood and Dean.

The Silviculture/Breed trials, designed experiments with stocking treatments, have been planted on 28 sites, between 1987 and 1991. Seedlots with up to GF25 are represented, including long internode seedlots. PSP plots have now been established at 27 sites (Hokonui Forest was abandoned) with a total of 844 current plots (Table 2).

The Special-purpose Breeds trials (Table 3), have been planted on 8 sites and represent seedlots up to GF30, low and high wood density and uninodal breeds, with a total of 241 plots. One site at Riverhead Forest has been abandoned.

In 1999 new proposals were accepted for revision of the remeasurement schedule to help in the rationalisation of time and cost in the 'long-term trials' remeasurement programme.

The following rules were agreed, that:

- 1975 trials be removed from the genetic gain work programme
- 1978-80 trials will be on a two yearly remeasurement schedule from age 20 years
- 1984 trial will be measured every two years from 2001
- 1987-91 Silviculture/Breed trials will be measured every year for 4 years after plot establishment, then every two years, with the exception of any late silviculture. After silviculture, trials will be measured annually for 3 years, then return to a two yearly schedule.
- 1992 and 1994 Special-purpose Breed trials will be measured every year for 4 years after plot establishment, then every two years.

In 2001, it was agreed that plots thinned to 100sph in Silviculture/Breed series will be abandoned at some sites due to the severity of undergrowth problems (gorse and blackberry), poor form caused by wind damage in the open grown plots and the time involved in remeasuring. Sites included are Tahorakuri, Tungrove, Kinleith, Tairua, Otago Coast and Ashley Forests. Data from this treatment have not been used in any analysis to date.

Using the above rationale, the current remeasurement programme was revised and the projected numbers of plots to be measured until 2004 is shown in Table 4.

It should be noted, that, the 1978-80 trial series encompasses some of the oldest trials and growth data from seedlots over GF18 and have been well designed to allow direct comparisons of growth between seedlots and sites, and for the development of growth models.

Future:

The revised SGMC Research Strategy (Feb 2001) is for measurements in these trials to focus on growth and quality aspects, with the data representing both site, stocking and planting stock. Data from this complete series will contribute to all themes and projects of the Stand Growth Modelling Cooperative. Plots were established in these trials for 'long-term' research and it is required that the plots continue to be measured until age 30 years (to be known as full rotation), even though not all plots will be measured every year. Given the current value of the data from these trials (the GF22 seedlot is the oldest block planting in New Zealand), it is essential that the trials be retained to allow measurements through to age 30. Landowners will attempt to preserve these trials to a minimum of 30 years with the following conditions:

- The landowner gives the SGMC 'an intent to clearfell' 2 years prior to the event if clearfell is to occur prior to age 30.
- If the land around or near the trial is to be clearfelled then a 'clearfell buffer' of a minimum of 80m is required.
- The landowner endeavours to take all reasonable steps to retain the trial for 30 years.

Future use of the existing trials will include:

- Investigation of:
 - branching, straightness and form acceptability (GTI assessments)
 - stem shape
 - genetic effects as well as site, stocking and health effects
 - crown architecture
- Provision of source trees, with a known history, for quantification of any other properties as required in the future
- Objective measurements of external stem characteristics (e.g. PhotoMARVL)

Responsibilities:

PSP establishment	- Dean Duyvesteyn
Annual remeasurement	- Dean Duyvesteyn
Data storage	- Judy Hayes
Trial records	- Judy Hayes
Management and Analysis	- Bob Shula, Judy Hayes, Jenny Grace

TABLE 1

Plots established in the 1978-84 Genetic Gain Trials

Trial	Forest	Cmpt	Plant year	Owner	No. of PSP's				Total no. plots ~
					GF2	GF7	GF14	GF22	
AK 1058	Aupouri	92	1978	JNL	3	6	6	3	18
RO 2103/1	Kaingaroa	1210	1978	FCFL	6	6	6	6	24
RO 2103/2	Kaingaroa	1210	1978	FCFL	6	6	6	6	24
WN 377	Mohaka	205	1978	PPFP	3	6	6	3	18
NN 530/2	Golden Downs	66	1978	WEYH	3	6	6	3	18
CY 421/1	Waimate	2	1978	CFML	3	3	3	3	12
SD 564/1	Longwood	62	1978	RAYN	3	3	3	3	12
SD 564/2	Longwood	62	1978	RAYN	3	3	3	2	11
NN 530/1	Golden Downs	26	1979	WEYH		6	6	6*	18
RO 2103/3	Kaingaroa	1218	1979	FCFL		4	4	4*	12
SD 682	Dean	501	1980	RAYN	5#	3	5	5*	12
RO 1897	Kaingaroa	327	1984	FCFL					66

* GF8 (LI19) long internode seedlot # GF8 local climbing select seedlot ~ Some plots are now abandoned

TABLE 2

Plots established in the 1987-1991 Silviculture/Breed Trials

Trial	Forest	Cmpt	Plant year	Owner	Range of seedlots GF	No. plots *
FR 7	Woodhill	86	1987	CHHF	7, 13(LI), 14, 21	54
FR 8	Tahorakuri	8342	1987	FCFL	7, 13(LI), 14, 21	52
FR 9	Kaingaroa	481	1987	FCFL	7, 13(LI), 14, 21	48
FR 10	Glengarry	180	1987	CHHF	7, 13(LI), 14, 21	54
FR 11	Ditchlings	26	1987	WEYH	7, 13(LI), 14, 21	45
FR 12	Otago Coast	170	1987	WENT	7, 13(LI), 14, 21	47
FR 54	Mamaranui	-	1988	CHHF	9(LI), 14, 17, 22	42
FR 55	Eyrewell	33	1988	CHHF	16, 17, 22	22
FR 56	Dalethorpe	-	1988	SELW	9(LI), 14, 17, 22	34
FR 57	Tikokino	-	1988	FRI	7(LI), 17, 19	40
FR 77	Tikokino	-	1989	FRI	2, 16, 23, 25	35
FR 78	Gwavas	59	1989	PPFP	2, 16, 23, 25	24
FR 84	Kawerau	7	1989	CHHF	2, 16, 23, 25	36
FR 85	Kaingaroa	1187	1989	FCFL	2, 16, 18, 22, 23, 25	42
FR 86	Golden Downs	112	1989	WEYH	2, 6(LI), 16, 23	16
FR 121/1	Tungrove	3148	1990	CHHF	7, 13(LI), 14, 16, 25	25
FR 121/2	Kinleith	7316	1990	CHHF	7, 13(LI), 14, 16, 25	32
FR 121/3	Gwavas	45	1990	PPFP	7, 13(LI), 14, 16, 25	22
FR 121/4	Tairua	120	1990	CHHF	7, 13(LI), 14, 16, 25	18
FR 121/6	Tarawera	30	1990	FCFL	7, 13(LI), 14, 16, 25	25
FR 121/7	Huanui	18	1990	HFFL	7, 13(LI), 14, 16, 25	18
FR 121/8	Mangatu	10	1991	RAYN	6, 13(LI), 14, 16, 25	23
FR 121/9	Santoft	108	1991	ERNS	6, 13(LI), 14, 16, 25	25
FR 121/10	Blue Mountains	325	1991	ERNS	6, 13(LI), 14, 16, 25	20
FR 121/11	Shellocks	36	1991	SELW	6, 13(LI), 14, 16, 25	25
FR 121/12	Ashley	19	1991	CHHF	6, 13(LI), 14, 16, 25	25
FR 121/13	Golden Downs	133	1991	WEYH	6, 13(LI), 14, 16, 25	25

* Some plots are now abandoned

TABLE 3

Plots established in the 1992 and 1994 Special Purpose Breeds Trials

Trial	Forest	Cmpt	Plant year	Owner	Range of seedlots GF	No. plots *
FR 172/1	Woodhill	36	1992	CHHF	7, 13(LD), 14, 18, 27, 28	28
FR 172/3	Kaingaroa	1276	1992	FCFL	7, 13(LD), 14, 18, 27, 28	27
FR 172/4	Kinleith	6216	1992	CHHF	7, 13(LD), 14, 18, 27, 28	27
FR 172/5	Takitoa	5	1992	CFL	7, 13(LD), 14, 18, 27, 28	35
FR 172/6	Otago Coast	11	1992	WENT	7, 13(LD), 14, 18, 27, 28	25
FR 215/1	Kaingaroa	1284	1994	FCFL	7, 14, 15(LD), 18, 25, 30	36
FR 215/2	Rakautao	18	1994	CHHF	7, 14, 15(LD), 18, 25, 30	36
FR 215/3	Tokoiti	41	1994	CFL	7, 14, 15(LD), 18, 25, 30	36

* Some plots are now abandoned

TABLE 4

PROJECTED WORK PROGRAMME 2000-2004

Expt No.	Forest	Owner	Plant Year	Month Meas.	Late Thin	2000/01	2001/02	2002/03	2003/04
AK 1058	AUPO	JUKN	78	July		15		15	
RO 2103/1	KANG	FCF	78	June			24		24
RO 2103/2	KANG	FCF	78	June			24		24
WN 377	MOHA	PPFP	78	Aug		18		18	
NN 530/2	GDNE	WEYH	78	July		18		18	
CY 421/1	WMTE	RMNZ	78	May			12		12
SD 564/1	LONG	RAYN	78	June			12		12
SD 564/2	LONG	RAYN	78	June			11		11
NN 530/1	GDNW	WEYH	79	July		18	18		15
RO 2103/3	KANG	FCF	79	June		12		12	
SD 682	DEAN	RAYN	80	June		24	24		24
RO 1897	KANG	FCF	84	July	'97	66		66	
FR 7	WOOD	CHHF	87	June	'00	54	54	54	54
FR 8	TAHO	FCF	87	April			40		40
FR 9	KANG	FCF	87	May	'03		48		48
FR 10	GLNG	CHHF	87	May			54		54
FR 11	DTLG	WEYH	87	July	'01	45		45	45
FR 12	OTCO	WENT	87	June	'03		39		39
FR 54	MMRN	CHHF	88	May	'99	42	42	42	
FR 55	EYWL	CHHF	88	May		22		22	
FR 56	DALE	SELW	88	May	'04	34		34	
FR 57	TIKO	NZFRI	88	May	'02	40	40	40	40
FR 77	TIKO	NZFRI	89	May	'02	35	35	35	35
FR 78	GWAV	PPFP	89	June	'02	24	24	24	24
FR 84	KAWA	CHHF	89	April	'98	36		36	
FR 85	KANG	FCF	89	April	'00	42	42	42	
FR 86	GDNW	WEYH	89	July			16		16
FR 121/1	TUNG	CHHF	90	April		22		22	
FR 121/2	KINL	CHHF	90	Aug			27		27
FR 121/3	GWAV	PPFP	90	May		22		22	
FR 121/4	TIRU	CHHF	90	Aug			16		16
FR 121/6	TAWA	FCF	90	Aug			25		25
FR 121/7	HNUI	HFF	90	July			18		18
FR 121/8	MANT	RAYN	91	August		23	23	23	
FR 121/9	SANT	ERNS	91	April		25	25		25
FR 121/10	BLUE	ERNS	91	June		20	20		20
FR 121/11	SHEL	SELW	91	May		25	25		25
FR 121/12	ASHY	CHHF	91	May		25	25		25
FR 121/13	GDNE	WEYH	91	July		25	25	25	
Total No. of Plots measured by year						732	788	595	698

TABLE 4 cont.

PROJECTED WORK PROGRAMME 2000-2004

Expt No.	Forest	Owner	Plant Year	Month Meas.	Late Thin	2000/01	2001/02	2002/03	2003/04
FR 172/1	WOOD	CHHF	92	June		27	27	27	27
FR 172/3	KANG	FCF	92	April		27	27	27	27
FR 172/4	KINL	CHHF	92	May		27	27	27	27
FR 172/5	TAKI	CFL	92	June		35	35	35	35
FR 172/6	OTCO	WENT	92	June		25	25	25	25
FR 215/1	KANG	FCF	94	April		36	36	36	36
FR 215/2	RKAT	CHHF	94	July		31	31	31	31
FR 215/3	TOIT	CFL	94	June		33	33	33	33
Total No. of Plots measured by year						241	241	241	241

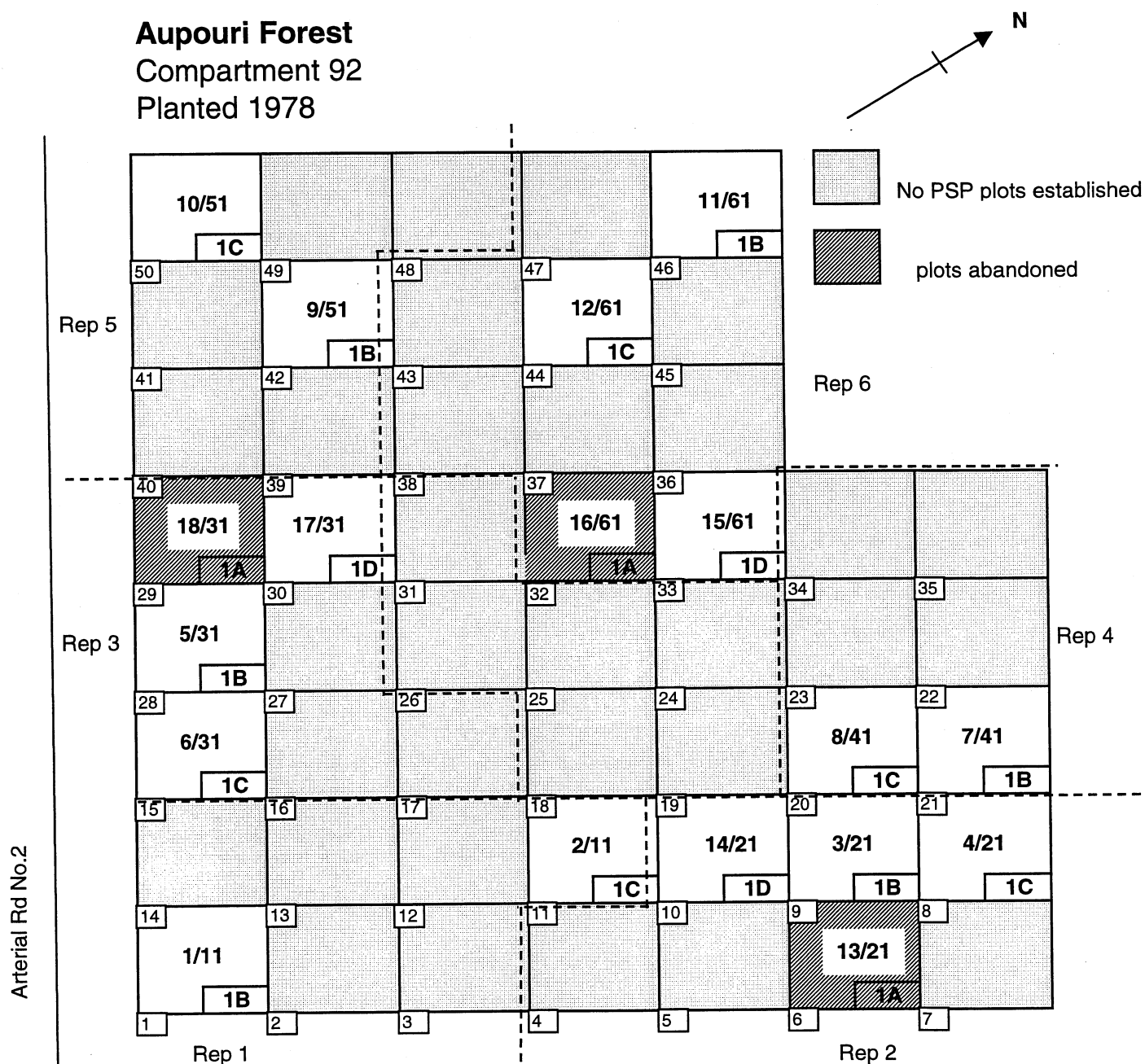
APPENDIX 1

TRIAL MAPS

STAND GROWTH MODELLING COOPERATIVE
GTI Genetic Gain Trial

AK 1058

Aupouri Forest
Compartment 92
Planted 1978



Treatment

1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

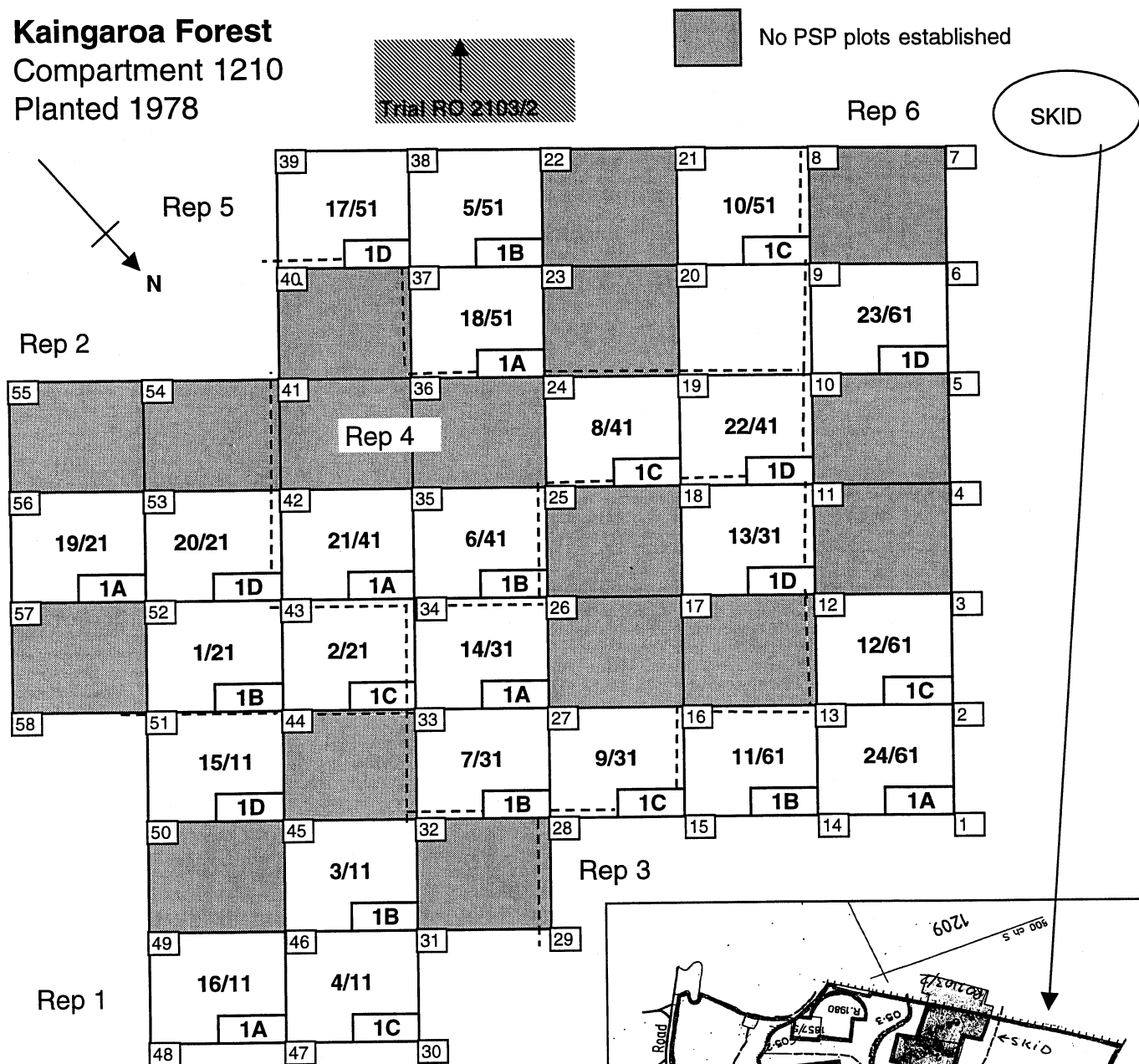
Seedlots

A = unknown (was to be GF2)
B = GF7, climbing select
C = GF14, Gwavas seed orchard
D = GF22, '850' single cross

STAND GROWTH MODELLING COOPERATIVE
GTI Genetic Gain Trial

RO 2103/1

Kaingaroa Forest
 Compartment 1210
 Planted 1978

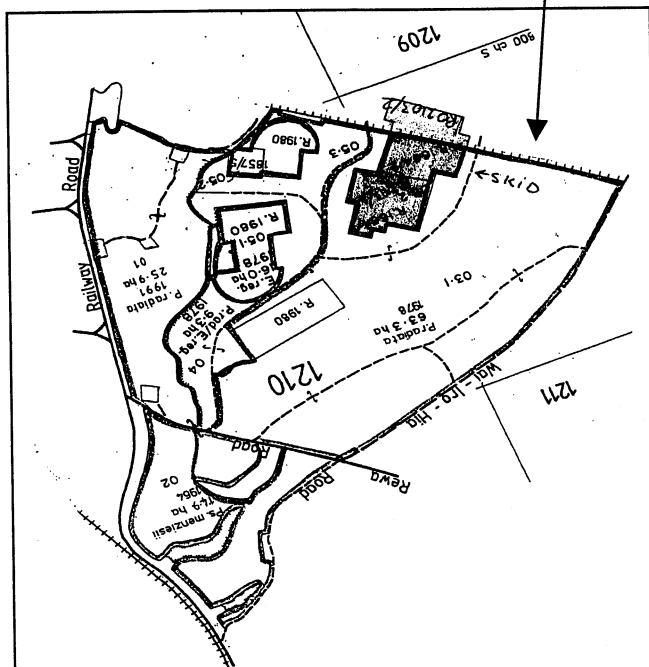


Treatment

1 = thinned from 1111 to 600 to 300,
 pruned 2.2m, 4.2m, 6m

Seedlots

A = GF2, unselected bulk
 B = GF7, climbing select
 C = GF14, Gwavas seed orchard
 D = GF22, '850' single cross



