

Coast Redwood silviculture trials – installation report

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Plantation Management Cooperative

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PLANTATION MANAGEMENT COOPERATIVE

EXECUTIVE SUMMARY

COAST REDWOOD SILVICULTURE TRIALS — INSTALLATION REPORT

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Three replicated final crop stocking trials and a replicated pruning response trial and have been installed across a range of sites to measure the response to silviculture management on the growth and quality of Coast Redwood (*Sequoia sempervirens*).

Where possible trials were installed in young to mid rotation aged stands of sufficient size on a range of site quality. The location of each trial is summarised in the following table.

Expt No	Location	Forest Owner	Plant year	Trial purpose	Date Installed
FR 453/9	Waiotapu, CNI	Kaingaroa Timberlands Ltd	1982	Final Crop Stocking	July 2004
FR 453/6	Otago Coast Otago	Wenita Forest Products	1986	Final Crop Stocking	August 2004
FR 453/8	Mangatu, East Coast	Ernslaw One Ltd	1978	Final Crop Stocking	April 2004
FR 475	Tutira, Hawkes Bay	R. Doust	1998	Pruning, Final Crop Stocking	Dec 2003

Final crop stocking treatments of 350, 500 and 650 stems/ha have been applied at all four sites. Each treatment is replicated twice at each site.

At the Tutira site, in conjunction with the New Zealand Redwood company (formally JPS), a pruning trial incorporating three intensities of pruning determined by stem diameter gauge including: unpruned, pruning to 9.0 cm calliper diameter and pruning to a 5.5 cm calliper diameter has been installed. Permanent sample plots have been installed in all treatments and the data stored on the Ensis Forests PSP system.

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INTRODUCTION

Californian coastal redwood *Sequoia sempervirens* has proved to grow well in New Zealand when correct siting and establishment practices are attended to. Until recently PSP data was limited to only three plots. However these data show that on good sites site indices are equal to or better than most California sites and mean annual increments' in excess of 30 m³/ha/year can be routinely achieved.

Although not commonly used in New Zealand, there is a strong traditional demand for Redwood timber in California. This demand is met with the harvest of Redwood from second growth stands that yield significant amounts of clear heart timber. In the Californian market, these clear grades attract a large premium over unpruned 'tight knot' grades, which in turn are more valued than timber with bark-encased knots. As access to natural stands in the USA is restricted the potential for an export market to develop for New Zealand plantation grown Redwood is considerable. In order to properly evaluate the economics of growing Redwood in New Zealand a model sensitive to site and silviculture must be fitted to enable managers to create reliable yield tables.

A search for existing Redwood stands has revealed that as at 1992 there was some 400 hectares of coastal redwood growing in New Zealand. Most of this is located on ex New Zealand Forest Service estate. Many stands were in excess of 70 years old and of limited area or planted in mixture with other species, often because of supposed initial failure at establishment of the Redwood. However there are several stands totalling some 70 ha area in the 20 – 30 year old age range. As rotation ages for Redwood plantations are expected to be in the 30 – 40 year range a final crop stocking trial installed in the younger of these will allow measurement of thinning response at a range of final crop stockings.

METHOD

PART 1. FINAL CROP STOCKING TRIALS

In order to establish site differences four trials have been installed across a wide range of geographic locations, soil types, and climatic zones. The four sites selected are listed in table 1.

Table 1. Trial sites

Expt No	Site	Region	Plant year	Cpt No / (area ha)
FR 475	Tutira	Hawkes Bay	1998	1/(3.2)
FR 453/6	Otago Coast	Otago	1986	44 (2.1)
FR 453/8	Mangatu	East Coast	1978	98/(58.6)
FR 453/9	Waiotapu	CNI	1982	3.1/(7.1)

Two replications of three stocking treatments are installed along with an unthinned control. Final crop stockings tested are 650, 500 and 350 stems/ha.

Plots will be re-measured in the winter immediately following plot installation and then biannually for 12 years after which remeasurement frequency maybe reviewed. All data will be entered and stored on the Ensis Forests Permanent Sample Plot (PSP) System.

The unthinned control plot is a 0.0400 ha circular bounded plot, whilst the 650, 500 and 350 stems/ha treatments have 0.0500 ha circular plots.

Details of individual trial sites follow.

FR 475 Tutira

Trial location (NZMG):	Near Lake Tutira, Northern Hawkes Bay 2845615 m East, 6211081 m North
Owner	Mr Richard Doust Email: rdoust_tf@comcast.net
Manager	Roger Dickie (NZ) Ltd
Contact person	Steve Bell Ph 025 433 889 Email: grl.napier@clear.net.nz
Soil type	Taupo ash over marine sediments
Geology:	Rich fossiliferous sands, silts, limestone and conglomerate
Rainfall:	
Stand details	Planted 1998 Initial stocking: 1300 stems/ha Seedlings ex Puha nursery Trial installed: January 2004.

Trial description

Ex pasture site located adjacent to a gravel pit 700m . Some scattered manuka scrub reversion. Some blackberry present which may become a significant hindrance in the future. Tree form is good, but growth is variable reducing as you move up slope.

Figure 1. FR 475 trial location map

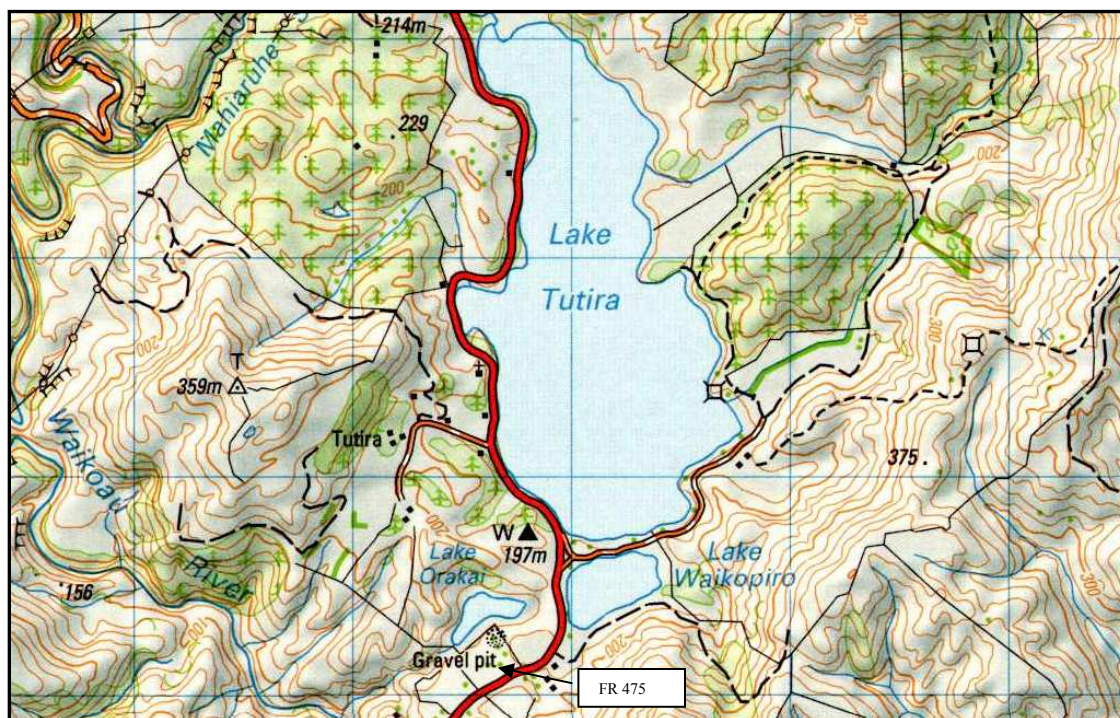
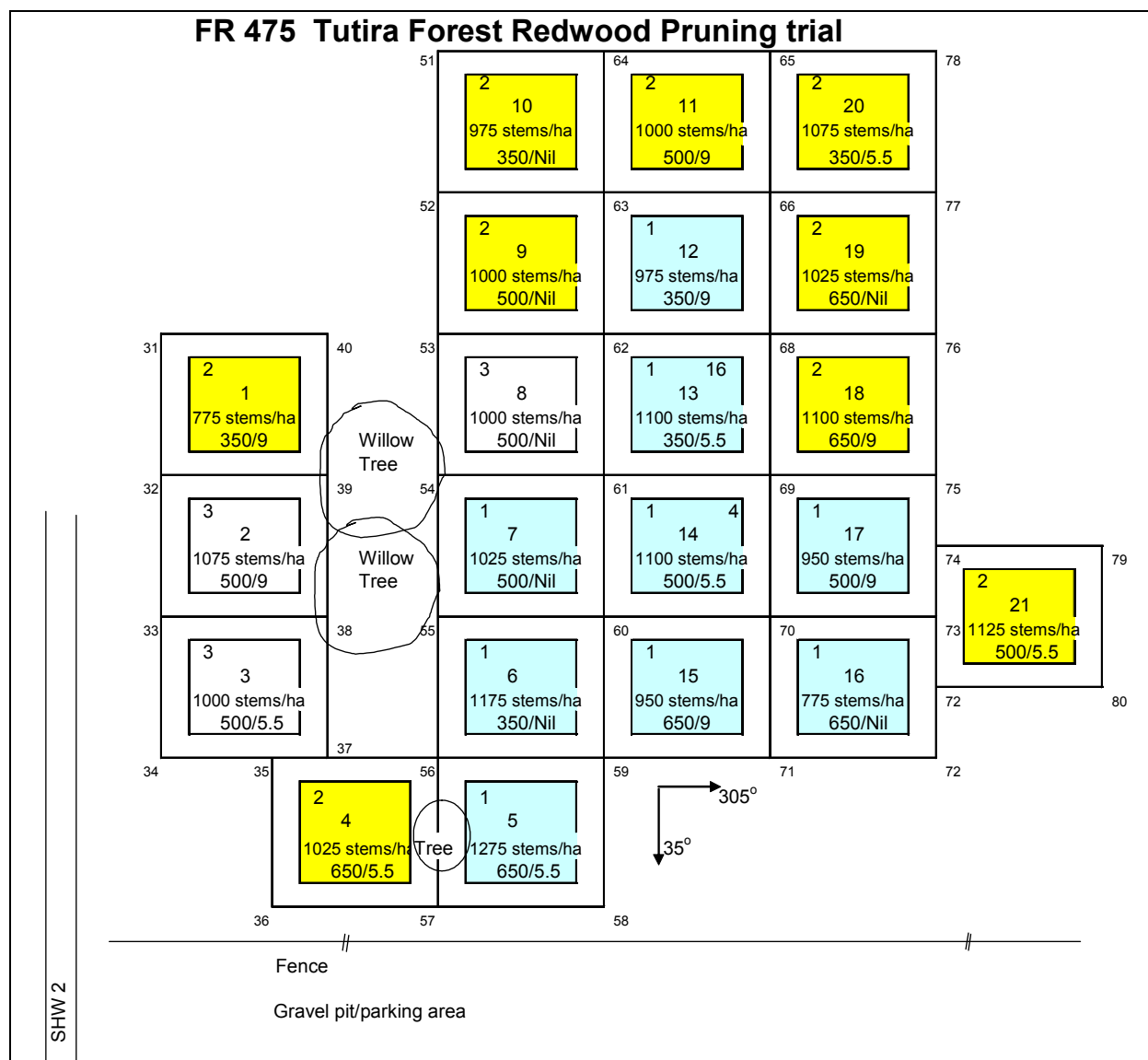


Figure 2. FR 475 plot layout map



FR 453/6 Otago Coast

Trial location Cpt 47, Otago Coast Forest
(NZMG): 2293931 m East, 5469463 m North

Owner Wenita Forest Products Ltd

Contact person James McEwan
Ph (03) 489 3234
Email: james.mcewan@dn.wenita.co.nz

Soil type 23 dH medium fertility Henly hill soils

Geology Strongly foliated quartzo-feldspathic schist

Annual Rainfall 677.8 mm

Stand details Planted 1986
Initial stocking: 1667 stems/ha
Trial installed: August 2004.