STAND GROWTH MODELLING COOPERATIVE GTI Genetic Gain Trial

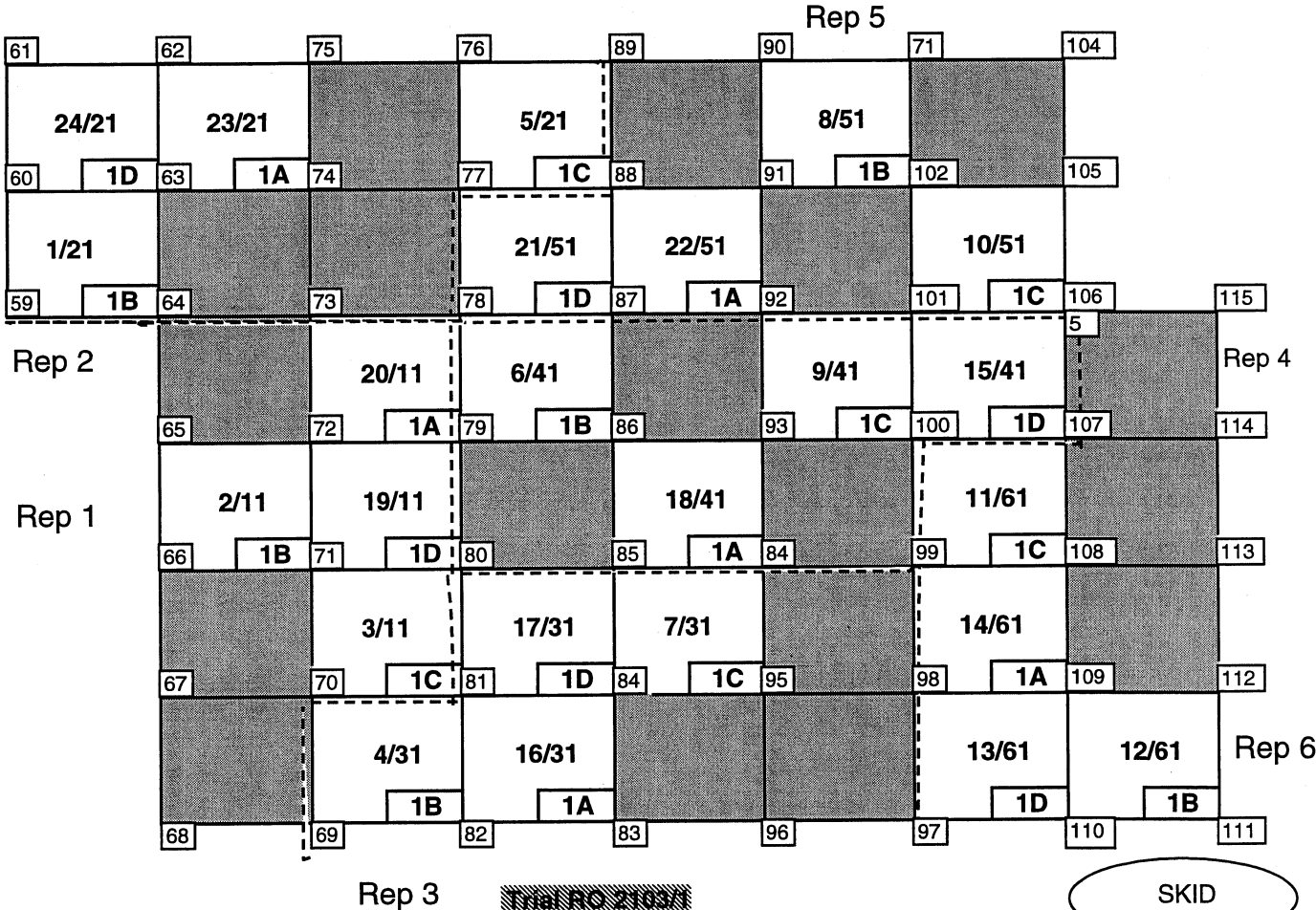
RO 2103/2

Kaingaroa Forest

Compartment 1210

Planted 1978

No PSP plots established



Seedlots

A = GF2, unselected bulk

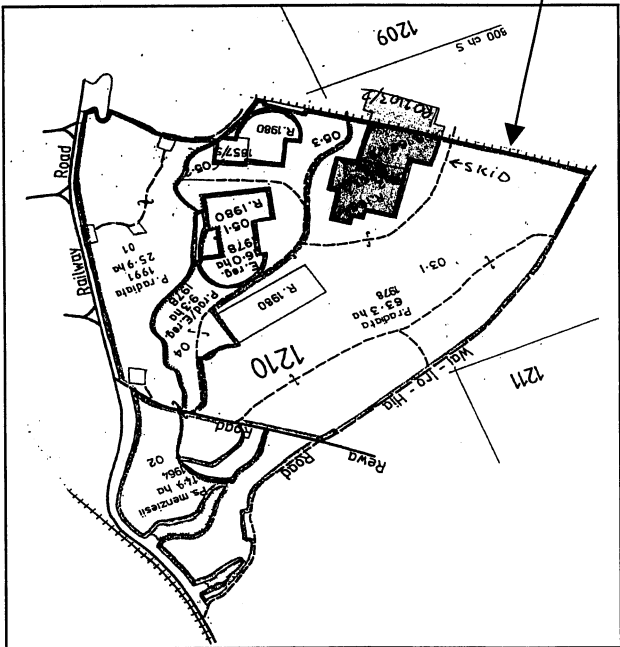
B = GF7, climbing select

C = GF14, Gwavas seed orchard

D = GF22, '850' single cross

Treatment

1 = unthinned 711sph, pruned 2.2m



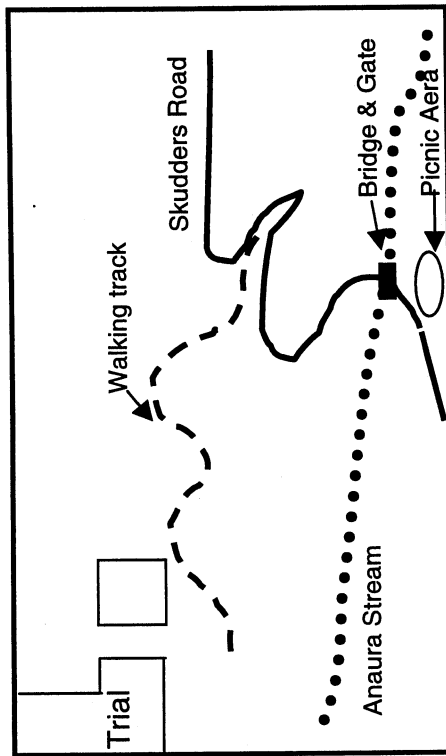
STAND GROWTH MODELLING COOPERATIVE GTI Genetic Gain Trial

WN 377

MOHAKA FOREST

Compartment 205

Planted 1978



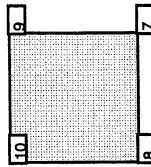
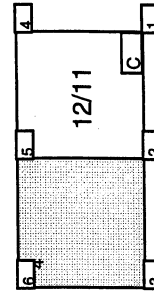
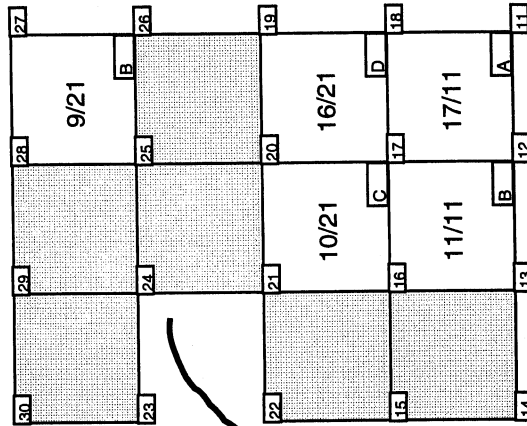
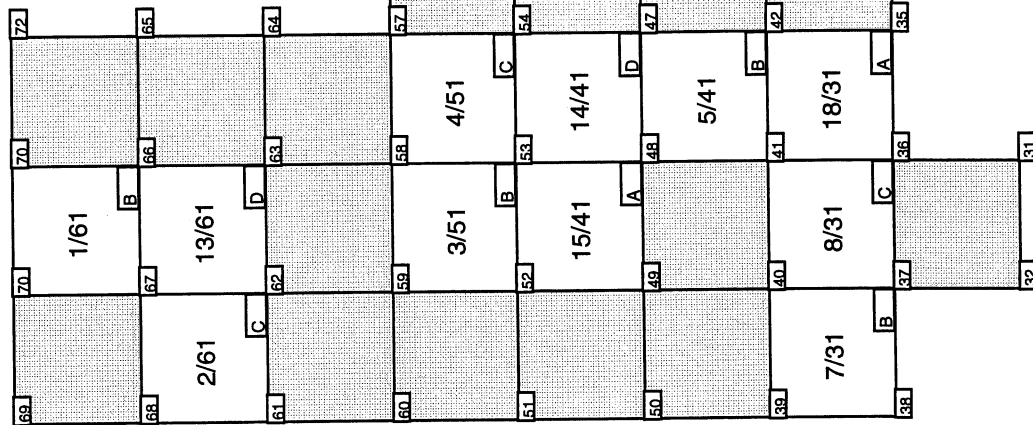
Seedlots

- A = GF2, unselected bulk
- B = GF7, climbing select
- C = GF14, Gwavas seed orchard
- D = GF22, '850' single cross

Treatment

1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

No PSP plots established



Stream

Walking track

STAND GROWTH MODELLING COOPERATIVE

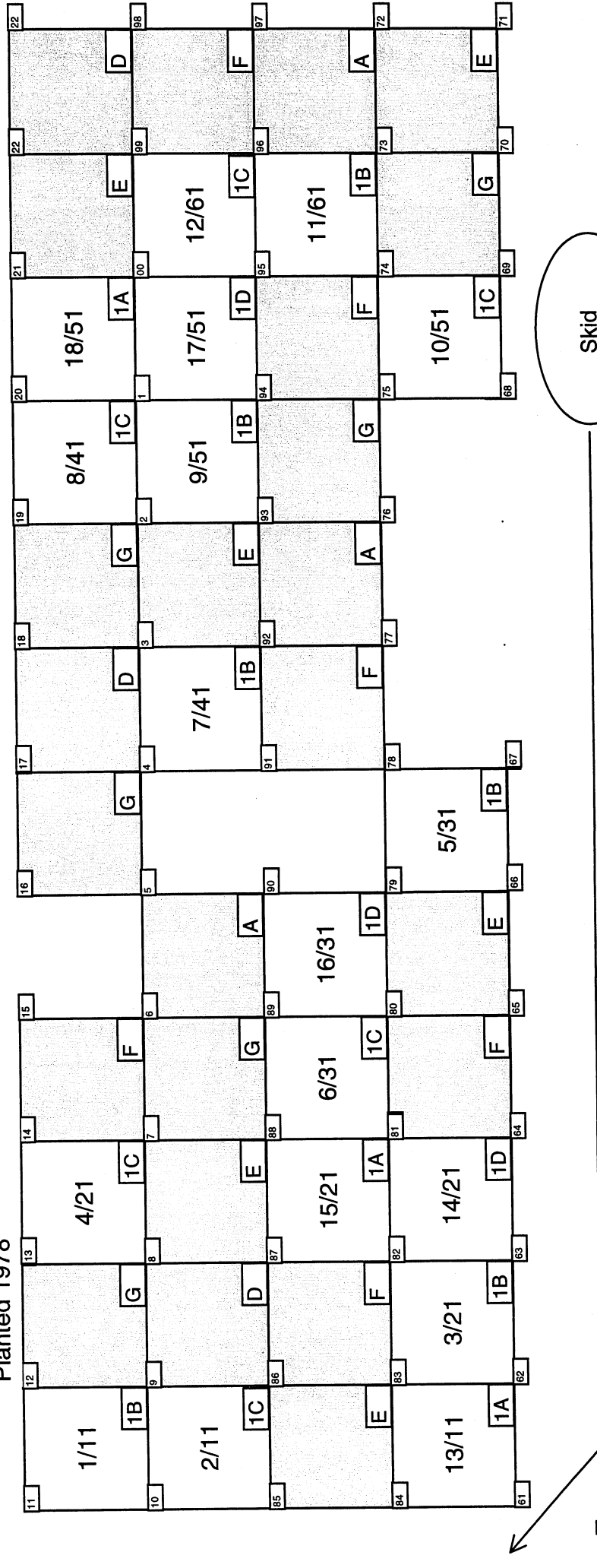
GTI Genetic Gain Trial

NN 530/2

Golden Downs Forest

Compartment 66

Planted 1978



Seedlots

- A = R74/1027, GF2, unselected bulk
- B = NN/C75/2, GF7, climbing select
- C = WN76/A2, GF14, Gwavas seed orchard
- D = 850-55x 850-96, GF22, '850' single cross
- E = FRI76/2052, GF14, '850' CP cross
- F = CY/C75/51, GF8, Canterbury '850'
- G = CY/C75/52, GF8, Canterbury '850'

Treatment

1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

No PSP plots established

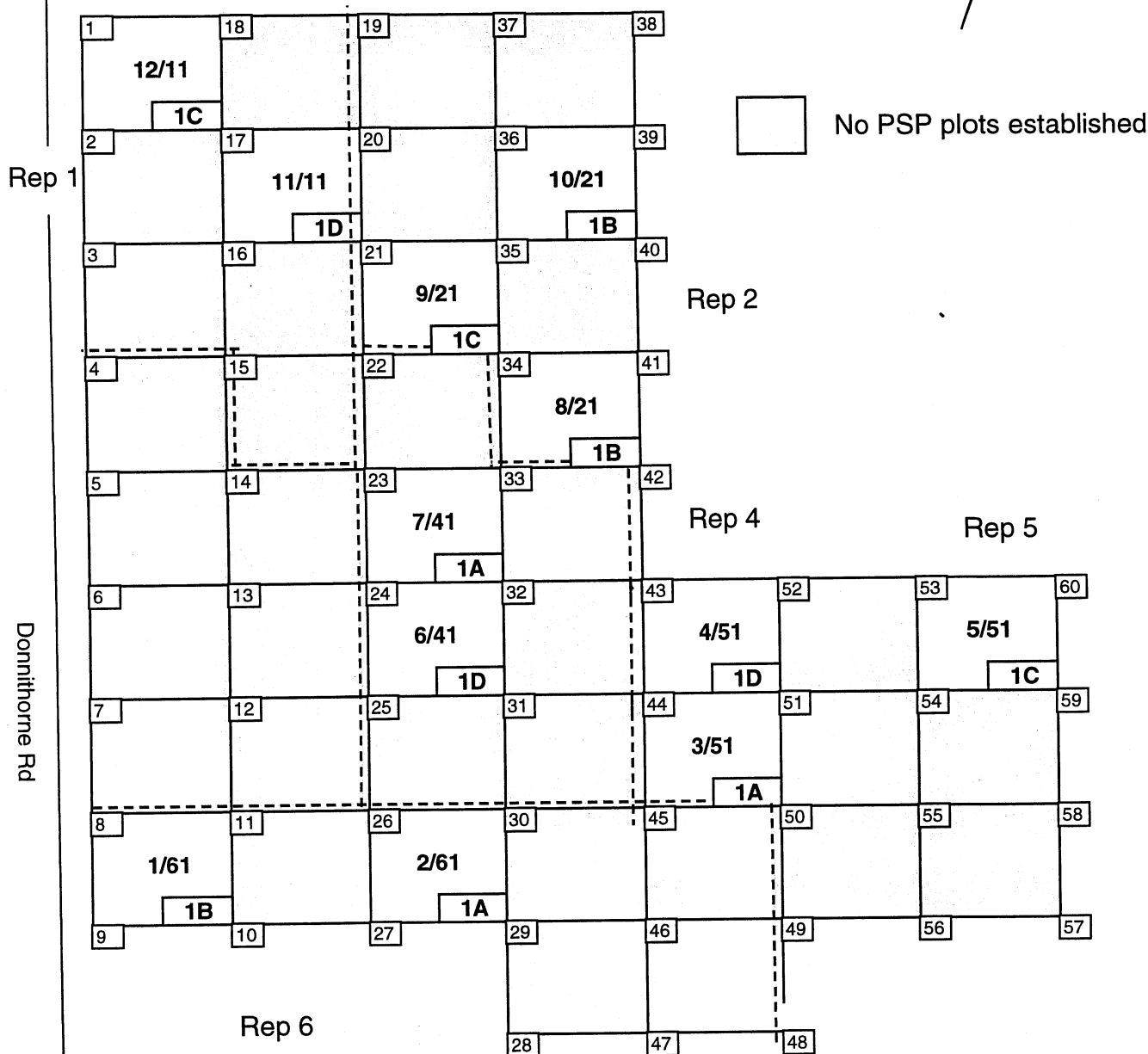
STAND GROWTH MODELLING COOPERATIVE
GTI Genetic Gain Trial

CY 421/1

Waimate Forest

Compartment 2

Planted 1978



Treatment

1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

Seedlots

A = GF2, unselected bulk

B = GF7, climbing select

C = GF14, Gwavas seed orchard

D = GF22, '850' single cross

STAND GROWTH MODELLING COOPERATIVE

GTI Genetic Gain Trial

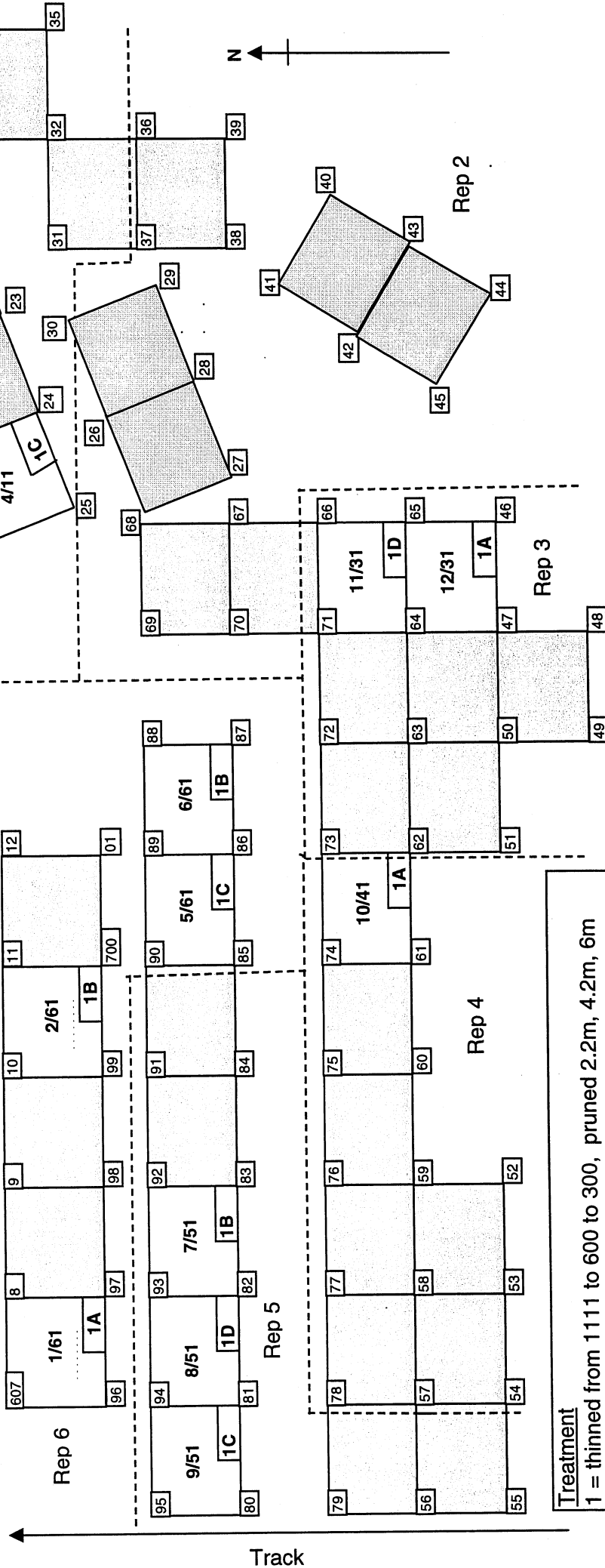
SD 564/1

Longwood Forest

Compartment 62

Planted 1978

To Happy Valley Rd



Treatment

1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

Seedlots

A = GF2, unselected bulk

B = GF7, climbing select

C = GF14, Gwavas seed orchard

D = GF22, '850' single cross

No PSP plots established

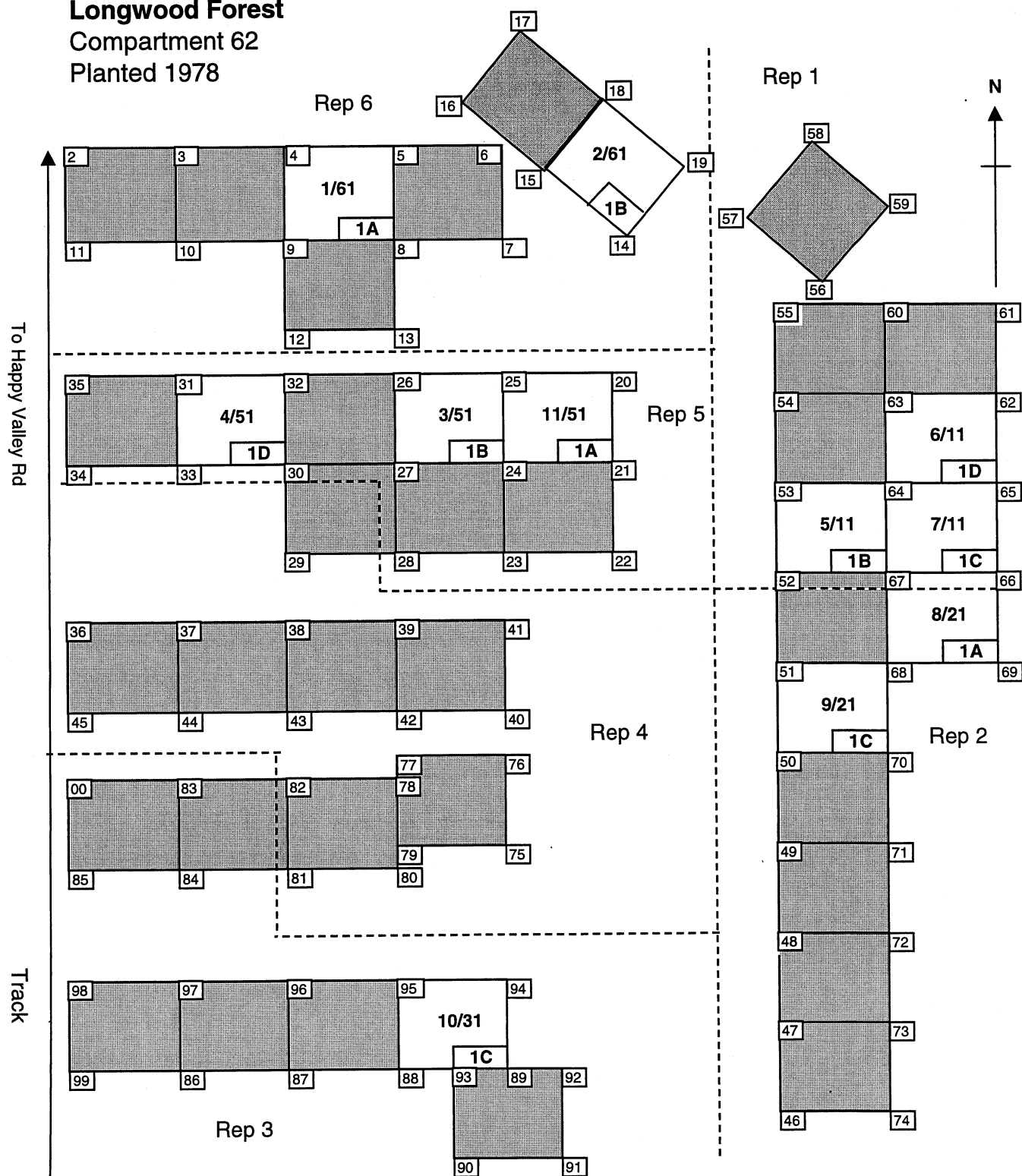
STAND GROWTH MODELLING COOPERATIVE
GTI Genetic Gain Trial