Site description Ex pasture site located on a gentle slope on the north bank of a small creek. The lower elevation plots are well sheltered but there is some evidence of top damage to trees in plots 6/50 and 7/65.

Figure 3. FR 453/6 - trial location map

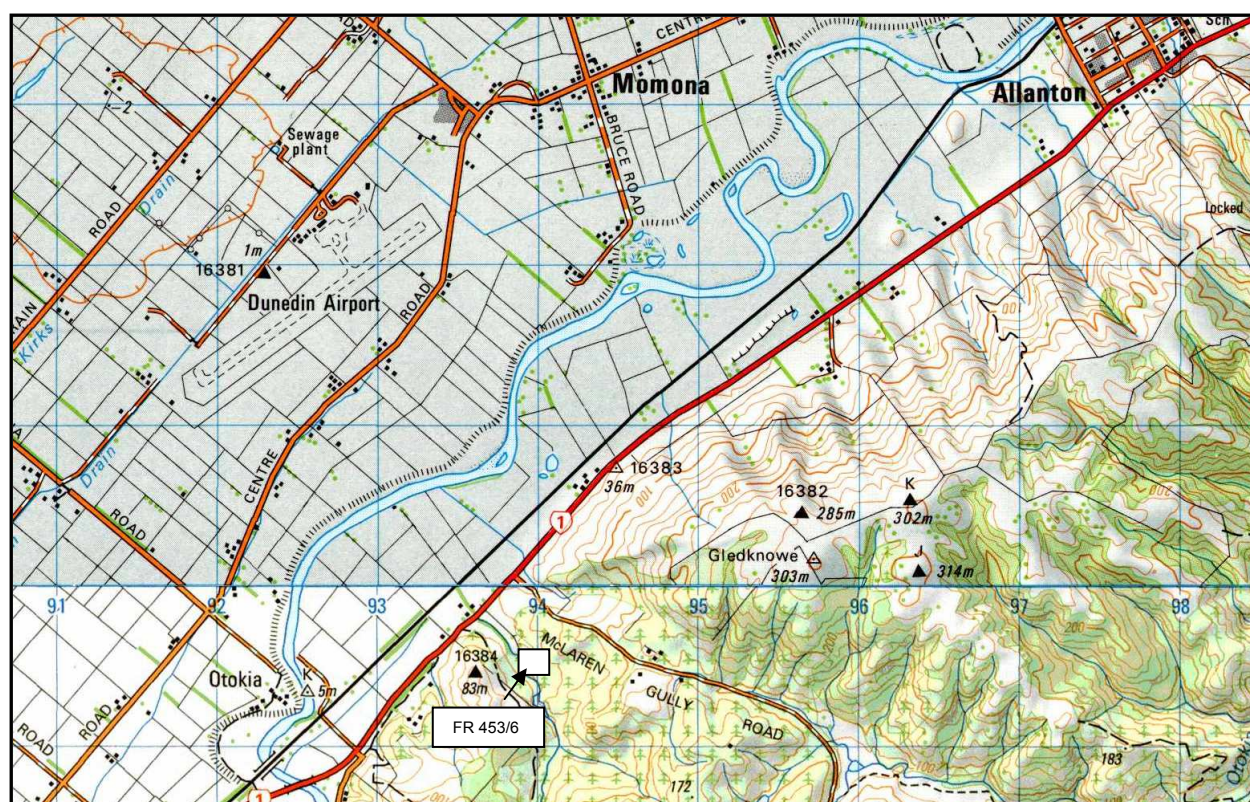
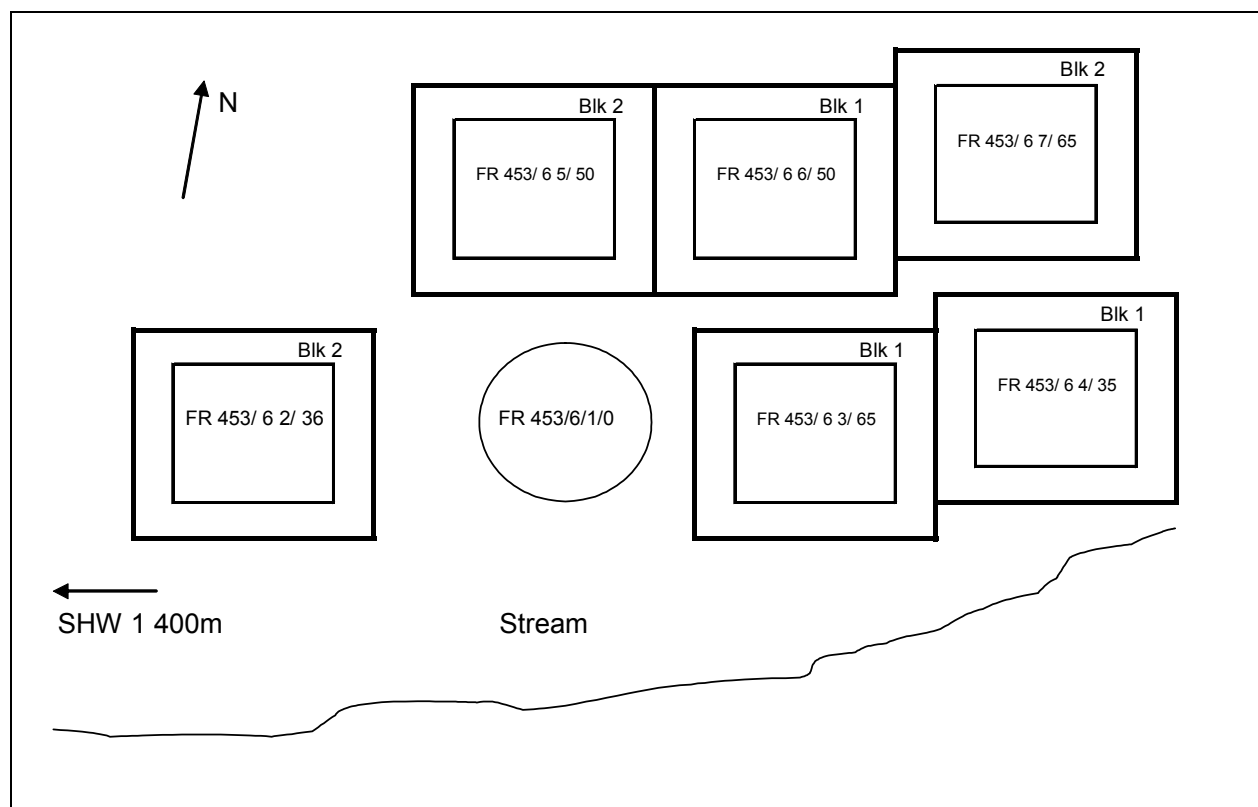


Figure 4. FR 45/6 - plot layout map



FR 453/8 Mangatu

Trial location Cpt 98 Mangatu Forest
(NZMG): 2940641 m East, 6324553 m North

Owner: Ernslaw One Limited

Contact person Dave Grogan
Ph (06) 8680089
Email: dave.grogan@ernslaw.co.nz

Soil type Ruakumara Yellow brown earth and Urewera Yellow brown pumice

Geology:

Annual Rainfall: 1300 mm

Stand details Planted: 1978
Planted stocking: 1200 (est)
Trial installed April 2004

Trial description: This is high altitude (600m a.s.l.) exposed site located at the back of Mangatu forest on the Wairangi boundary. The trial itself is moderately sheltered from the north west by a predominant ridge. Access is gained via Wairangi forest and Fern Island road. The site is considered to be ex pasture but the understorey, where present is dominated by pig fern indicating a fairly run out status before being afforested. Because of the variable topography the plots are scattered through the compartment in reasonably homogenous micro sites.
This trial was installed by Harry Saunders and Simon Stuckey of NZ Forestry Ltd.

Figure 5. FR 453/8 - trial location map

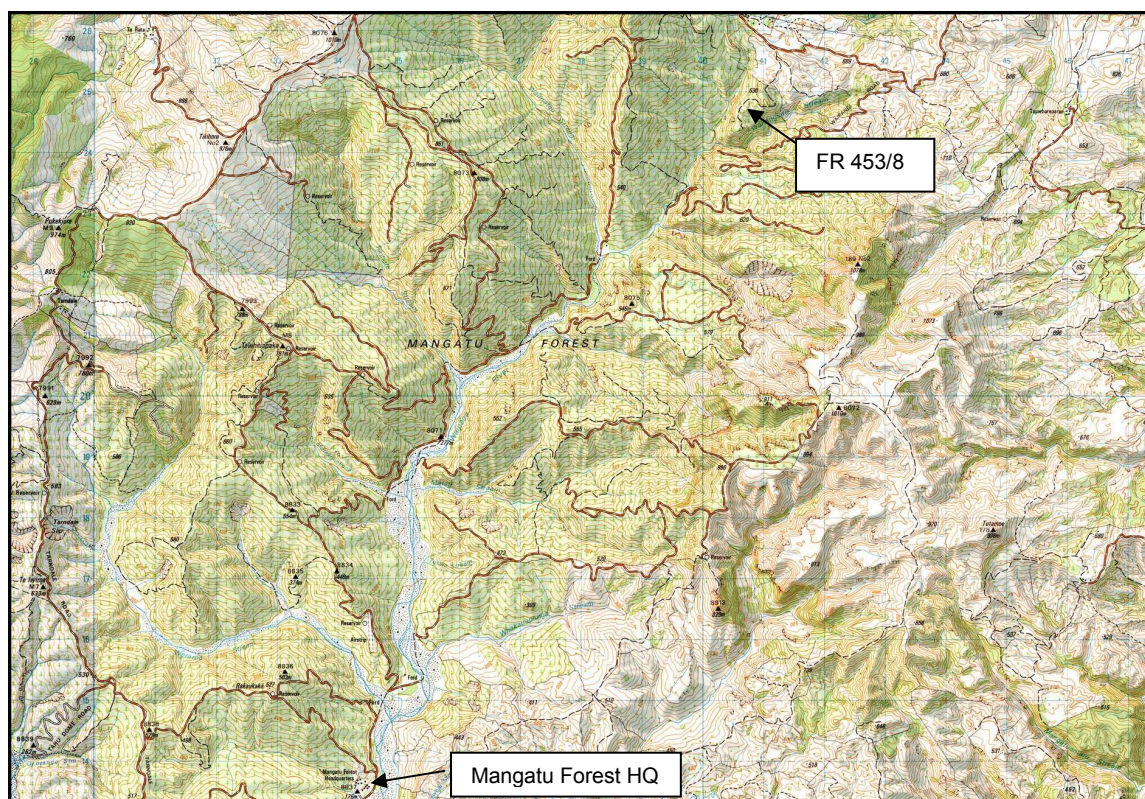
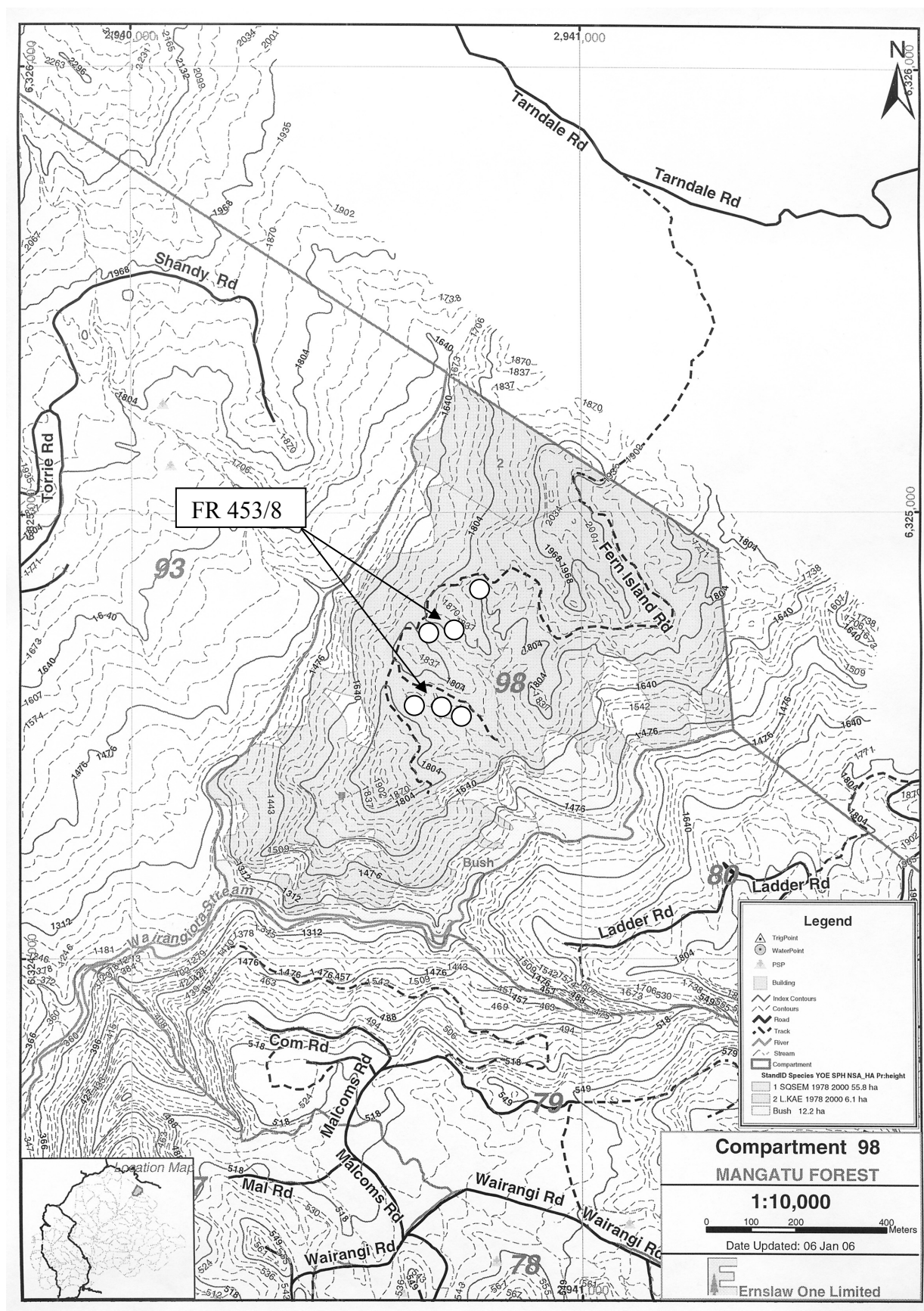


Figure 6. Plot location map



FR 453/9 Waiotapu

Trial location (NZMG)	Cpt 3/01 Kaingaroa forest 2804751 m East, 6312211 m North
Owner	Kaingaroa Timberlands Management Limited
Contact person	James Bullen Ph (07)343 1070 Email: james.bullen@ktml.co.nz
Soil type	Taupo yellow brown pumice
Geology:	Siltstone, sandstone conglomerates and pumice breccias
Annual Rainfall	1300 mm
Stand details	Planted: 1982 Planted stocking: 1200 stems/ha
Trial description	Located in Waiotapu thermal area. Some parts of this stand failed because of geothermal activity. The stocking was variable at the time of trial installation so plots were blocked and thinning designed to normalise standing basal area.