SD 564/2

Longwood Forest

Compartment 62

Planted 1978



Treatment

1 = unthinned 711sph, pruned 2.2m

Seedlots

A = GF2, unselected bulk

B = GF7, climbing select

C = GF14, Gwavas seed orchard

D = GF22, '850' single cross



No PSP plots established

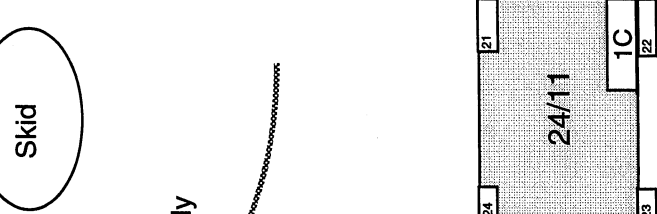
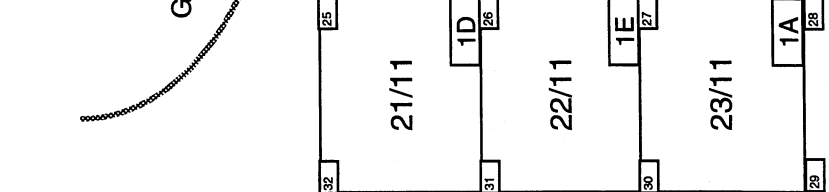
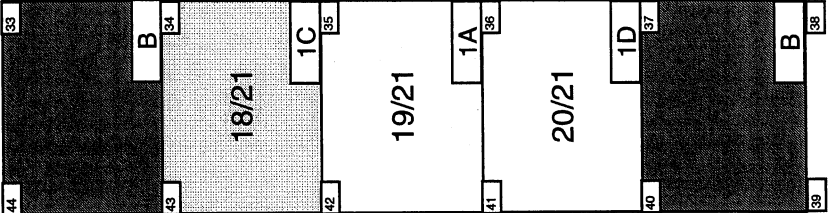
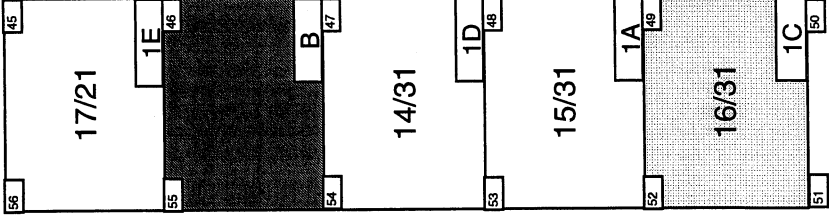
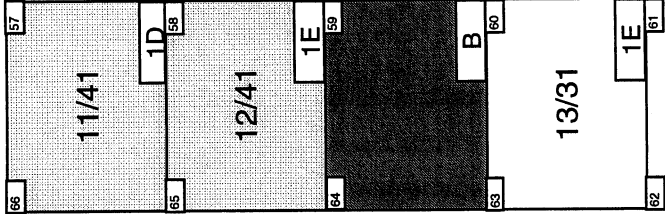
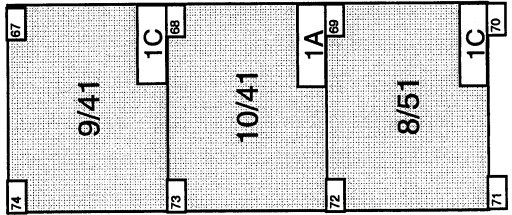
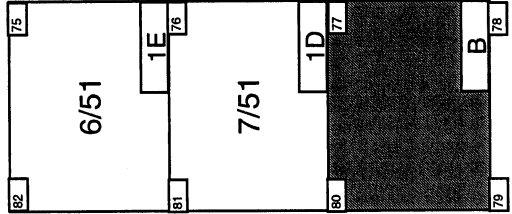
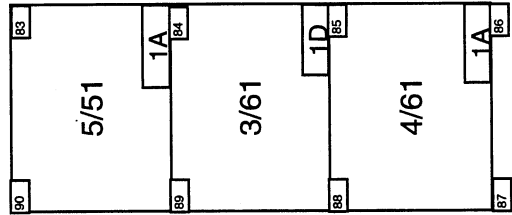
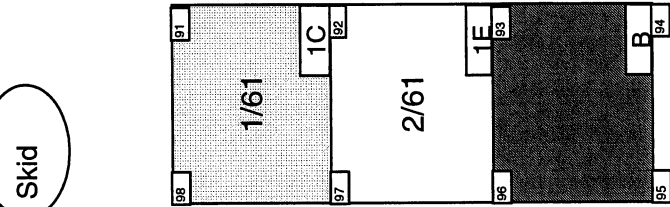
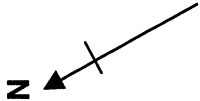
STAND GROWTH MODELLING COOPERATIVE

GTI Genetic Gain Trial

NN 530/1

Golden Downs Forest
 Compartment 26
 Planted 1979

Firewood Gully Road 86



Seedlots
 A = GF7, climbing select
 B = GF8, Canterbury seed orchard
 C = GF14, '875' series - inbred
 D = GF14, '268' seed orchard
 E = GF8 (LI19), long internode

Treatment
 1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

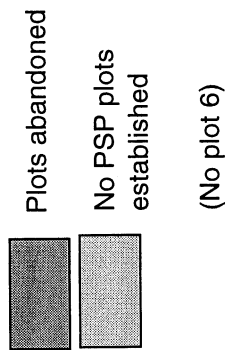
Plots abandoned

No PSP plots established

STAND GROWTH MODELLING COOPERATIVE GTI Genetic Gain Trial

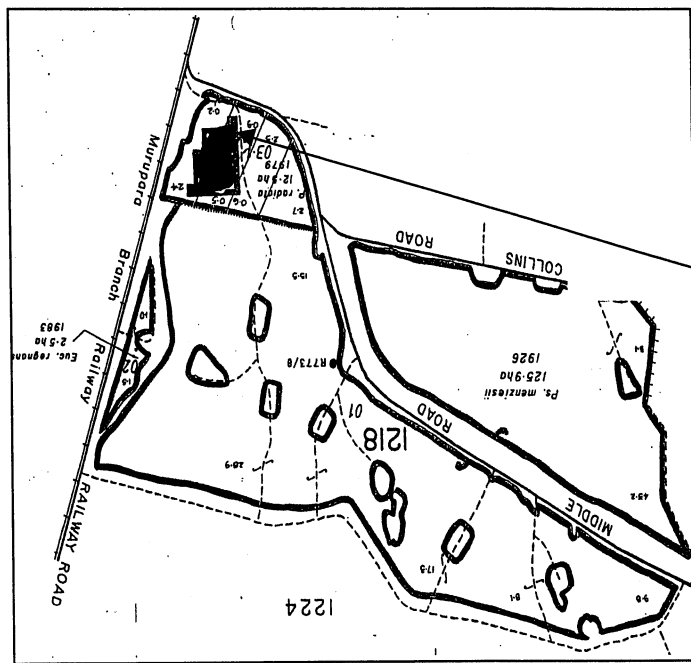
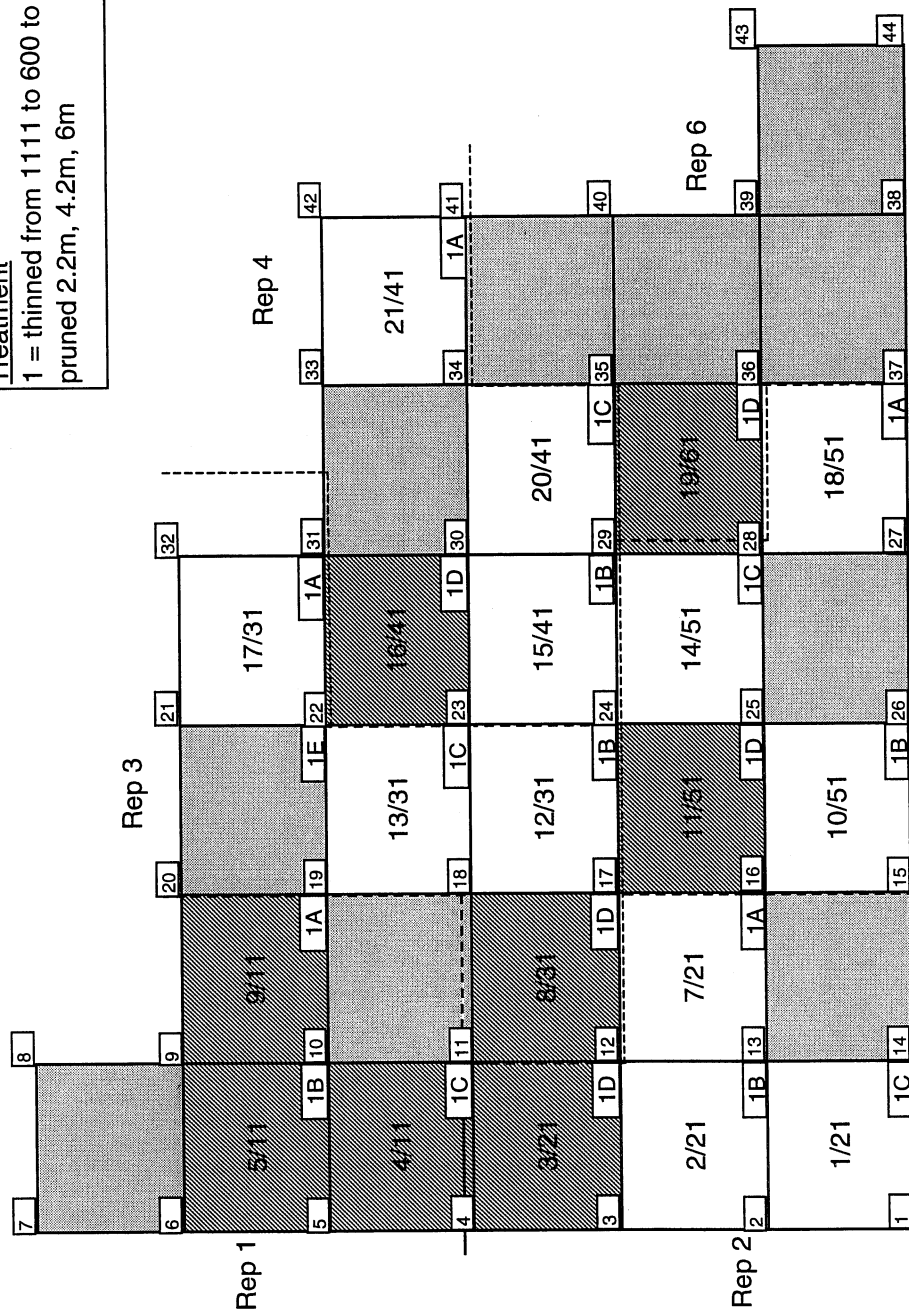
RO 2103/3

Kaingarua Forest
Compartment 1218
Planted 1979



Seedlots
A = GF7, climbing select
B = GF14, '268' seed orchard
C = GF8 (LI19), long internode
D = GF14, '875' series - inbred

Treatment
1 = thinned from 1111 to 600 to 300,
pruned 2.2m, 4.2m, 6m



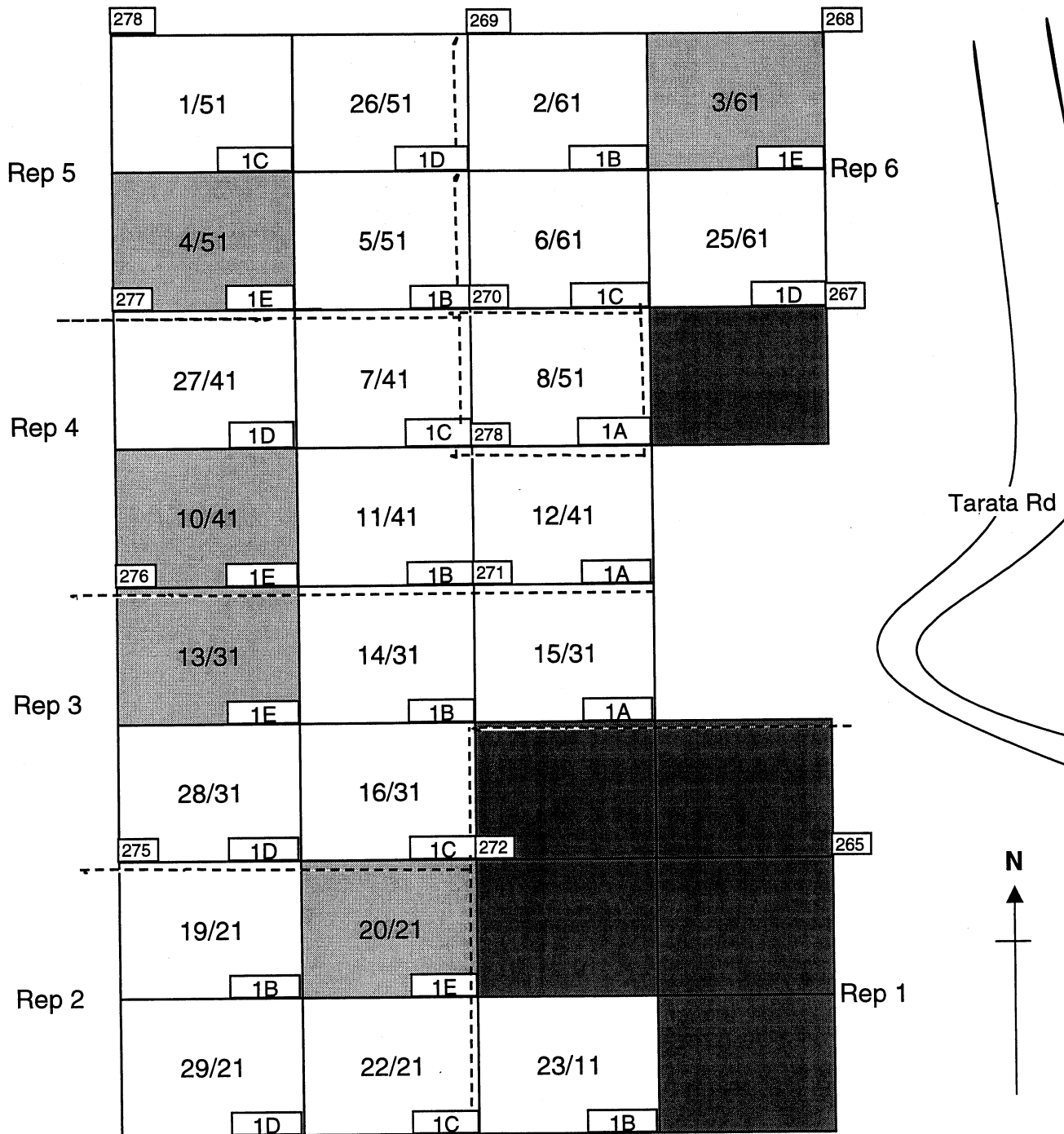
**STAND GROWTH MODELLING COOPERATIVE
GTI Genetic Gain Trial**

SD 682

Dean Forest

Compartment 501

Planted 1980



Treatment

1 = thinned from 1111 to 600 to 300, pruned 2.2m, 4.2m, 6m

Seedlots

A = GF7, climbing select
 B = GF14, '268' seed orchard
 C = GF8 (LI19), long internode
 D = GF8, Canterbury seed orchard
 E = GF14, '875' series - inbred



No PSP plots established



Plots abandoned

STAND GROWTH MODELLING COOPERATIVE Genetic Gain Trial

RO 1897

Kaingaroa Forest

Compartment 327

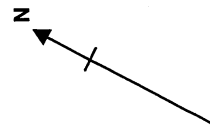
Planted 1984

Seedlots

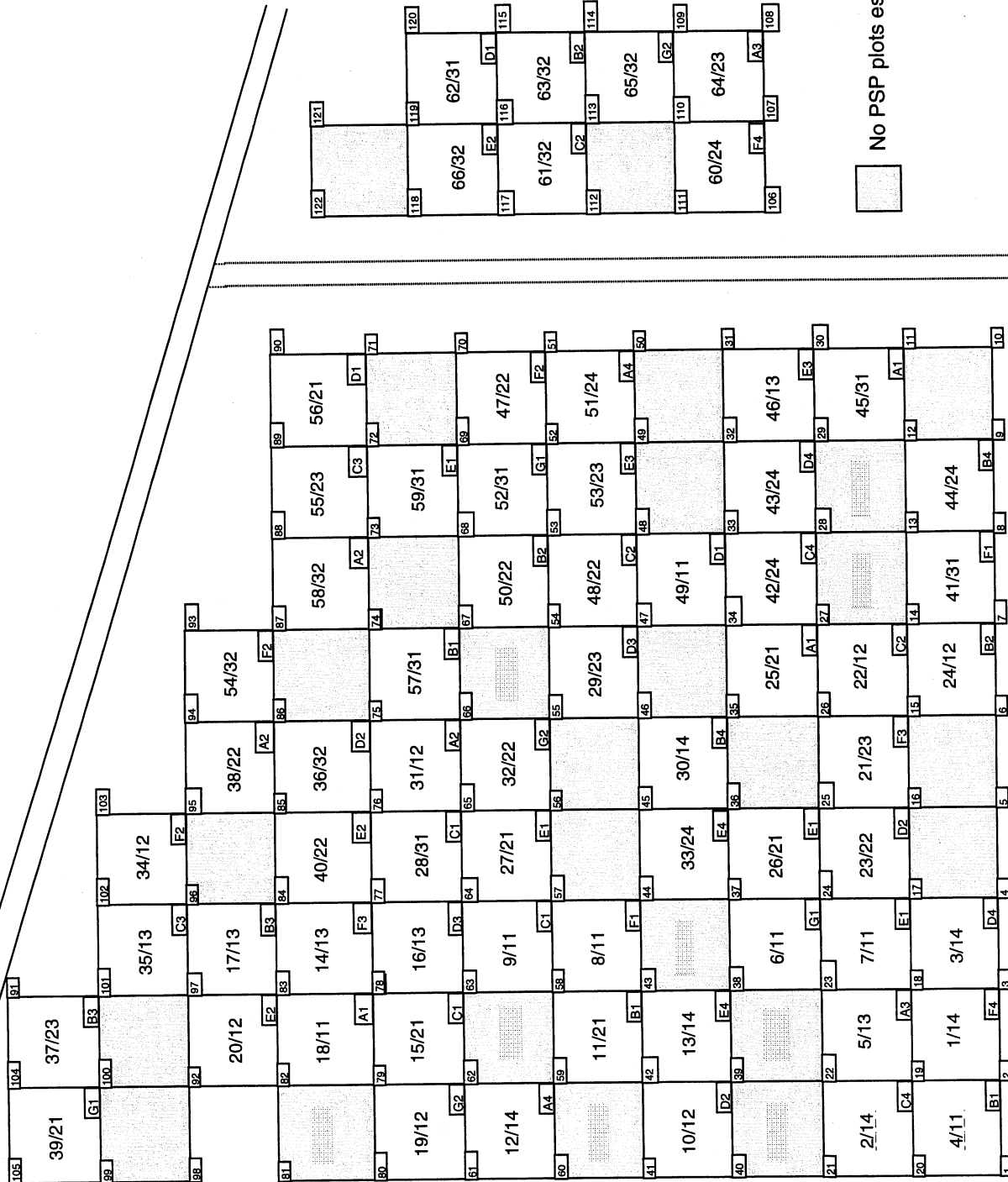
A = GF7, climbing select
B = GF14, Gwavas seed orchard
C = GF16, '268'
D = GF17, '268' OP
E = GF11 (LI25), long internode
F = GF10 (LI20), long internode
G = GF17, '875' cuttings

Treatments

1 = 700 to 300, pruned
2 = 700 to 400, pruned
3 = 700 to 300, late thin, pruned
4 = 700 to 400, late thin, pruned



No PSP plots established



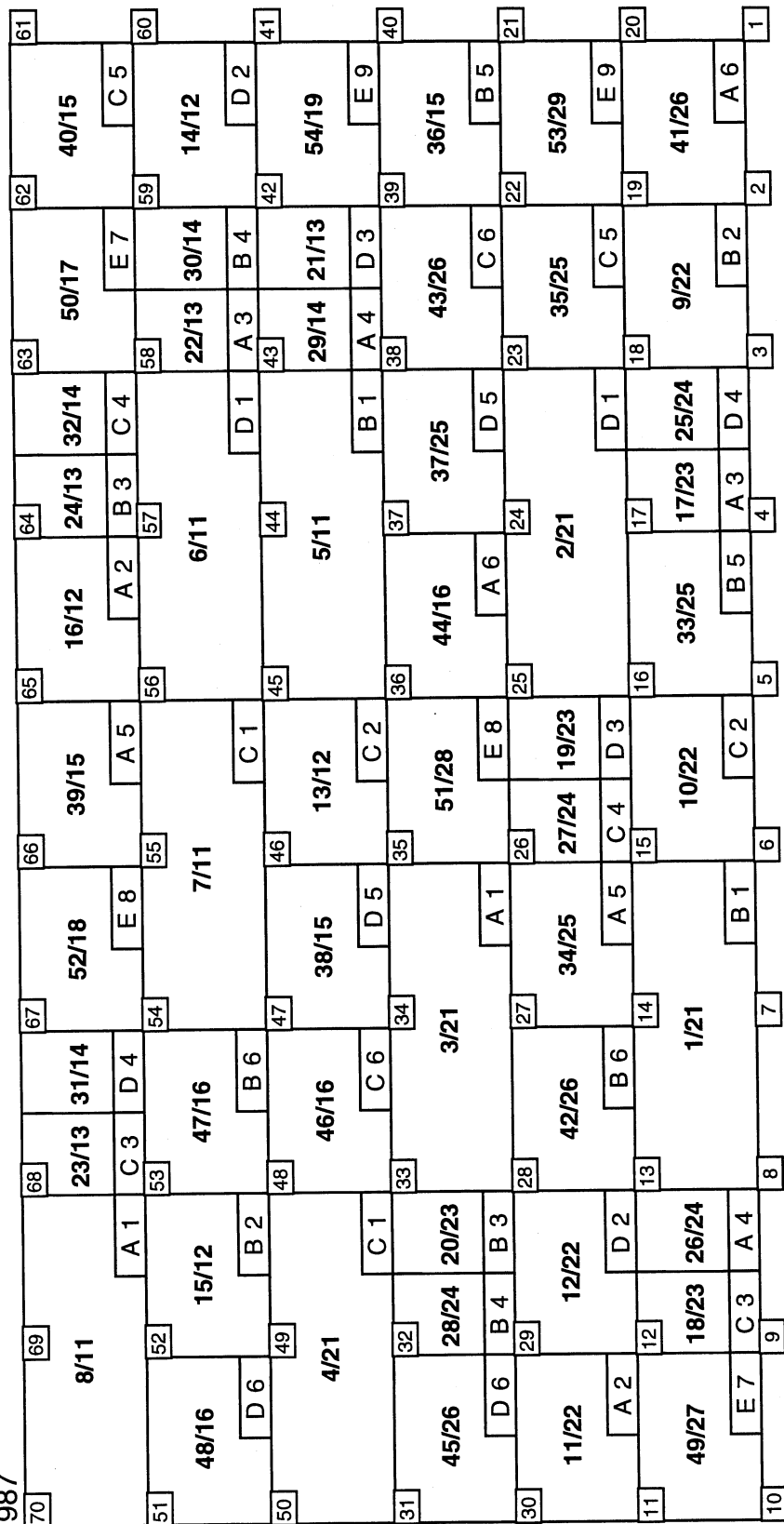
FR 7

Woodhill Forest

Compartment 86

Planted 1987

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial



Landing area

SELWYN ROAD

LOOKOUT ROAD

N

Seedlots

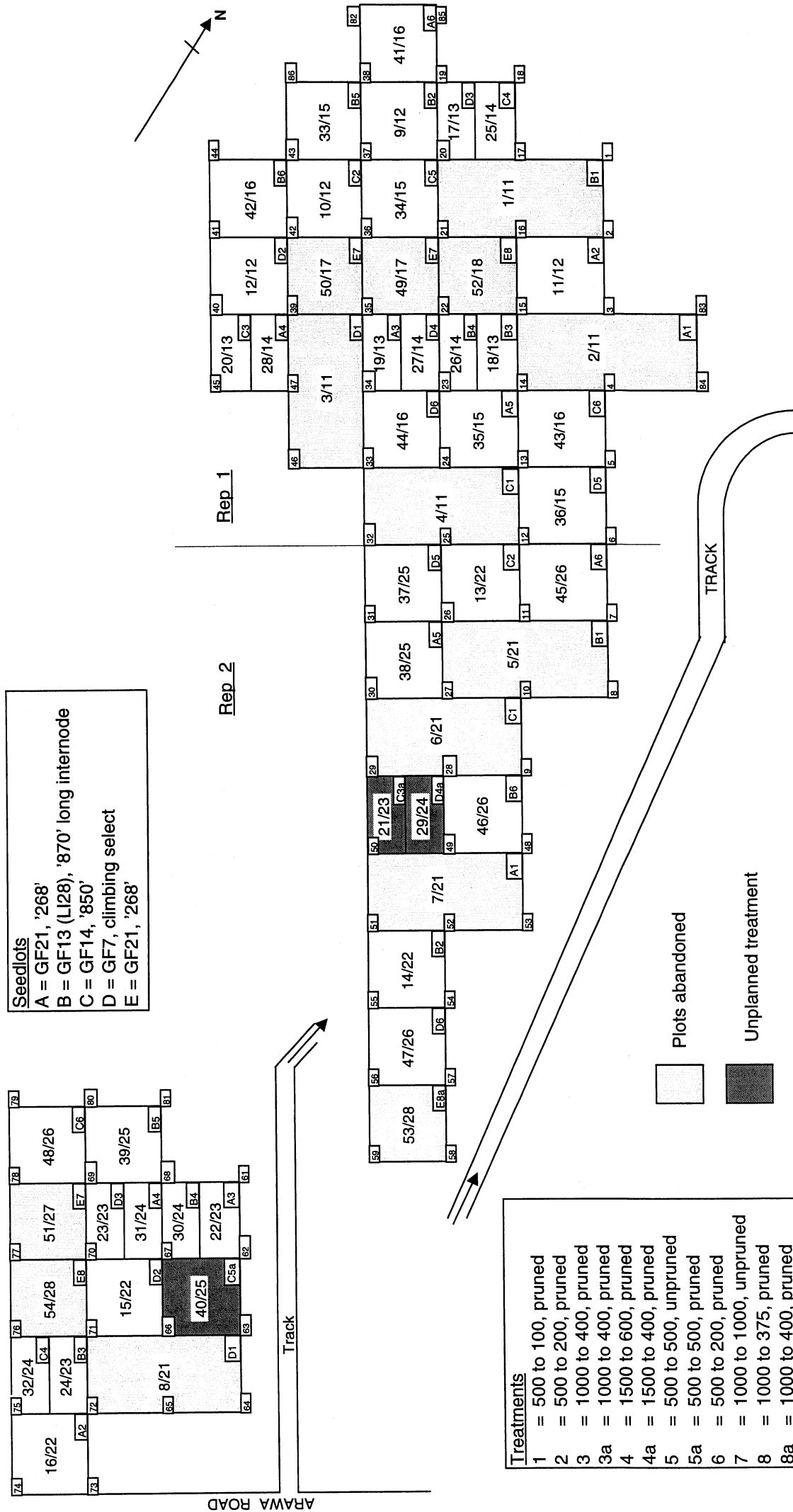
A = GF21, '268'
 B = GF13 (L128), '870' long internode
 C = GF14, '850'
 D = GF7, climbing select
 E = GF19, '268'

Treatments

1 = 500 to 100, pruned
 2 = 500 to 200, pruned
 3 = 1000 to 400, pruned
 4 = 1500 to 600, pruned
 5 = 500, unthinned, unpruned
 6 = 500 to 200 (late), pruned
 7 = 800 to 300, pruned
 8 = 1000 to 300, pruned
 9 = 1200 to 300, pruned

8FRF

Tahorakuri Forest
Compartment 8342
Planted 1987



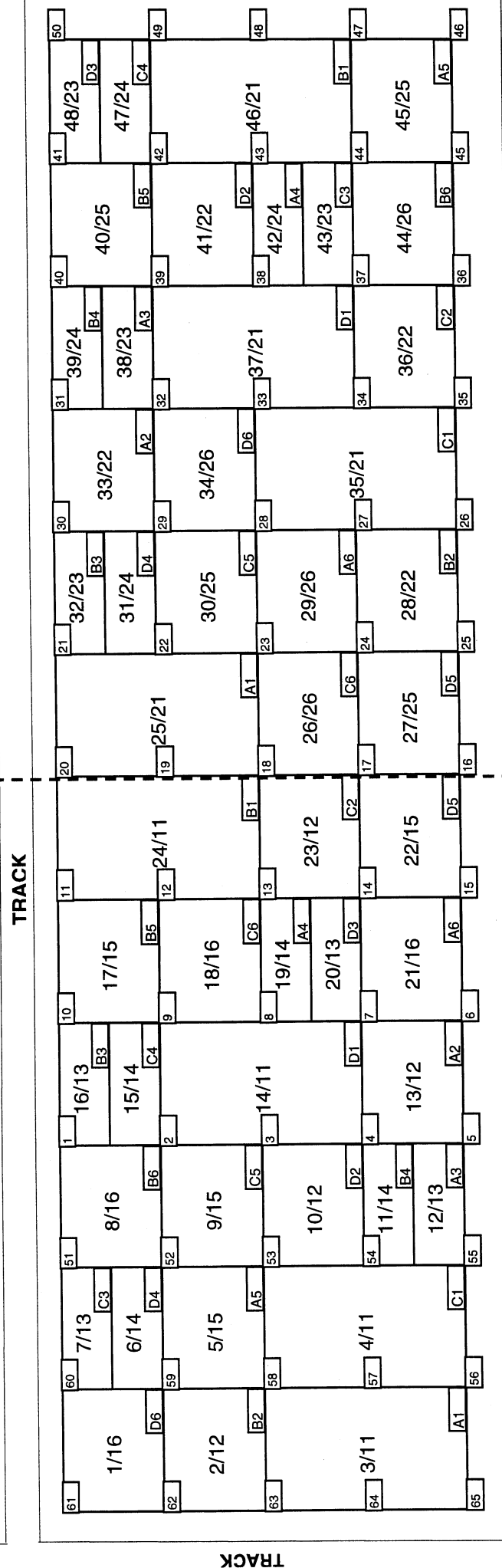
STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

LOW LEVEL ROAD

600 M

Rep 1

Rep 2

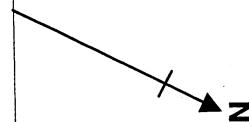


Seedlots

A = GF21, '268'
B = GF13 (L128), '870' long internode
C = GF14, '850'
D = GF7, climbing select

Treatments

Treatments
1 = 500 to 100, pruned
2 = 500 to 200, pruned
3 = 1000 to 400, pruned
4 = 1500 to 600, pruned
5 = 500, unthinned, unpruned
6 = 500 to 200 (late), pruned

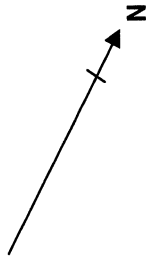


STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 10

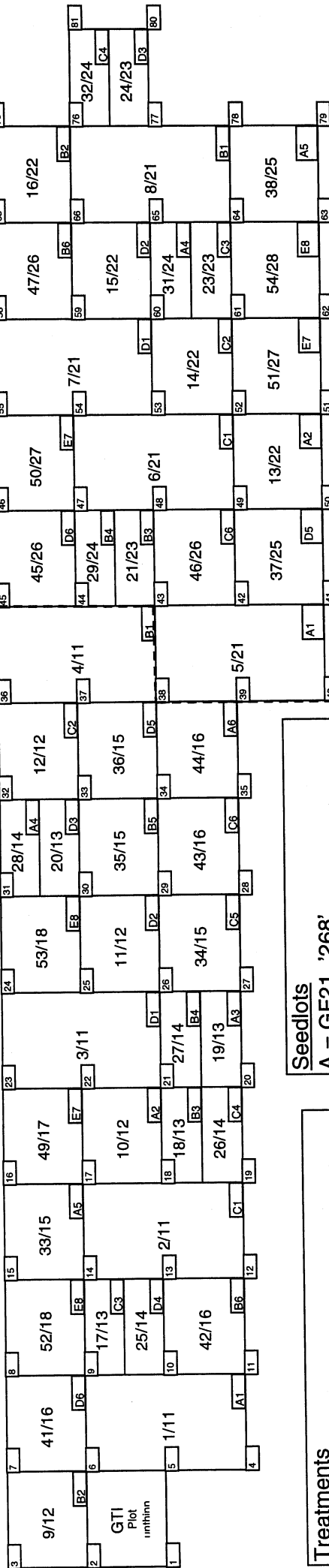
**Glengarry Forest
Compartment 180
Planted 1987**

Glengarry Station Rd



TRACK

Rep 1 Rep 2



Seedlots

- A = GF21, '268'
- B = GF13 (LI28), long internode
- C = GF14, '850'
- D = GF7, climbing select
- E = GF16, '268'

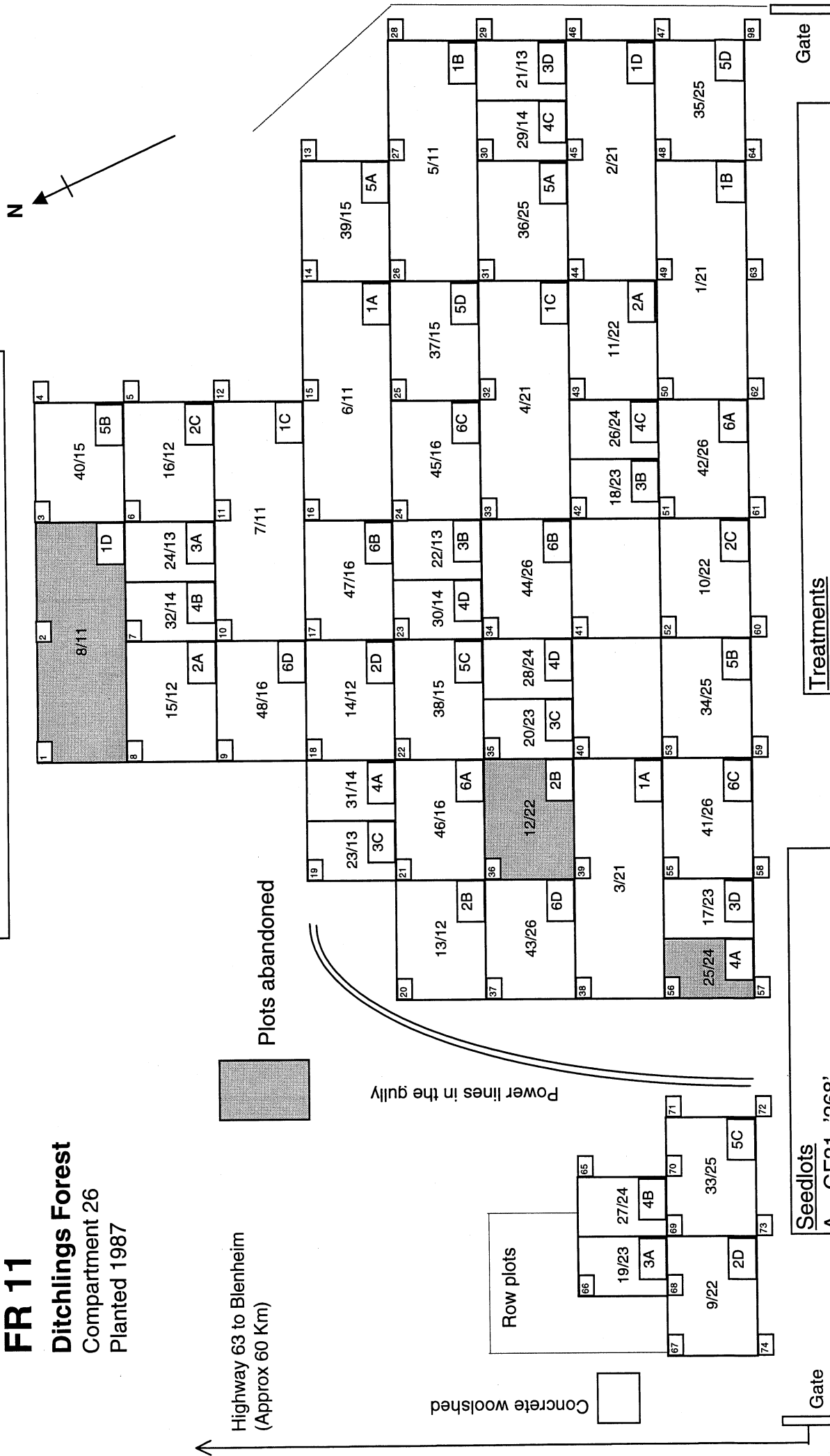
Treatments

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 1500 to 600, pruned
- 5 = 500 to 500, unpruned
- 6 = 500 to 200, pruned
- 7 = 500 to 200, pruned, late thin
- 8 = 1000 to 200, pruned, 2 late thinnings

FR 11

Ditchlings Forest
Compartment 26
Planted 1987

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial



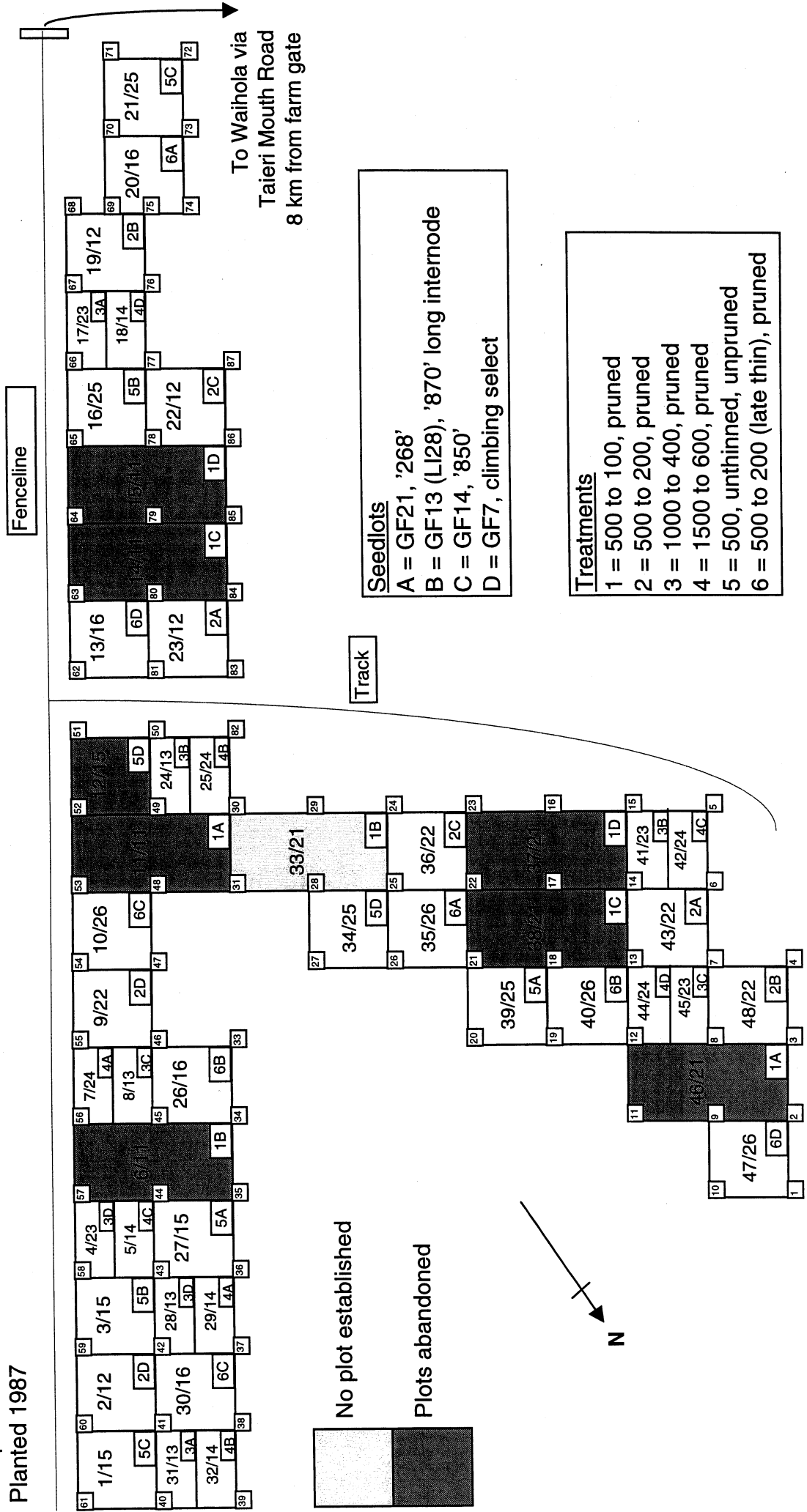
Treatments
1 = 500 to 100, pruned
2 = 500 to 200, pruned
3 = 1000 to 400, pruned
4 = 1500 to 600, pruned
5 = 500, unthinned, unpruned
6 = 500 to 200 (late), pruned

Seedlots
A = GF21, '268'
B = GF13 (LI28), '870' long internode
C = GF14, '850'
D = GF7, climbing select

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 12

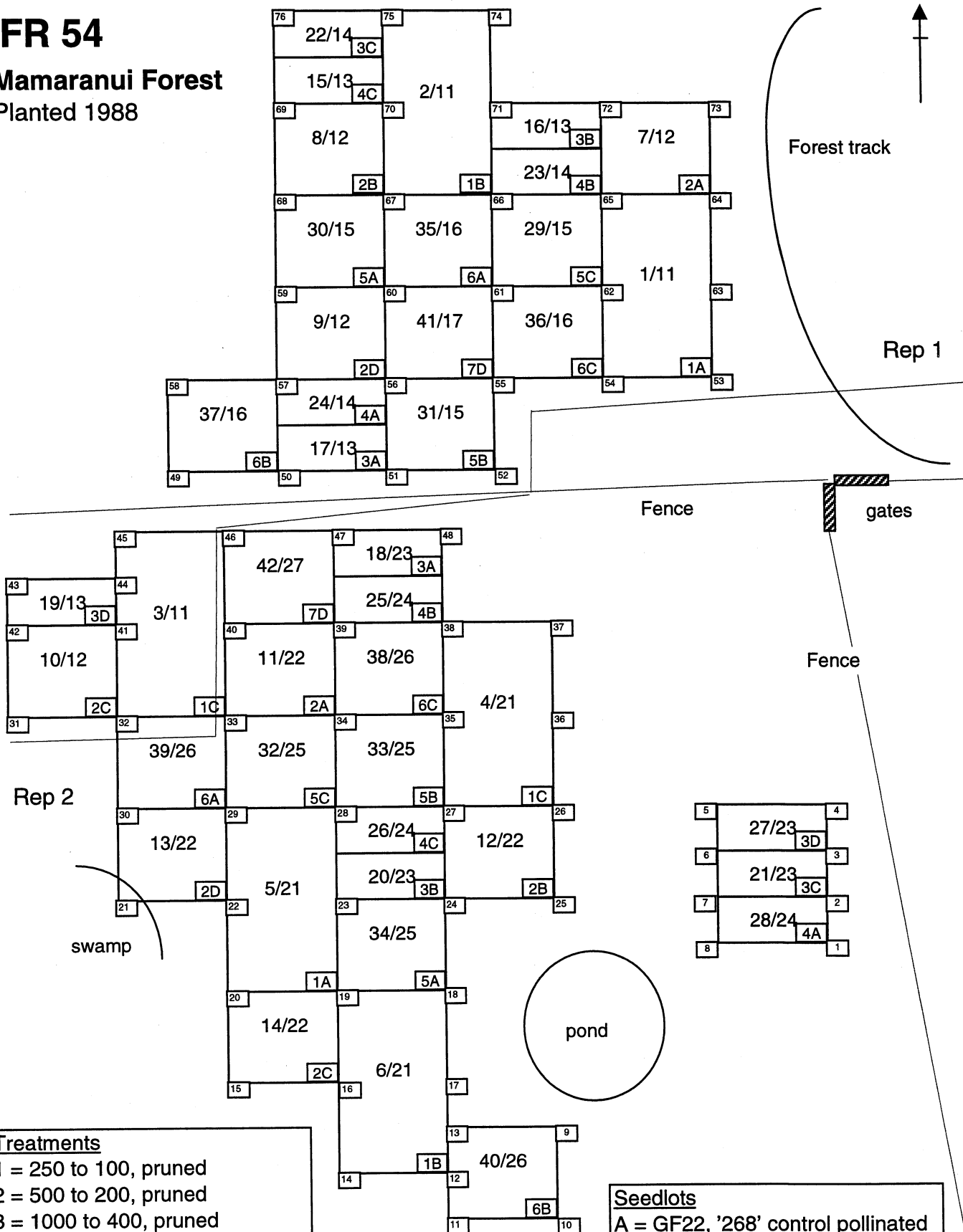
Otago Coast Forest
Compartment 170
Planted 1987



STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 54

Mamaranui Forest
Planted 1988



Treatments

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 1500 to 600, pruned
- 5 = 500, unthin, unpruned
- 6 = 500 to 200, late thin, pruned
- 7 = 200, unthin, pruned

Seedlots

- A = GF22, '268' control pollinated
- B = GF9 (LI23), long internode
- C = GF14, '850' open pollinated
- D = GF17, '268' cuttings

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 55

Eyrewell Forest
Compartment 33
Planted 1988

Hunter Road

'CATCH' crop
Planted 1968

'MAIN' crop
Planted 1975

Rep 1

Rep 2

Treatments

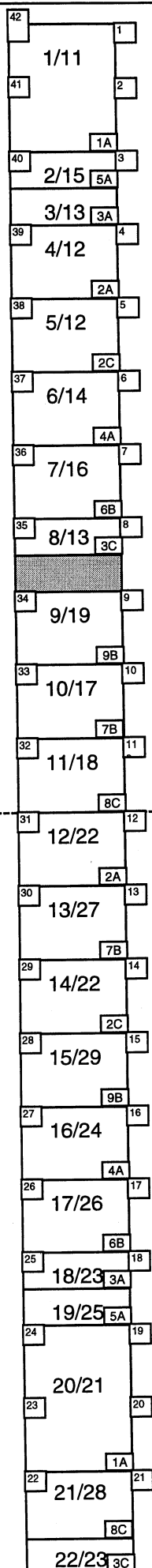
- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500, unthin, unpruned
- 5 = 1200 to 600, pruned
- 6 = 550 to 275, pruned
- 7 = 830 to 300, pruned
- 8 = 200, unthin, pruned
- 9 = 275, unthin, pruned

Seedlots

- A = GF22, '268' control pollinated
- B = GF16, '850' open pollinated
- C = GF17, '268' cuttings

Anderson Road

N

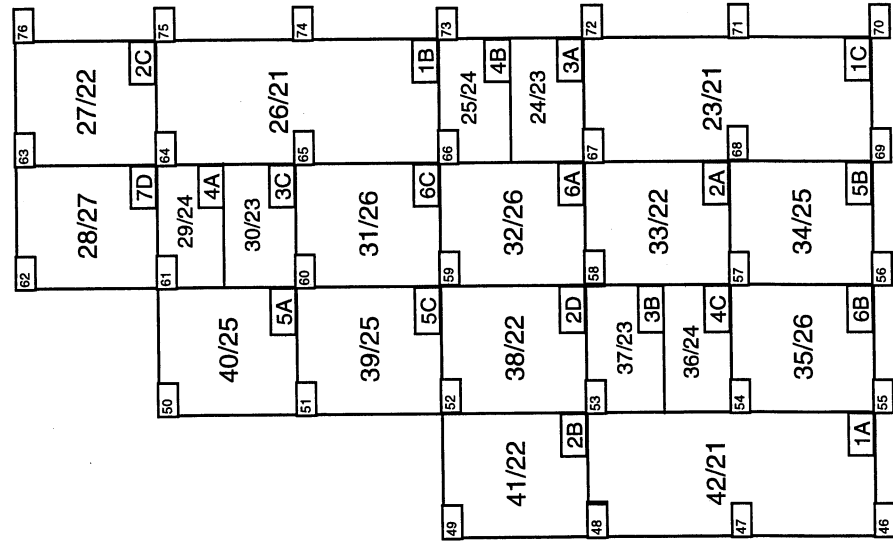
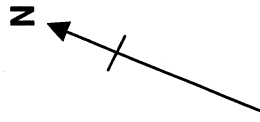


FR 56

Dalethorpe Forest

Planted 1988

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

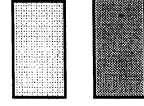


Seedlots

A = GF22, '268' control pollinated
B = GF9(LI23), long internode
C = GF14, '850' open pollinated
D = GF17, '268' cuttings

Treatments

1 = 250 to 100, pruned
2 = 500 to 200, pruned
3 = 1000 to 400, pruned
4 = 1555 to 600, pruned
5 = 500, unthinned, unpruned
6 = 500 to 200, late thin, pruned
7 = 200, unthinned, pruned



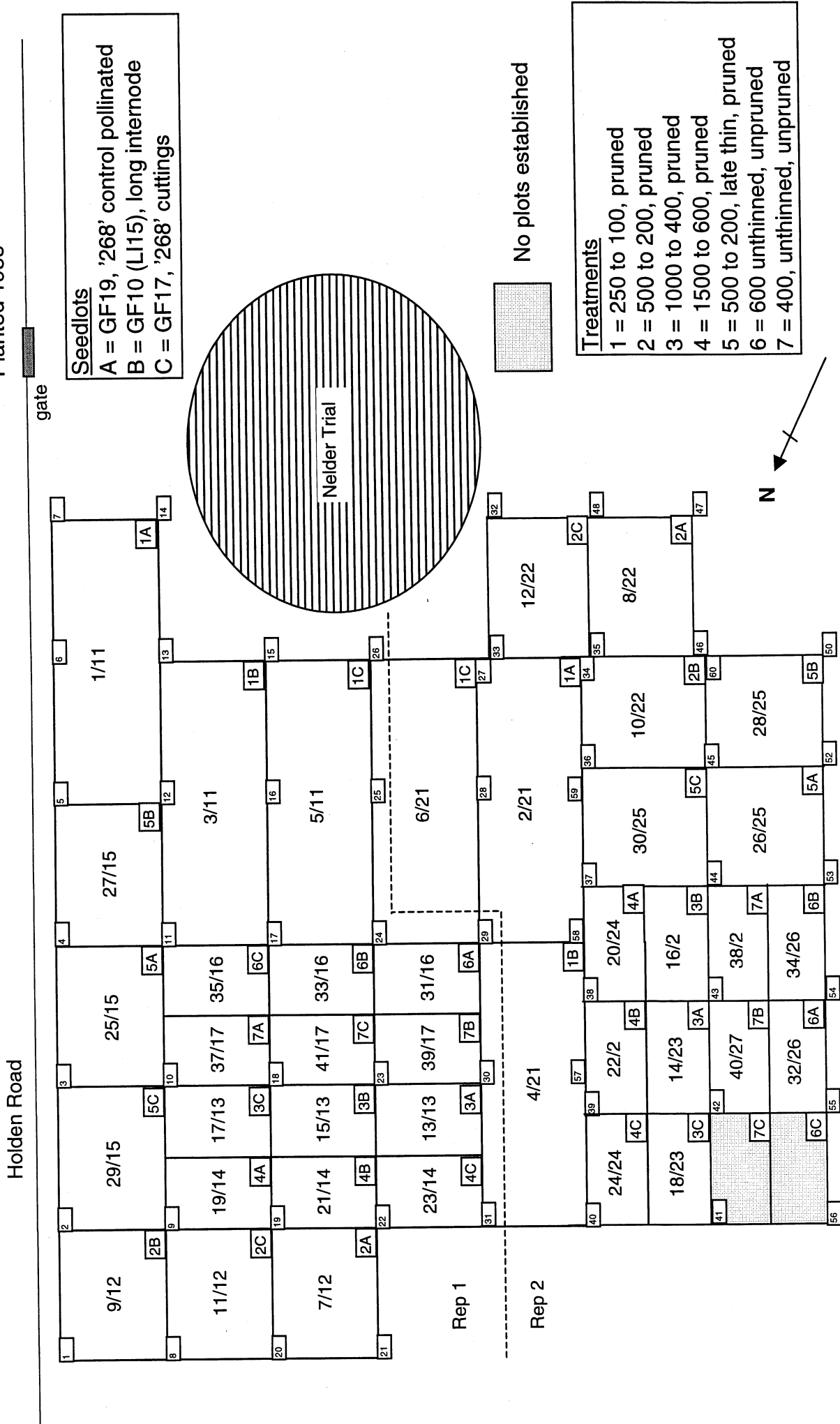
Plots abandoned

No plots established

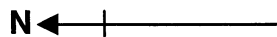
Fences

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 57
Tikokino Forest
Planted 1988

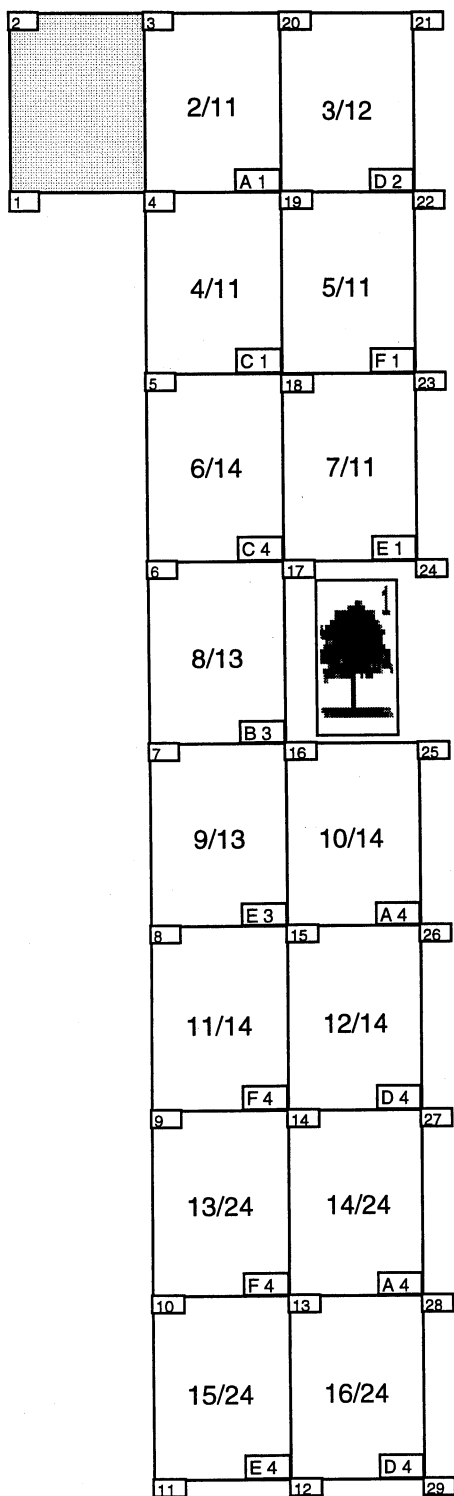


STAND GROWTH MODELLING COOPERATIVE
Silviculture / Breed Trial

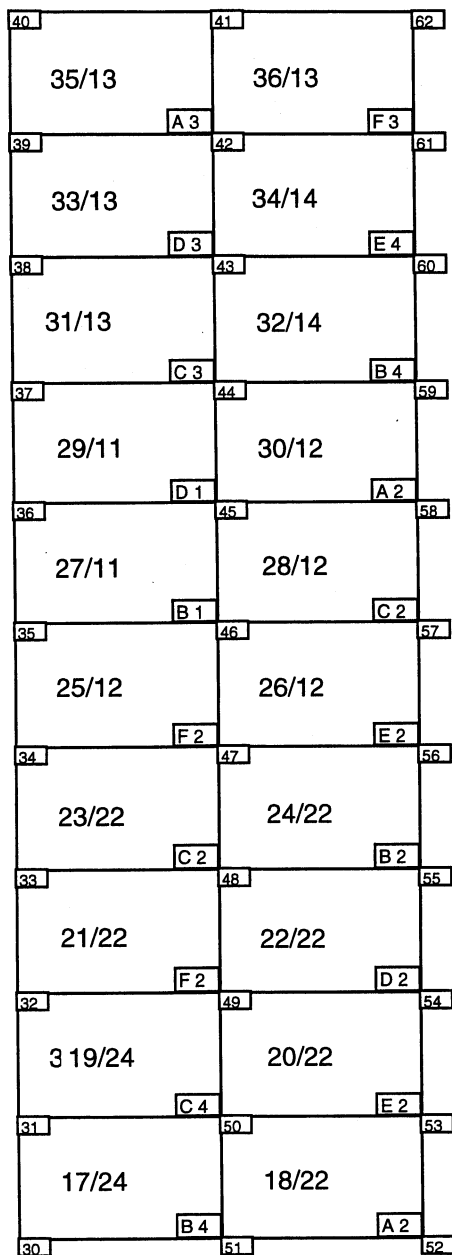


FR 77

Tikokino Forest
Planted 1989



 No plots established



↑
To Tikokino

Holden Road

Seedlots

A = GF2, Unimproved
 B = GF16, Open-grown seedlings
 C = GF25, Root trainer seedlings
 D = GF23, Open-grown cuttings
 E = GF25, Root trainer cuttings
 F = Direct field cuttings

Treatments

1 = 500 Unpruned, Unthinned
 2 = 500 to 200, Pruned
 3 = 500 to 200, Late thin, pruned
 4 = 500 to 400, Pruned

Gate
↓

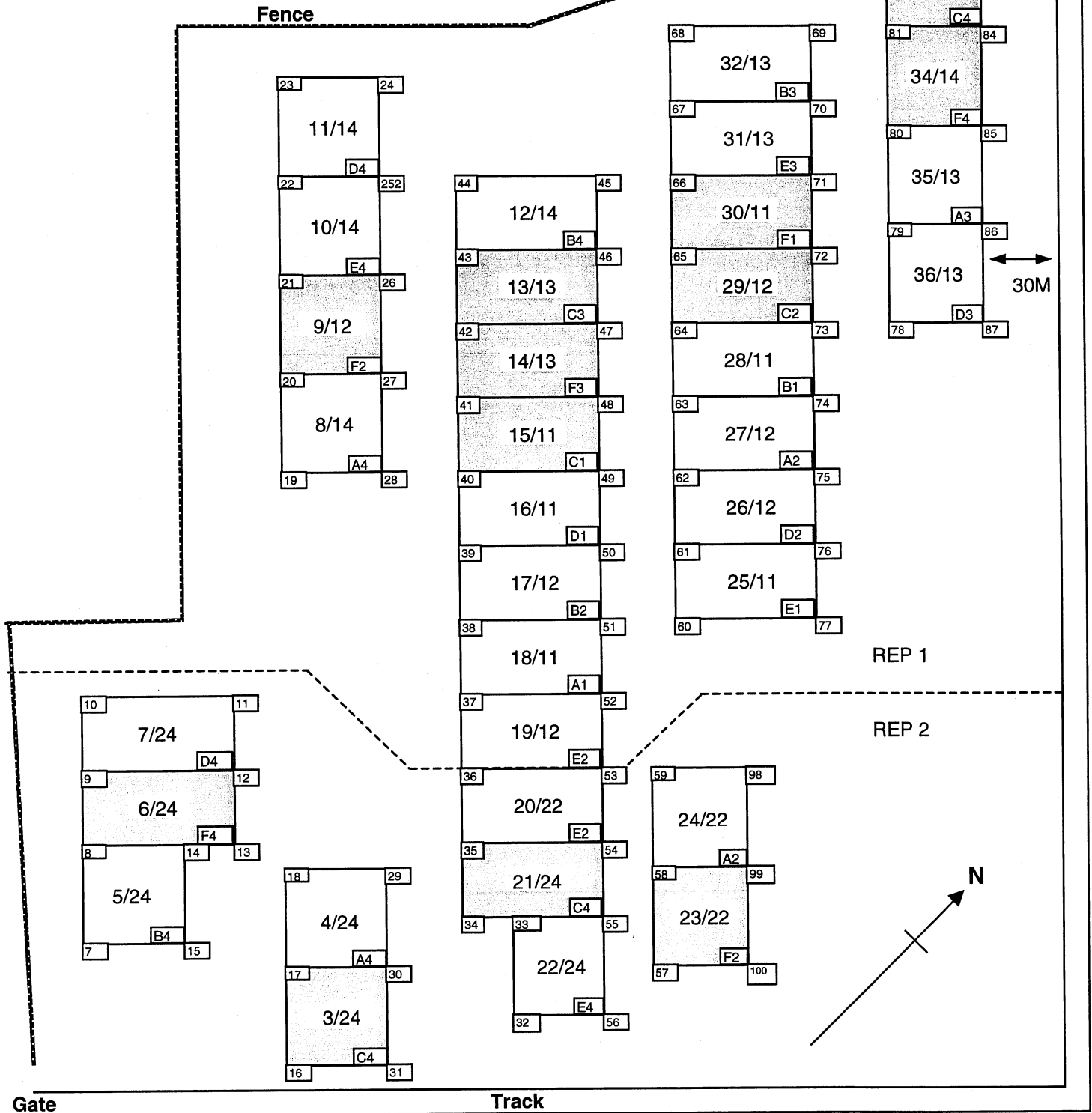
STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 78

Gwavas Forest

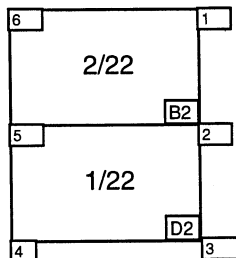
Compartment 59

Planted 1989



Treatments

- 1 = 500 Unpruned, Unthinned
- 2 = 500 to 200, Pruned
- 3 = 500 to 200, Late thin, pruned
- 4 = 500 to 400, Pruned



Seedlots

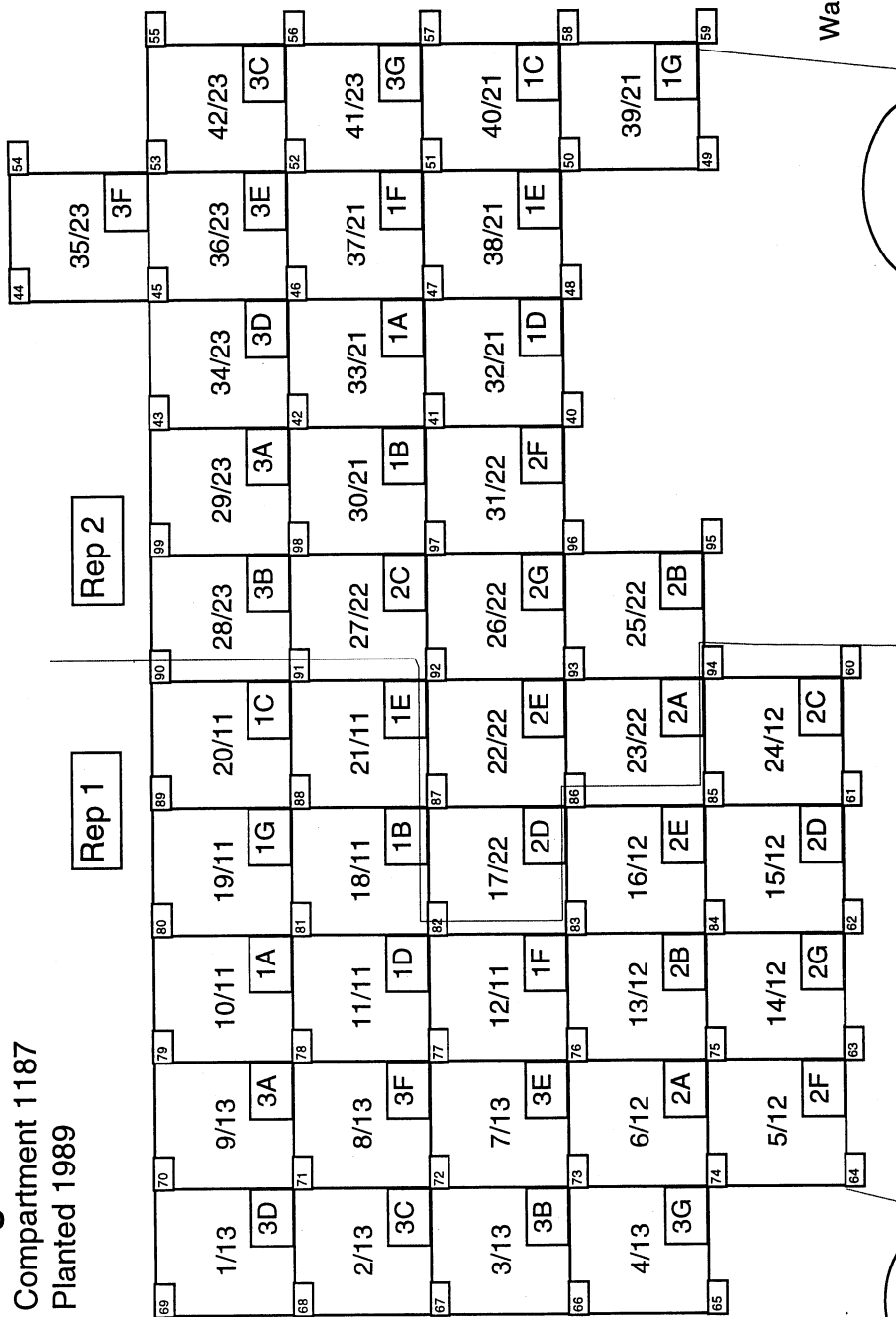
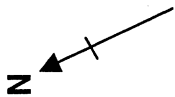
- A = GF2, Unimproved
- B = GF16, Open-grown seedlings
- C = GF25, Root trainer seedlings
- D = GF23, Open-grown cuttings
- E = GF25, Root trainer cuttings
- F = Direct field cuttings

**To main Kawerau Rd
10 kms to Whakatane
Highway**

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 85

Kaingaroa Forest
Compartment 1187
Planted 1989



Skid site

Vehicle track

Skid site

Walking track

To
Caves Road

Directions - take Wairapukau Rd, turn left into Caves Rd, follow this for approx 10 kms,
turn left down unmarked track opposite skid site on right.

STAND GROWTH MODELLING COOPERATIVE
Silviculture / Breed Trial

FR 86

Golden Downs Forest

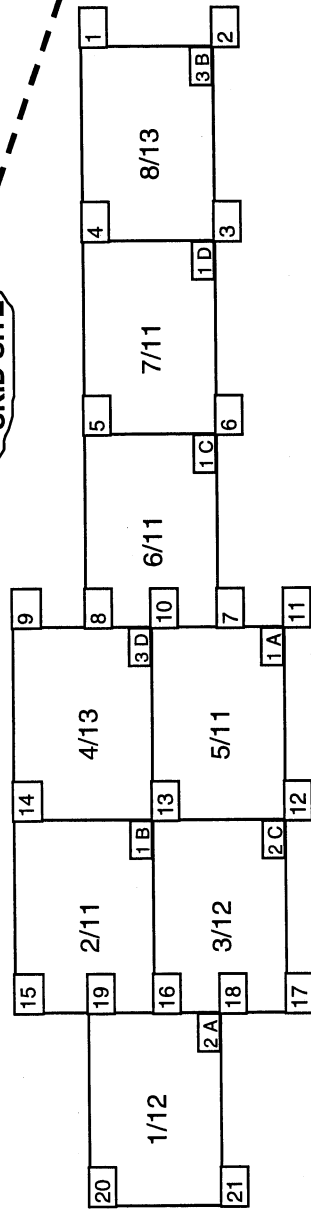
Compartment 112

Planted 1988

Seedlots
A = GF16, '268' seedlings
B = GF23, '268' seedlings
C = LI27(GF6), long internode
D = GF2, unimproved

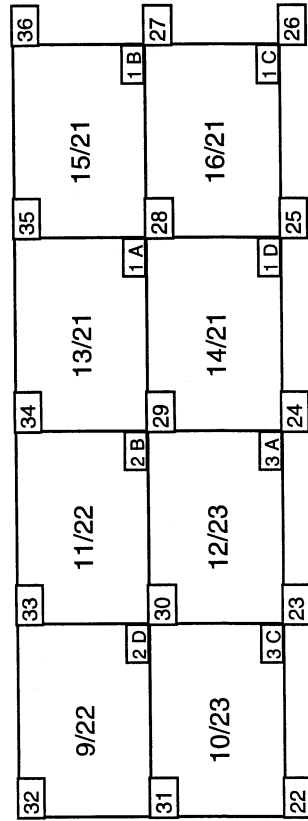
Treatments
1 = 667 to 250, pruned
2 = 667, unthinned, unpruned
3 = 667, unthinned, pruned

REP 1

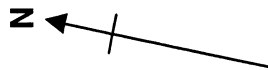


Gully & Stream

REP 2



Ridge

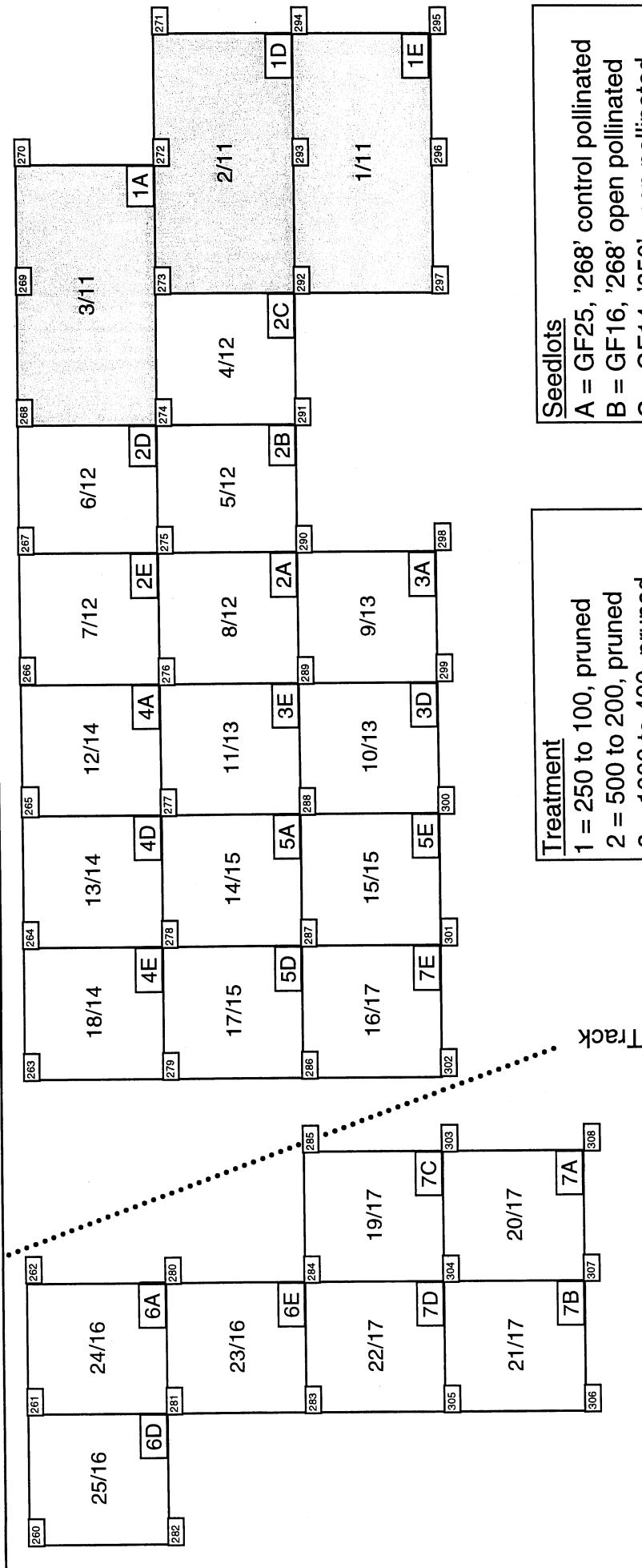


STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 121/1

Tungrove Forest
Compartment 3148
Planted 1990

To Zinnia Road



Treatment

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 400, unpruned
- 6 = 1000 to 600, unpruned
- 7 = 1000, unthin, unpruned

Seedlots

- A = GF25, '268' control pollinated
- B = GF16, '268' open pollinated
- C = GF14, '850' open pollinated
- D = GF7, climbing select
- E = GF13 (LI25), long internode

Plots abandoned



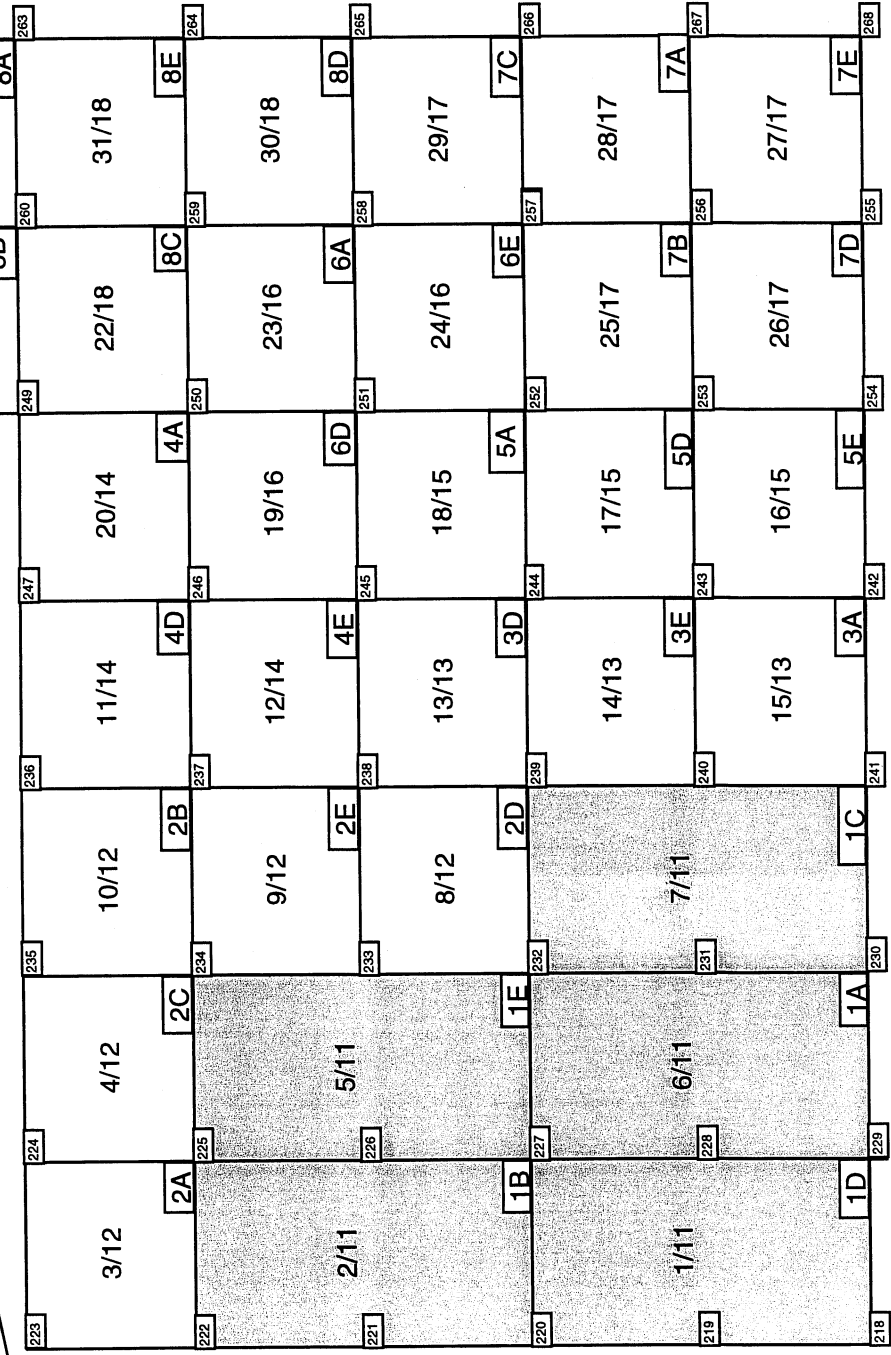
STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 121/2

Atiamuri Forest
Compartment 7316
Planted 1990

Hickory

Plots abandoned

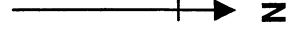


Seedlots

A = GF25, '268' control pollinated
B = GF16, '268' open pollinated
C = GF14, '850' open pollinated
D = GF7, climbing select
E = GF13 (LI25), long internode

Treatments

1 = 250 to 100, pruned
2 = 500 to 200, pruned
3 = 1000 to 400, pruned
4 = 500 to 200, unpruned
5 = 1000 to 400, unpruned
6 = 1000 to 600, unpruned
7 = 1000, unthin, unpruned
8 = 722 to 300, unpruned



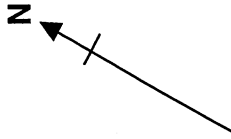
Cherry Road

FR 121/3

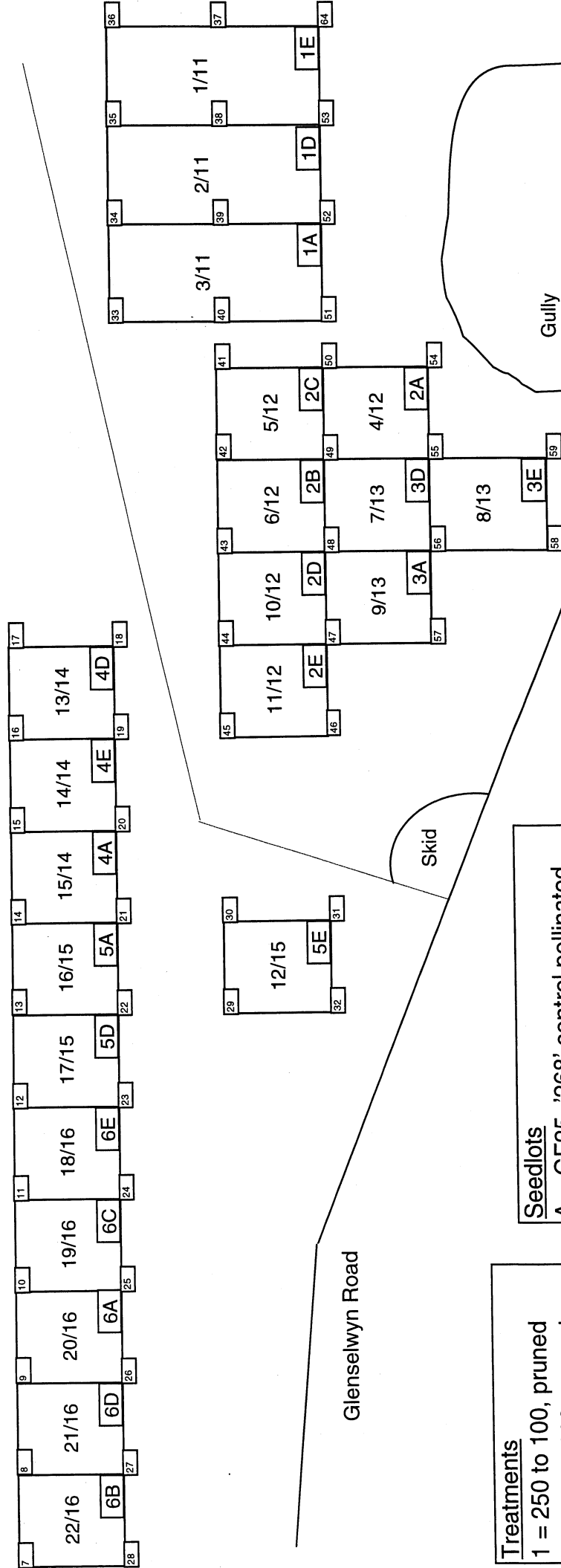
Gwavas Forest
Compartment 45
Planted 1990

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

Farmland



Fence



Treatments

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 600, unpruned
- 6 = 1000, unthin, unpruned

Seedlots

- A = GF25, '268' control pollinated
- B = GF16, '268' open pollinated
- C = GF14, '850' open pollinated
- D = GF7, climbing select
- E = GF13 (LI25), long internode

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 121/4

Tairua Forest

Compartment 120

Planted 1990

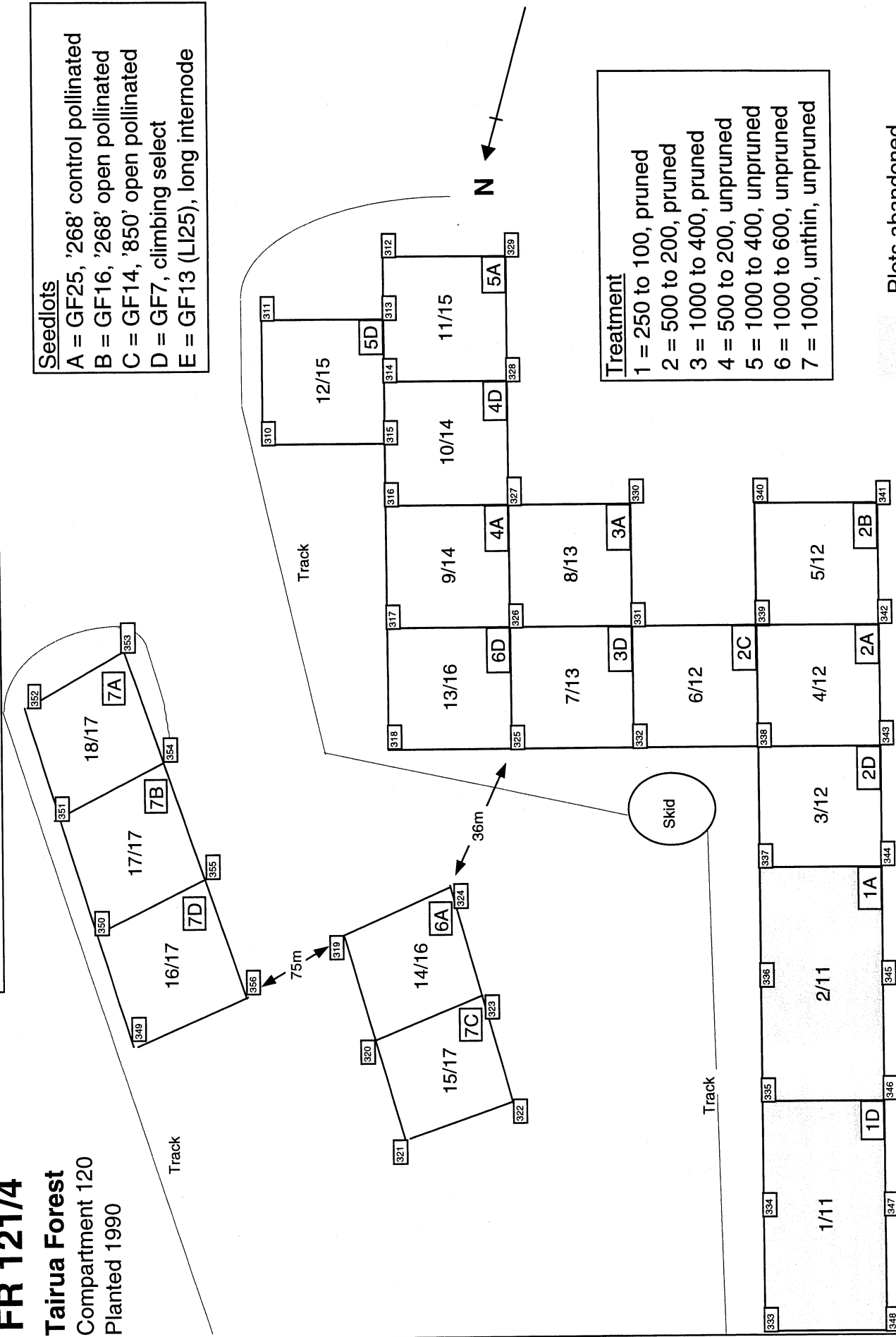
Seedlots

- A = GF25, '268' control pollinated
- B = GF16, '268' open pollinated
- C = GF14, '850' open pollinated
- D = GF7, climbing select
- E = GF13 (LI25), long internode

Treatment

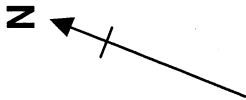
- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 400, unpruned
- 6 = 1000 to 600, unpruned
- 7 = 1000, unthin, unpruned

Plots abandoned

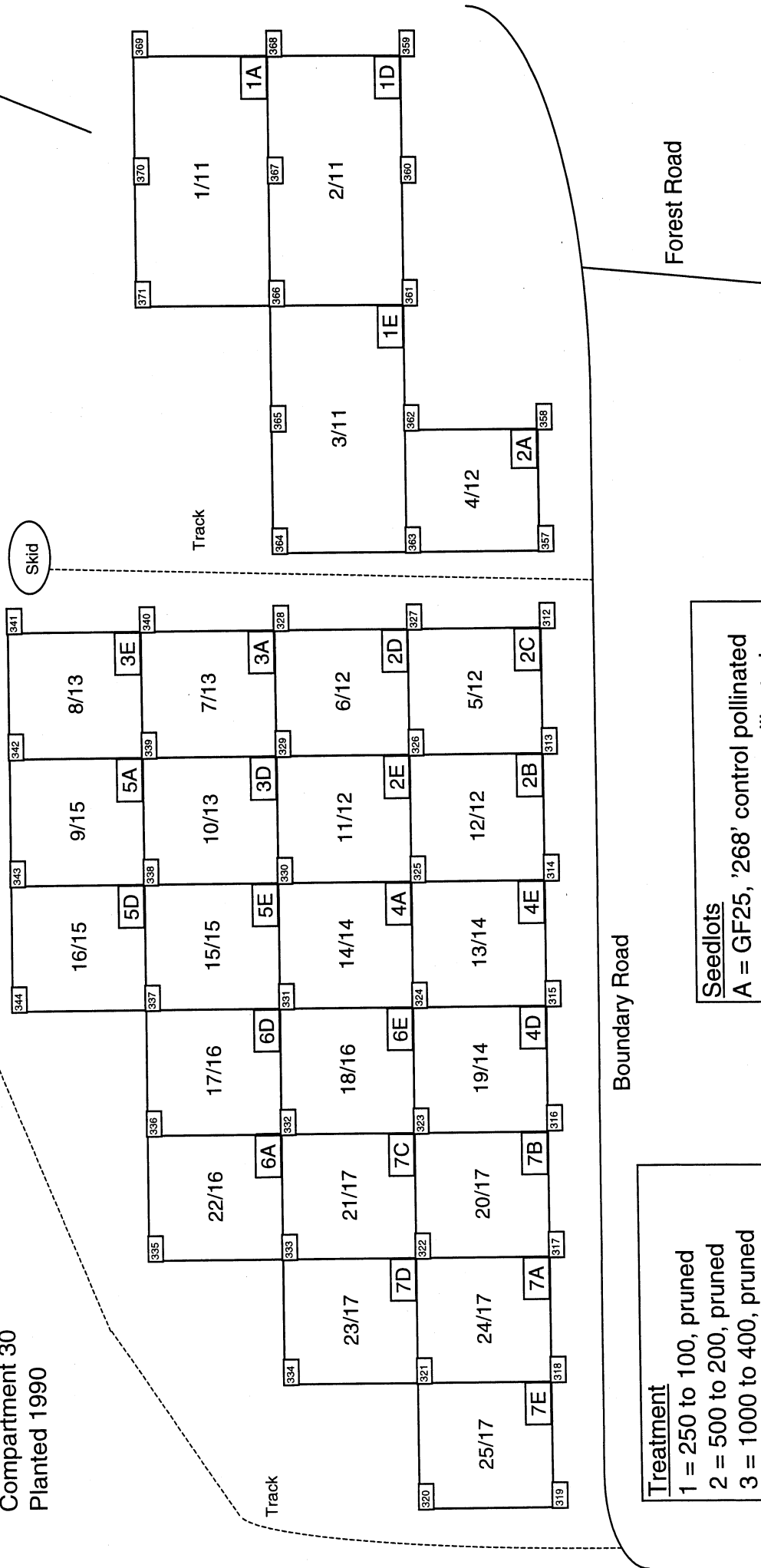


State Highway 25 To Whangamata

STAND GROWTH MODELLING COOPERATIVE
Silviculture / Breed Trial



FR 121/6
Tarawera Forest
 Compartment 30
 Planted 1990



Treatment
 1 = 250 to 100, pruned
 2 = 500 to 200, pruned
 3 = 1000 to 400, pruned
 4 = 500 to 200, unpruned
 5 = 1000 to 400, unpruned
 6 = 1000 to 600, unpruned
 7 = 1000, unthin, unpruned

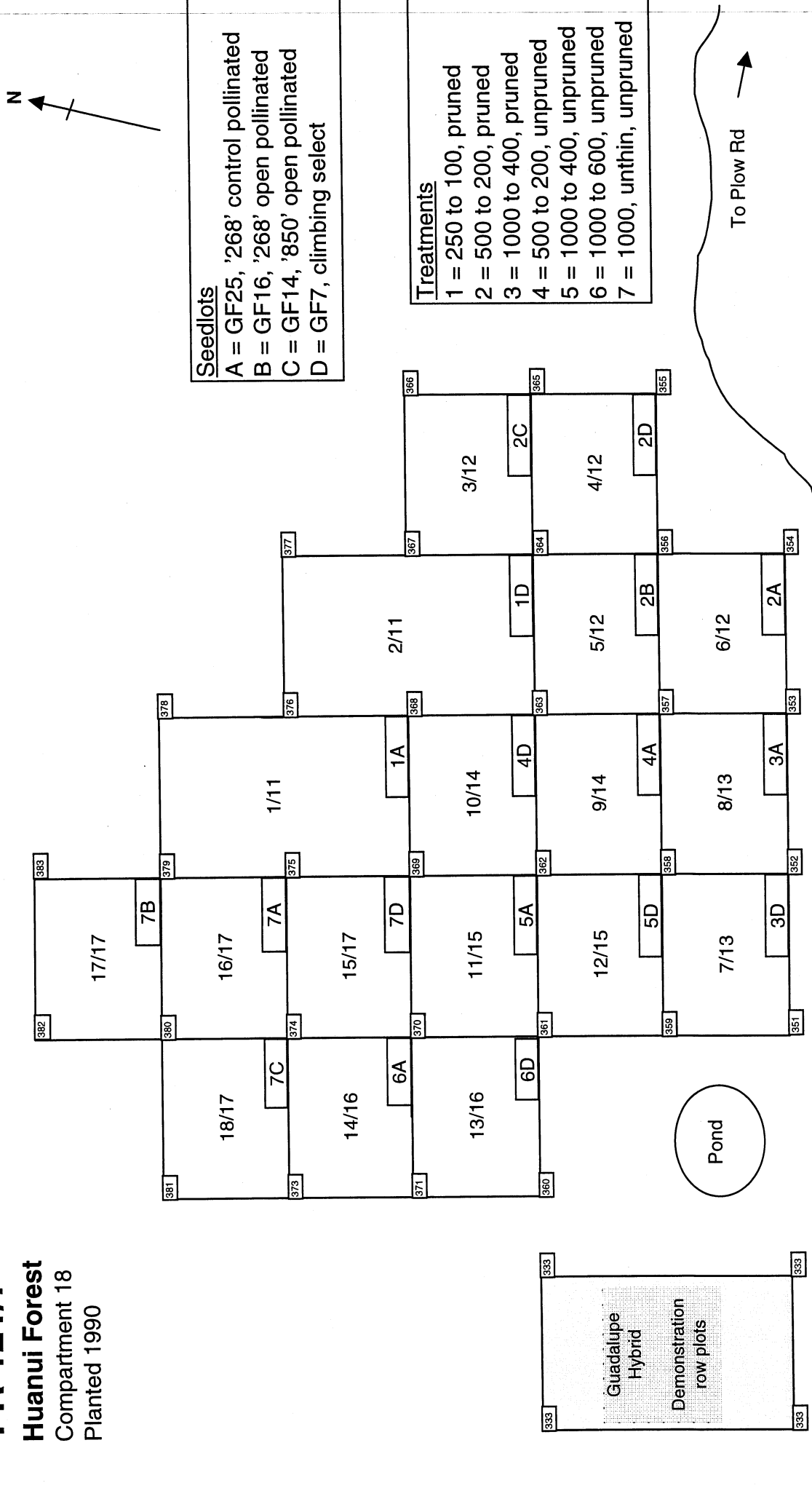
Seedlots
 A = GF25, '268' control pollinated
 B = GF16, '268' open pollinated
 C = GF14, '850' open pollinated
 D = GF7, climbing select
 E = GF13 (LI25), long internode

FR 121/7

Huanui Forest

Compartment 18
Planted 1990

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial



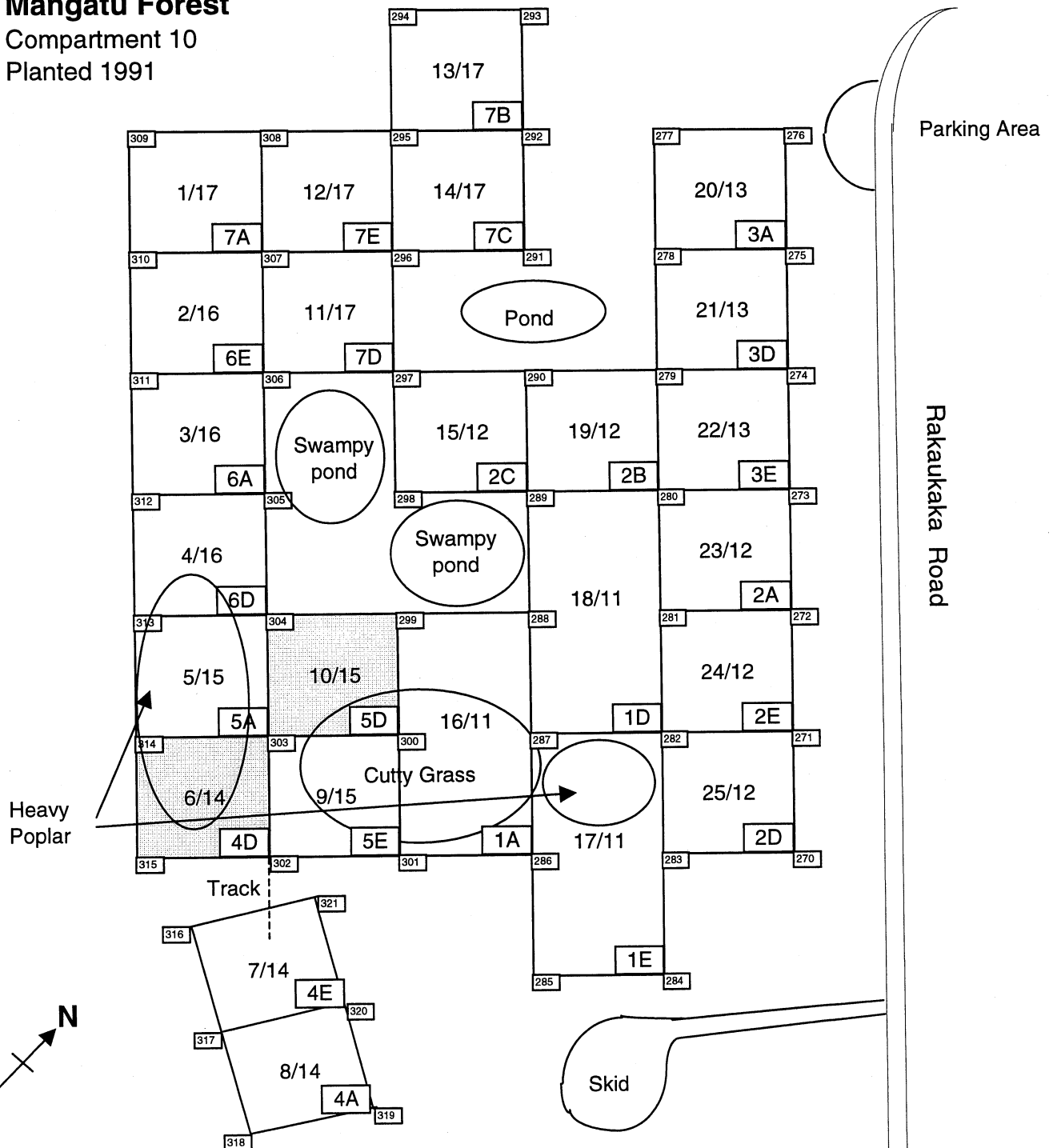
STAND GROWTH MODELLING COOPERATIVE
Silviculture / Breed Trial

FR 121/8

Mangatu Forest

Compartment 10

Planted 1991



Treatment

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 400, unpruned
- 6 = 1000 to 600, unpruned
- 7 = 1000, unthin, unpruned

Seedlots

- A = GF25, '268' control pollinated
- B = GF16, '268' open pollinated
- C = GF14, '850' open pollinated
- D = GF6, climbing select
- E = GF13 (LI25), long internode



No PSP plots established

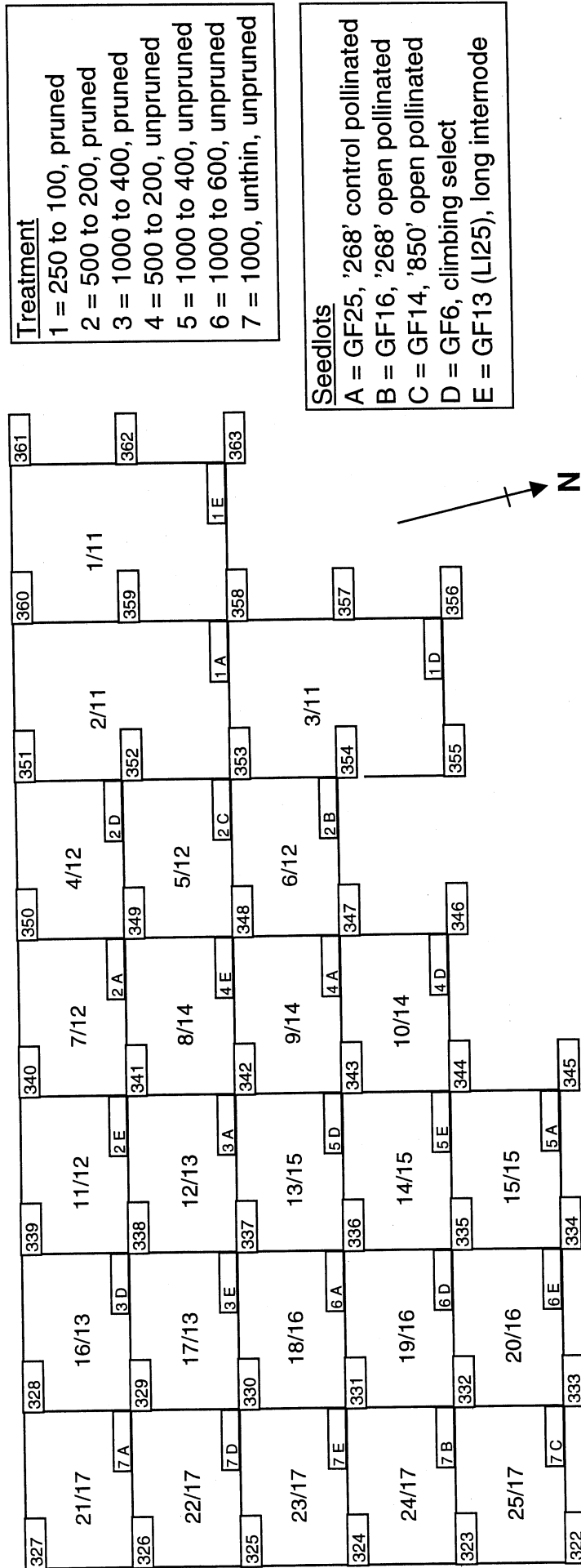
STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 121/9

Santoft Forest

Compartment 108

Planted 1991



500m to junction of Inland and No.30 Rds

STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 121/10

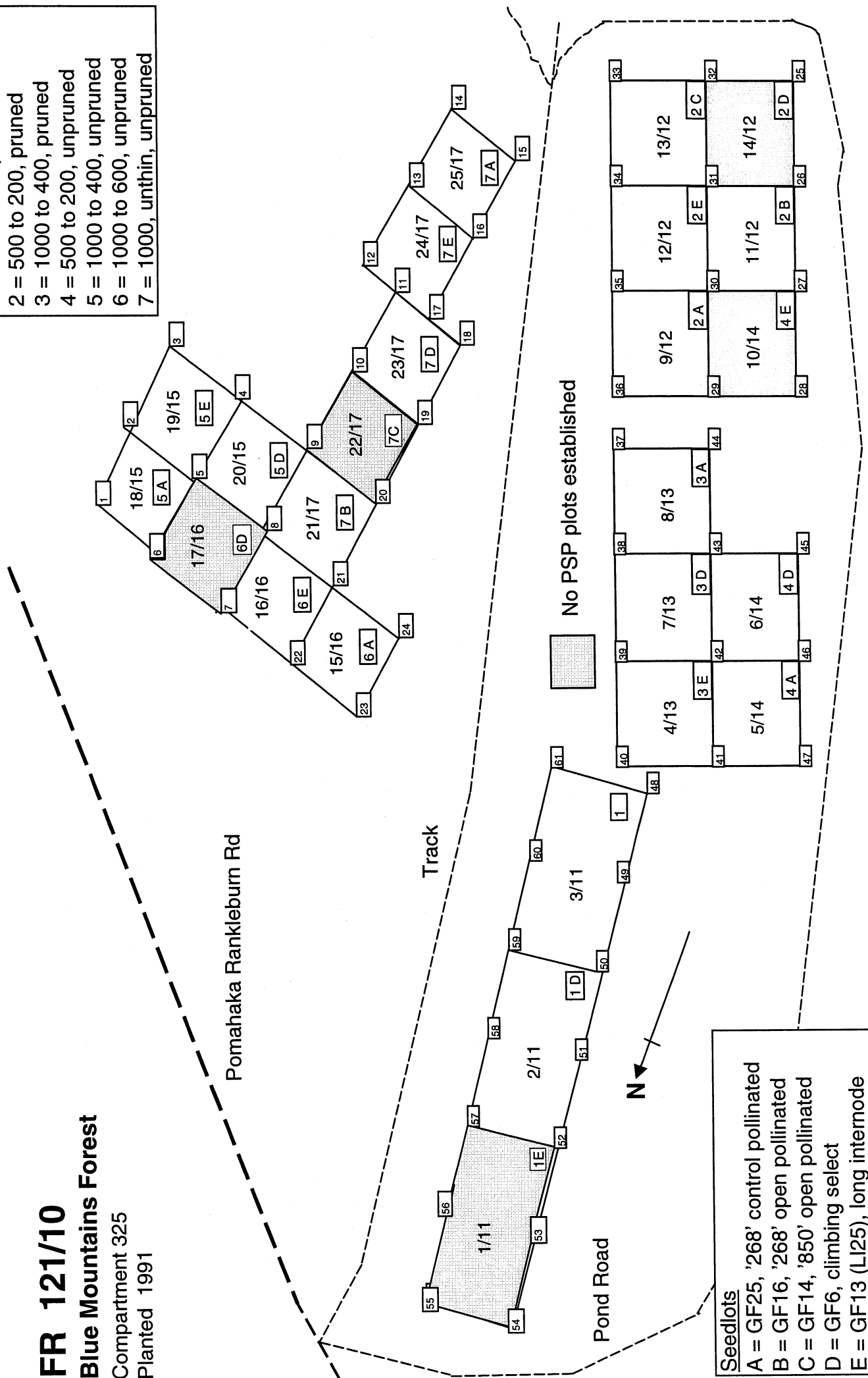
Blue Mountains Forest

Compartment 325

Planted 1991

Treatment

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 400, unpruned
- 6 = 1000 to 600, unpruned
- 7 = 1000, unthin, unpruned



STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

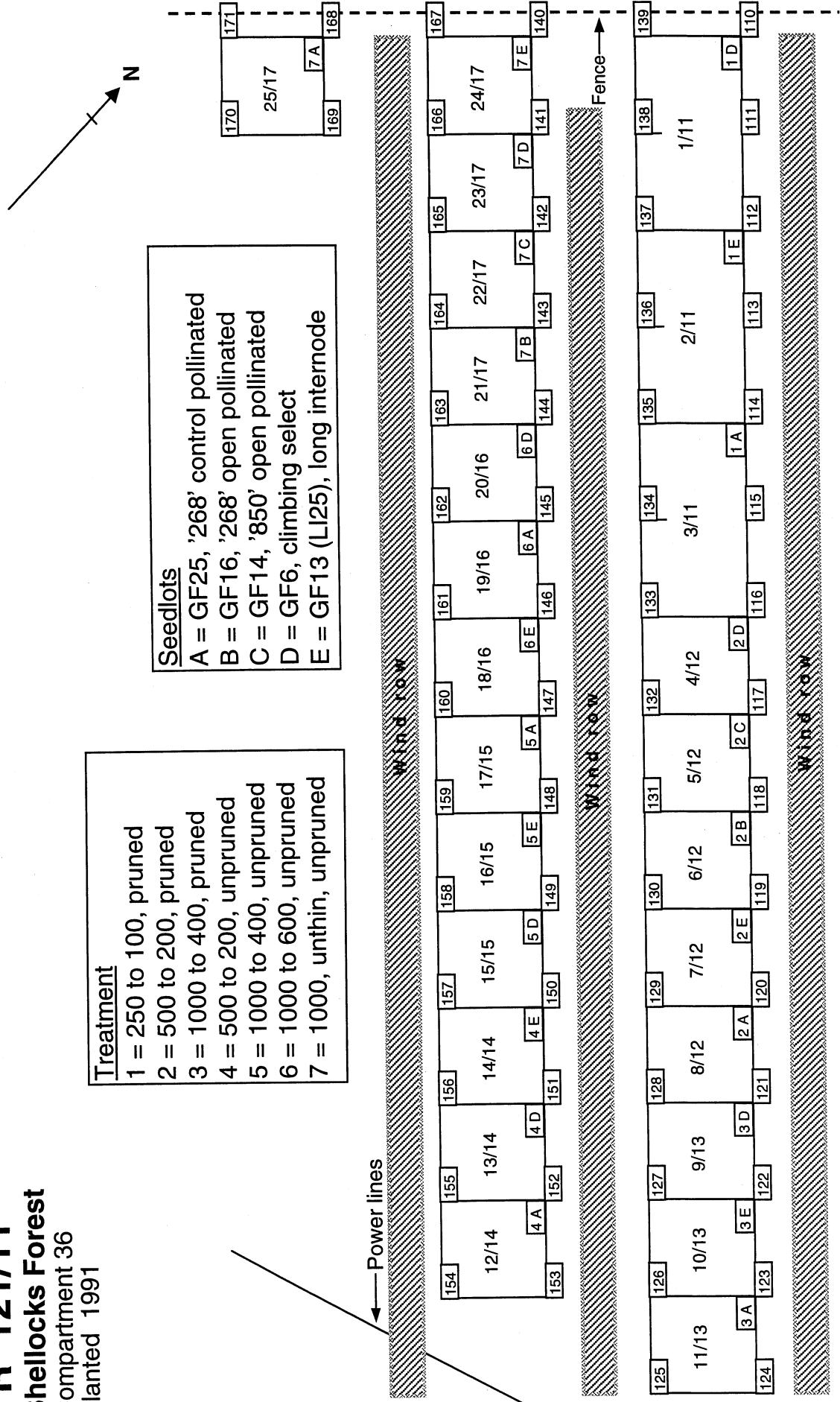
FR 121/11
Shellocks Forest
 Compartment 36
 Planted 1991

Treatment

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 400, unpruned
- 6 = 1000 to 600, unpruned
- 7 = 1000, unthin, unpruned

Seedlots

- A = GF25, '268' control pollinated
- B = GF16, '268' open pollinated
- C = GF14, '850' open pollinated
- D = GF6, climbing select
- E = GF13 (LI25), long internode



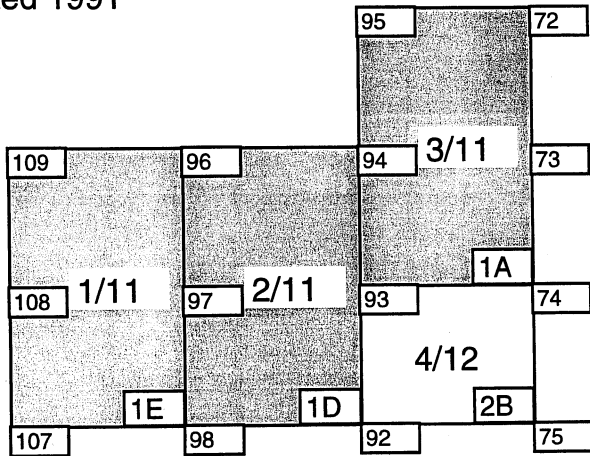
STAND GROWTH MODELLING COOPERATIVE
Silviculture / Breed Trial

FR 121/12

Ashley Forest

Compartment 19

Planted 1991

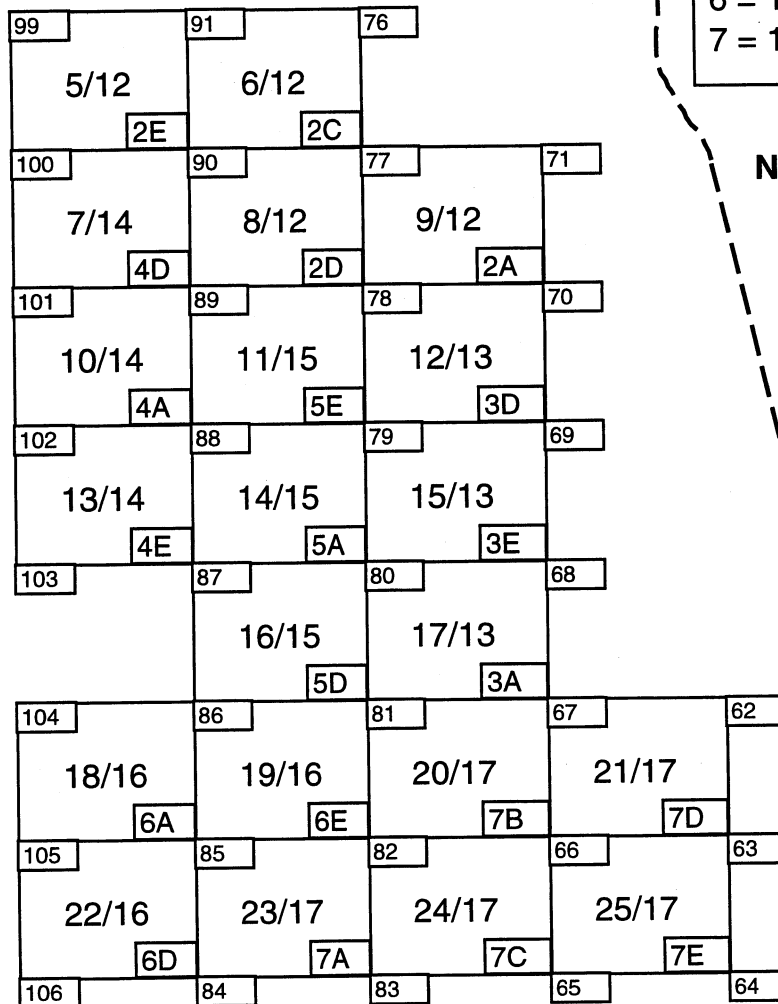


Seedlots

A = GF25, '268' control pollinated
 B = GF16, '268' open pollinated
 C = GF14, '850' open pollinated
 D = GF6, climbing select
 E = GF13 (LI25), long internode

Treatment

1 = 250 to 100, pruned
 2 = 500 to 200, pruned
 3 = 1000 to 400, pruned
 4 = 500 to 200, unpruned
 5 = 1000 to 400, unpruned
 6 = 1000 to 600, unpruned
 7 = 1000, unthin, unpruned



N

Victory Rd



No PSP plots established

FR 121/13

Golden Downs Forest

C compartment 133

Planted 1991

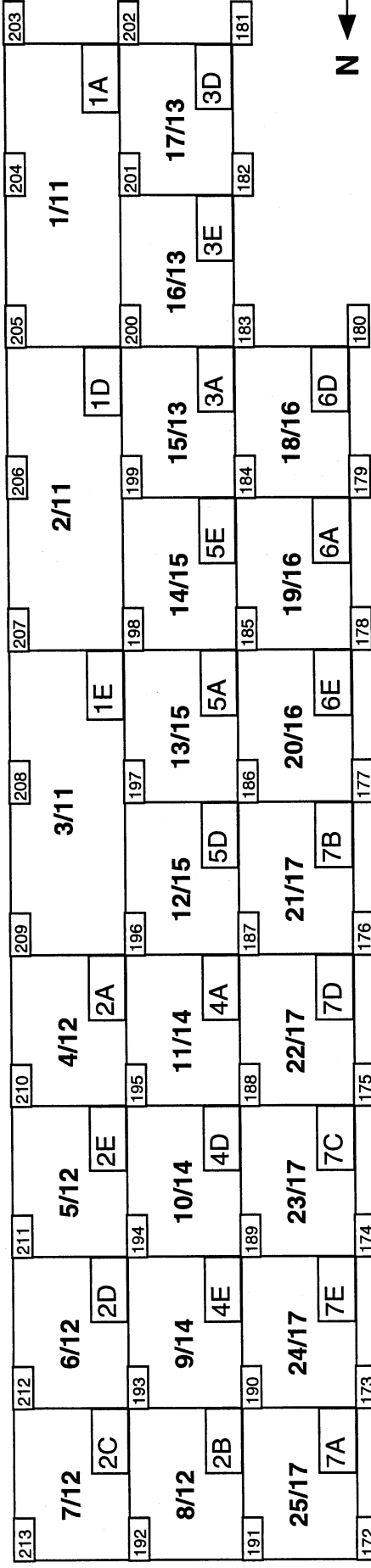
STAND GROWTH MODELLING COOPERATIVE
Silviculture / Breed Trial

SKID

To Stanley Brook Rd 73

SKID

20



Treatment

- 1 = 250 to 100, pruned
- 2 = 500 to 200, pruned
- 3 = 1000 to 400, pruned
- 4 = 500 to 200, unpruned
- 5 = 1000 to 400, unpruned
- 6 = 1000 to 600, unpruned
- 7 = 1000, unthin, unpruned

Seedlots

- A = GF25, '268' control pollinated
- B = GF16, '268' open pollinated
- C = GF14, '850' open pollinated
- D = GF6, climbing select
- E = GF13 (LI25), long internode

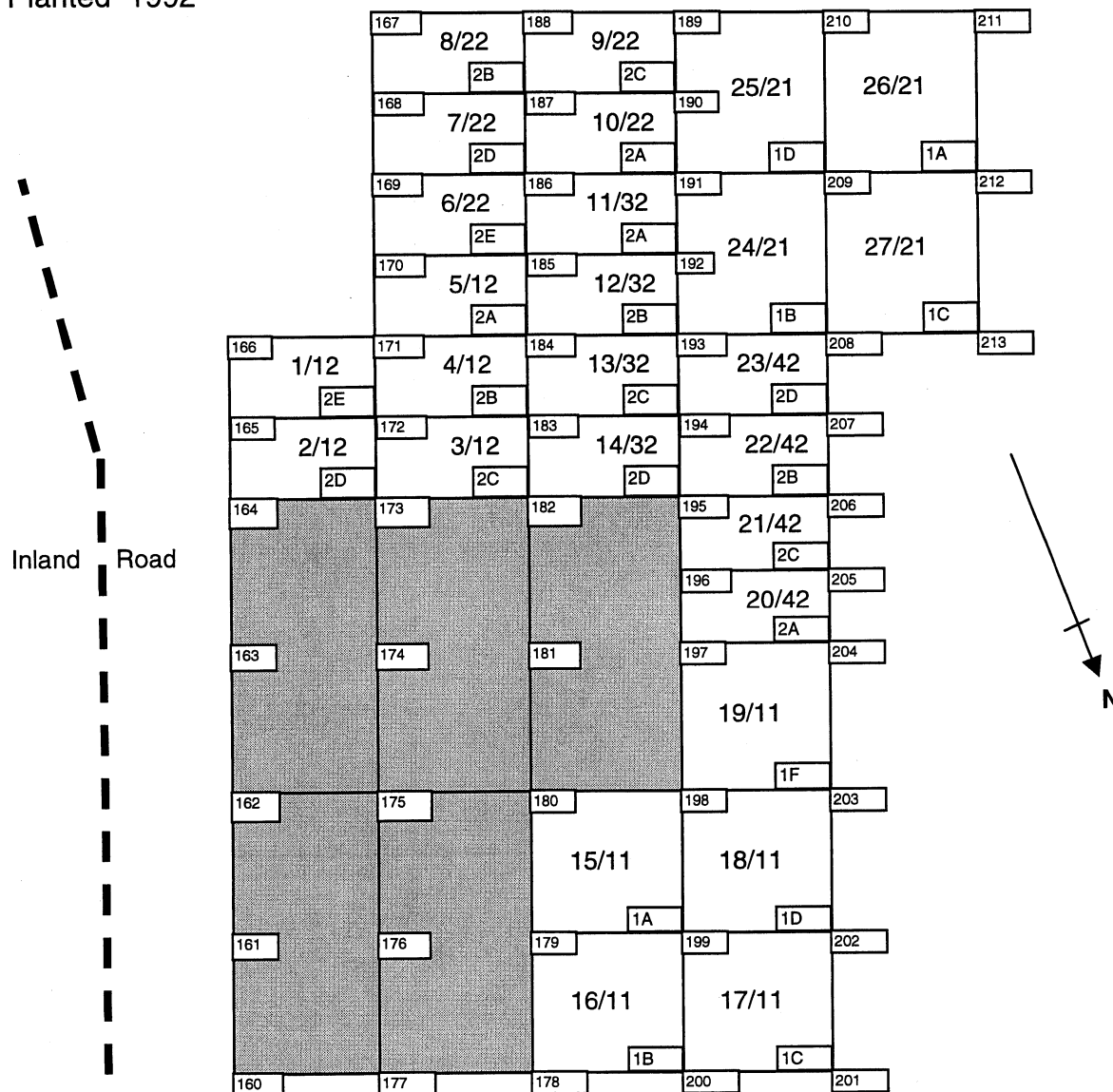
STAND GROWTH MODELLING COOPERATIVE Special-Purpose Breeds Trial

FR 172/1

Woodhill Forest

Compartment 36

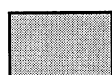
Planted 1992



1992 Female Tester Trial FR 170/1

Treatment

1 = 500, unthinned, unpruned
2 = 1000 to 400, pruned



No PSP plots established

Seedlots

A = GF27, highly multinodal
B = GF13 (LI25), long internode
C = GF18, high wood density
D = GF28, low wood density
E = GF14, Gwavas seed orchard
F = GF7, climbing select

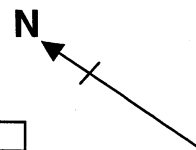
STAND GROWTH MODELLING COOPERATIVE
Special-Purpose Breeds Trial

FR 172/3

Kaingaroa Forest

Compartment 1276

Planted 1992



Treatment

1 = 500, unthinned, unpruned

2 = 1000 to 400, pruned

Seedlots

A = GF27, highly multinodal

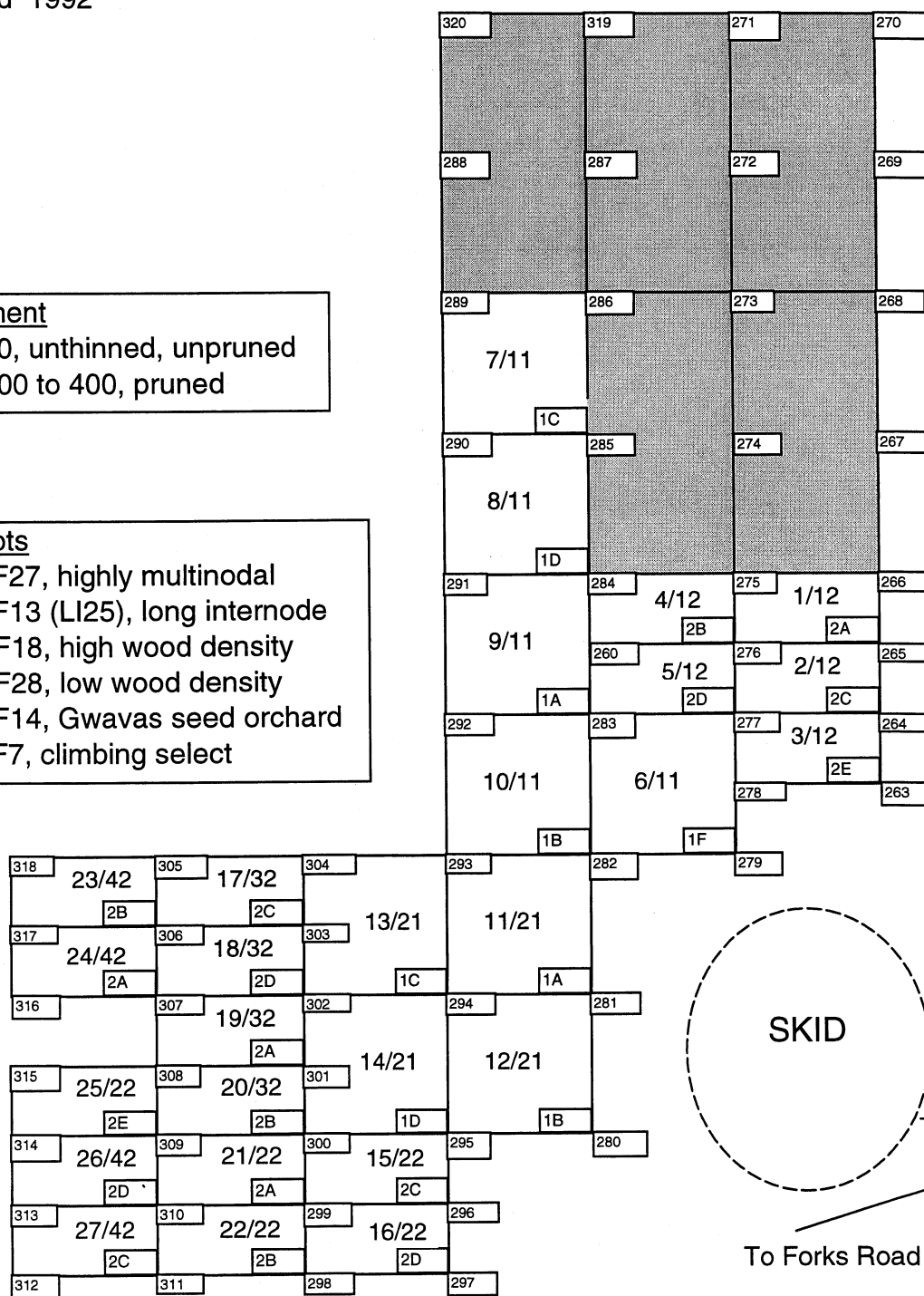
B = GF13 (LI25), long internode

C = GF18, high wood density

D = GF28, low wood density

E = GF14, Gwavas seed orchard

F = GF7, climbing select



No PSP plots established

To Forks Road off Bonish Rd

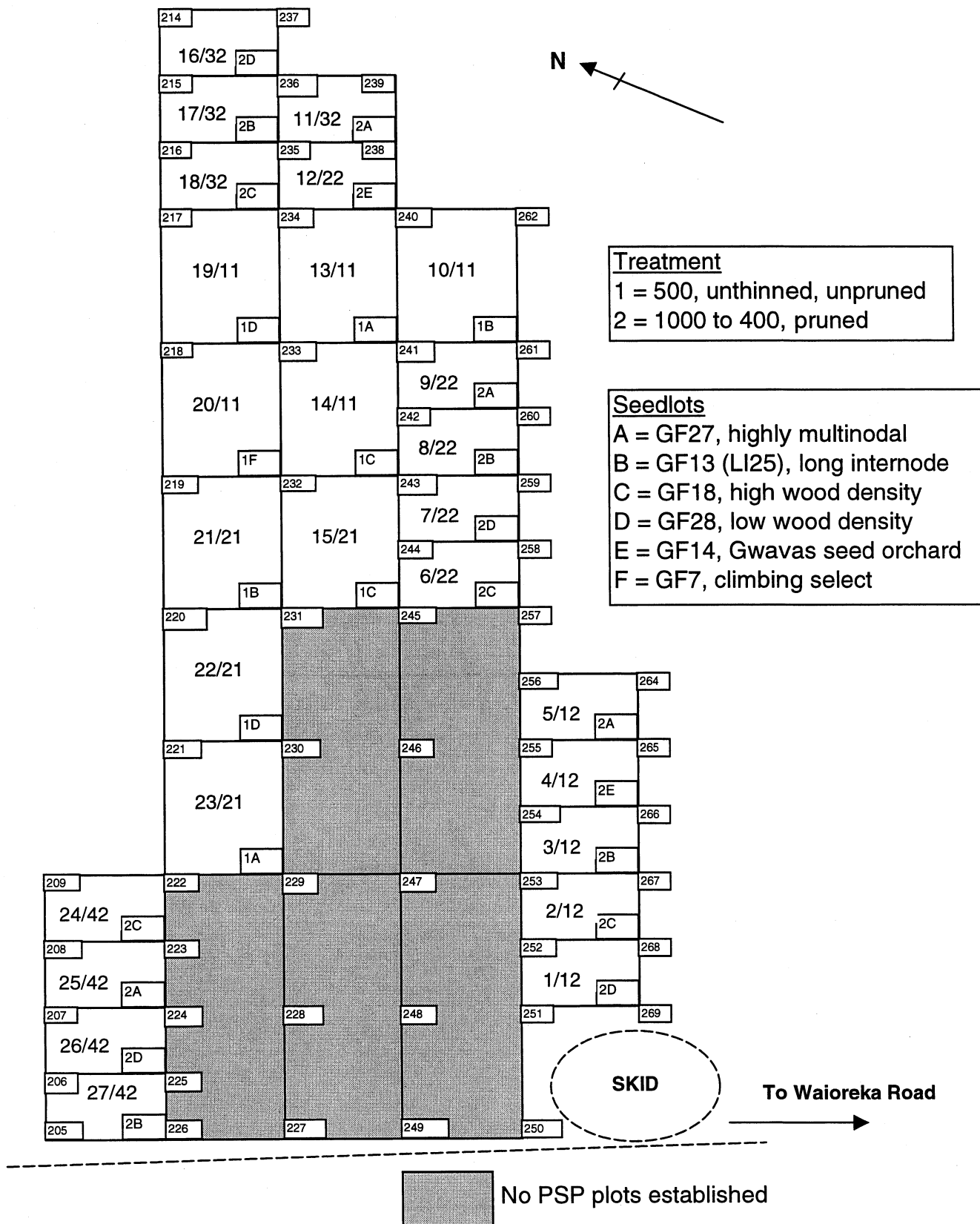
STAND GROWTH MODELLING COOPERATIVE Special Purpose Breeds Trial

FR 172/4

Kinleith Forest

Compartment 6216

Planted 1992



STAND GROWTH MODELLING COOPERATIVE
Special-Purpose Breeds Trial

FR 172/5

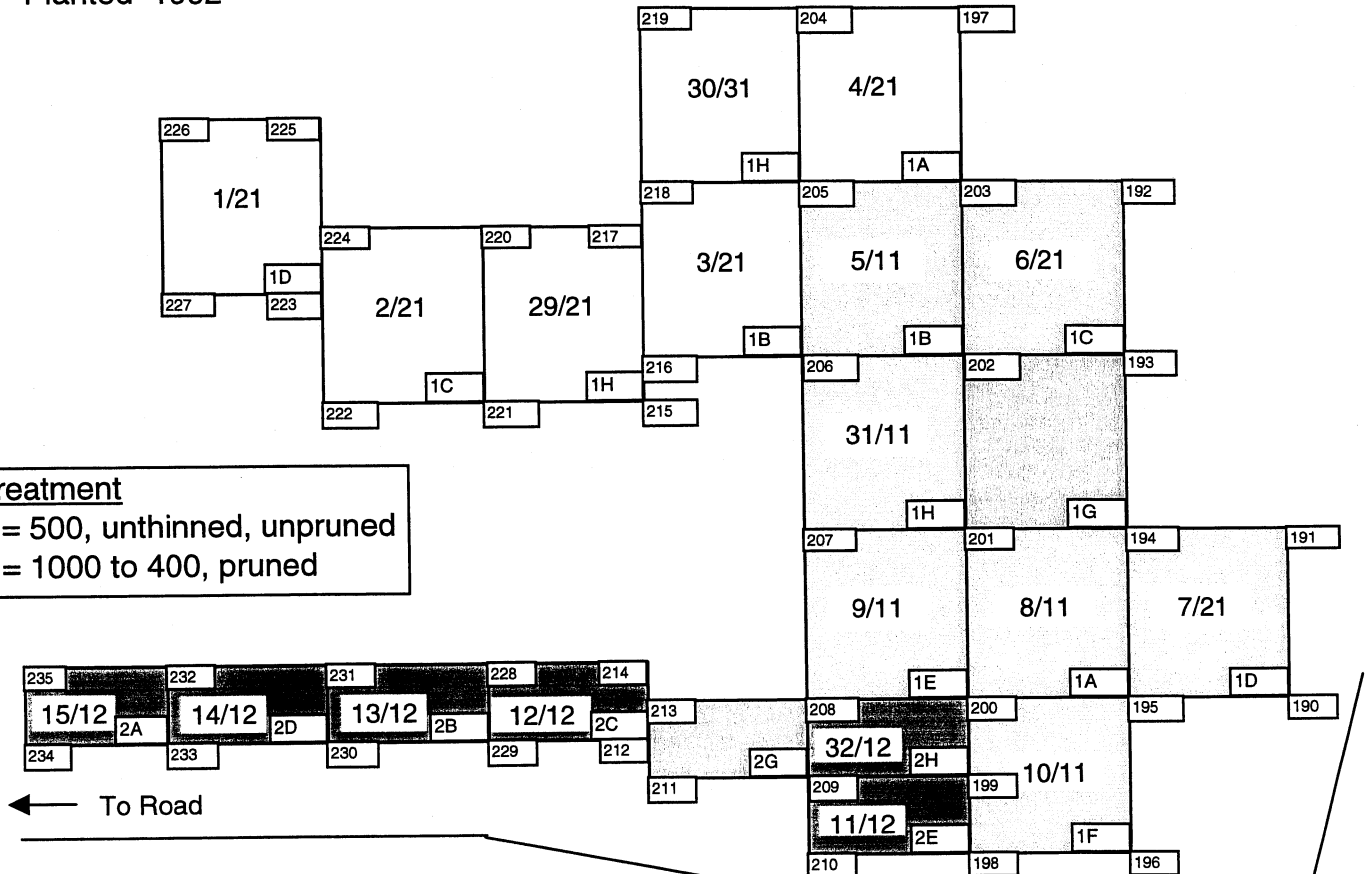
Takitoa Forest

Compartment 5

Planted 1992

Treatment

1 = 500, unthinned, unpruned
 2 = 1000 to 400, pruned



Seedlots

A = GF27, highly multinodal
 B = GF13 (LI25), long internode
 C = GF18, high wood density
 D = GF28, low wood density
 E = GF14, Gwavas seed orchard
 F = GF7, climbing select
 H = GF17, local seedlot



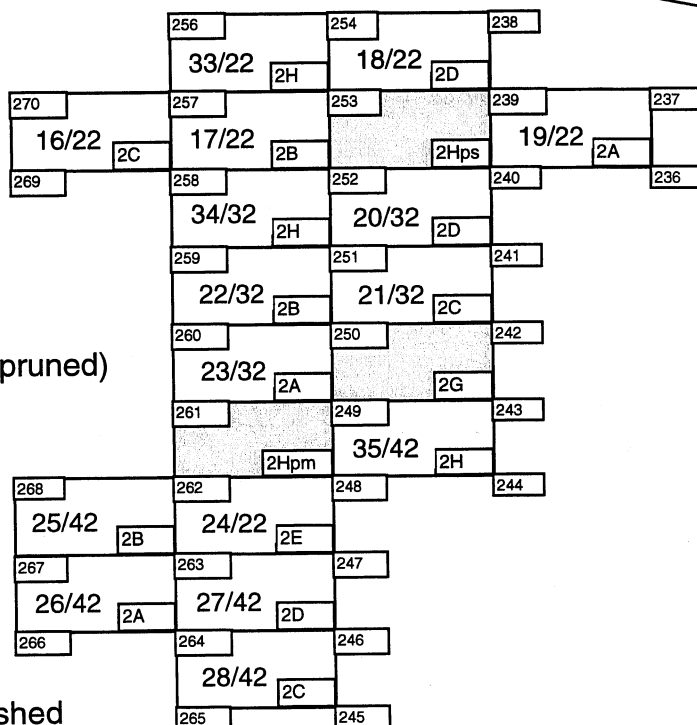
Unthinned, pruned (trt 1 unpruned)



Pruned early in 1998



Additional plots not established



**STAND GROWTH MODELLING COOPERATIVE
Special-Purpose Breeds Trial**

FR 172/6

Otago Coast Forest

Compartment 11

Planted 1992

Margaret Rd

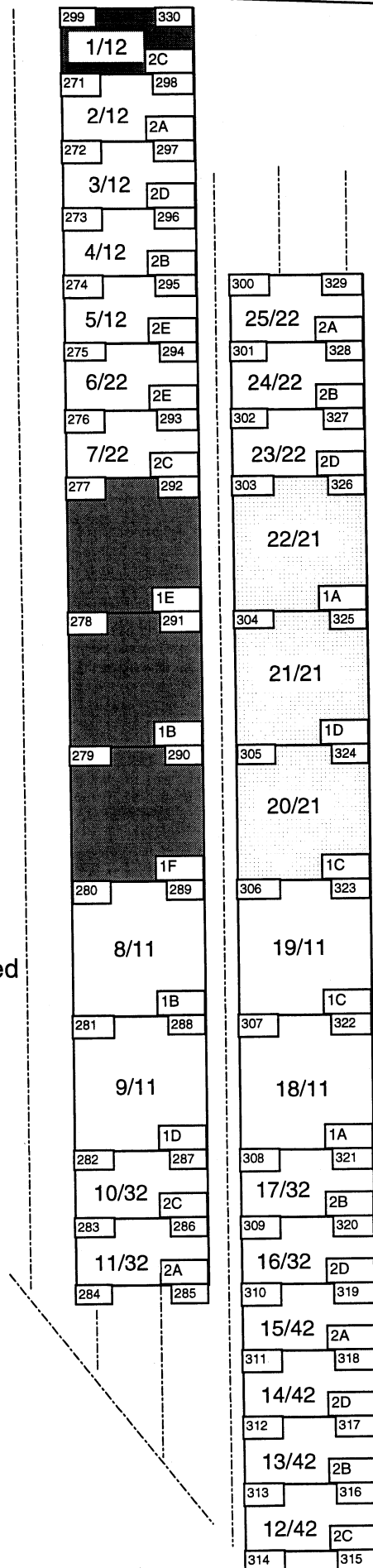
Seedlots

A = GF27, highly multinodal
B = GF13 (LI25), long internode
C = GF18, high wood density
D = GF28, low wood density
E = GF14, Gwavas seed orchard
F = GF7, climbing select

Treatment

1 = 500, unthinned, unpruned
2 = 1000 to 400, pruned

-  Thinned to 500, pruned
Should be thinned to 400, pruned
-  Unthinned, pruned
Should be unpruned
-  No PSP plots established



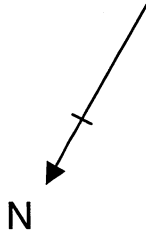
STAND GROWTH MODELLING COOPERATIVE
Special-Purpose Breeds Trial

FR 215/1

Kaingaroa Forest

Compartment 1284

Planted 1994

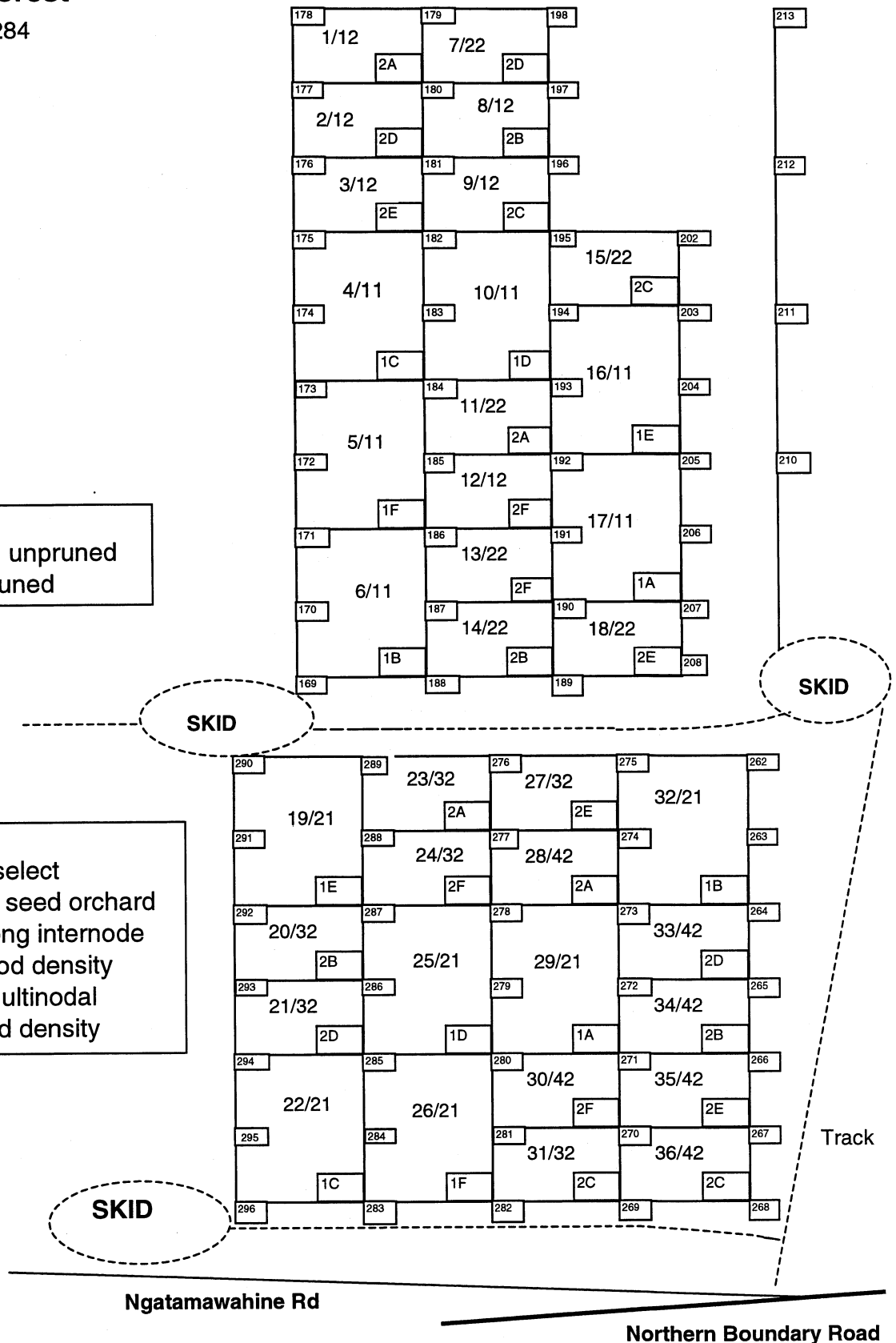


Treatment

1 = 500, unthinned, unpruned
 2 = 1000 to 400, pruned

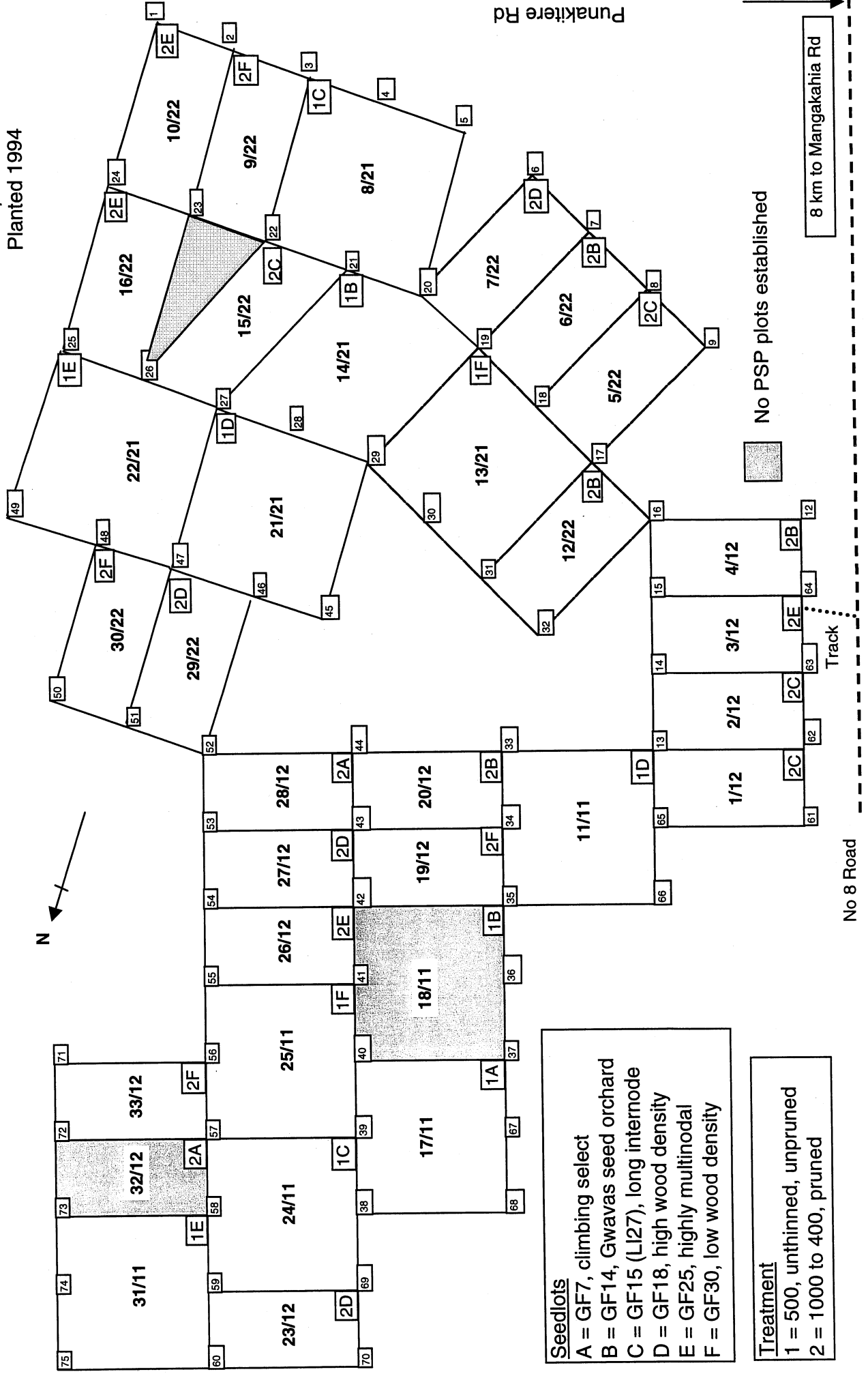
Seedlots

A = GF7, climbing select
 B = GF14, Gwavas seed orchard
 C = GF15 (LI27), long internode
 D = GF18, high wood density
 E = GF25, highly multinodal
 F = GF30, low wood density



STAND GROWTH MODELLING COOPERATIVE Special-Purpose Breeds Trial

FR 215/2
Rakautao Forest
Compartment 18
Planted 1994



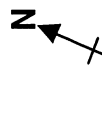
STAND GROWTH MODELLING COOPERATIVE Silviculture / Breed Trial

FR 215/3

Tokoiti Forest

Compartment 41

Planted 1994



Glenledi Road

Stream

Seedlots

- A = GF7, climbing select
- B = GF14, Gwavas seed orchard
- C = GF15 (LI27), long internode
- D = GF18, high wood density
- E = GF25, highly multinodal
- F = GF30, low wood density

Treatment

- 1 = 500, unthinned, unpruned
- 2 = 1000 to 400, pruned