Figure 7. FR 453/9 - trial location map

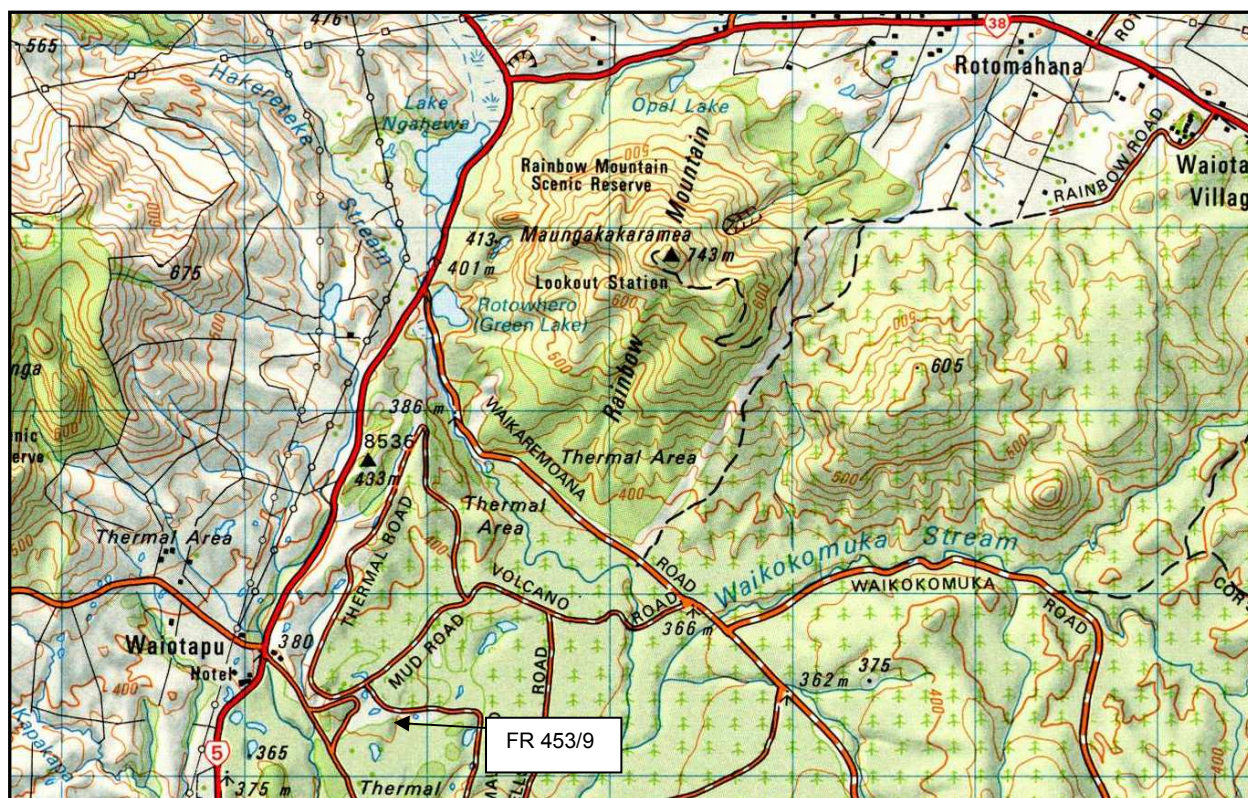
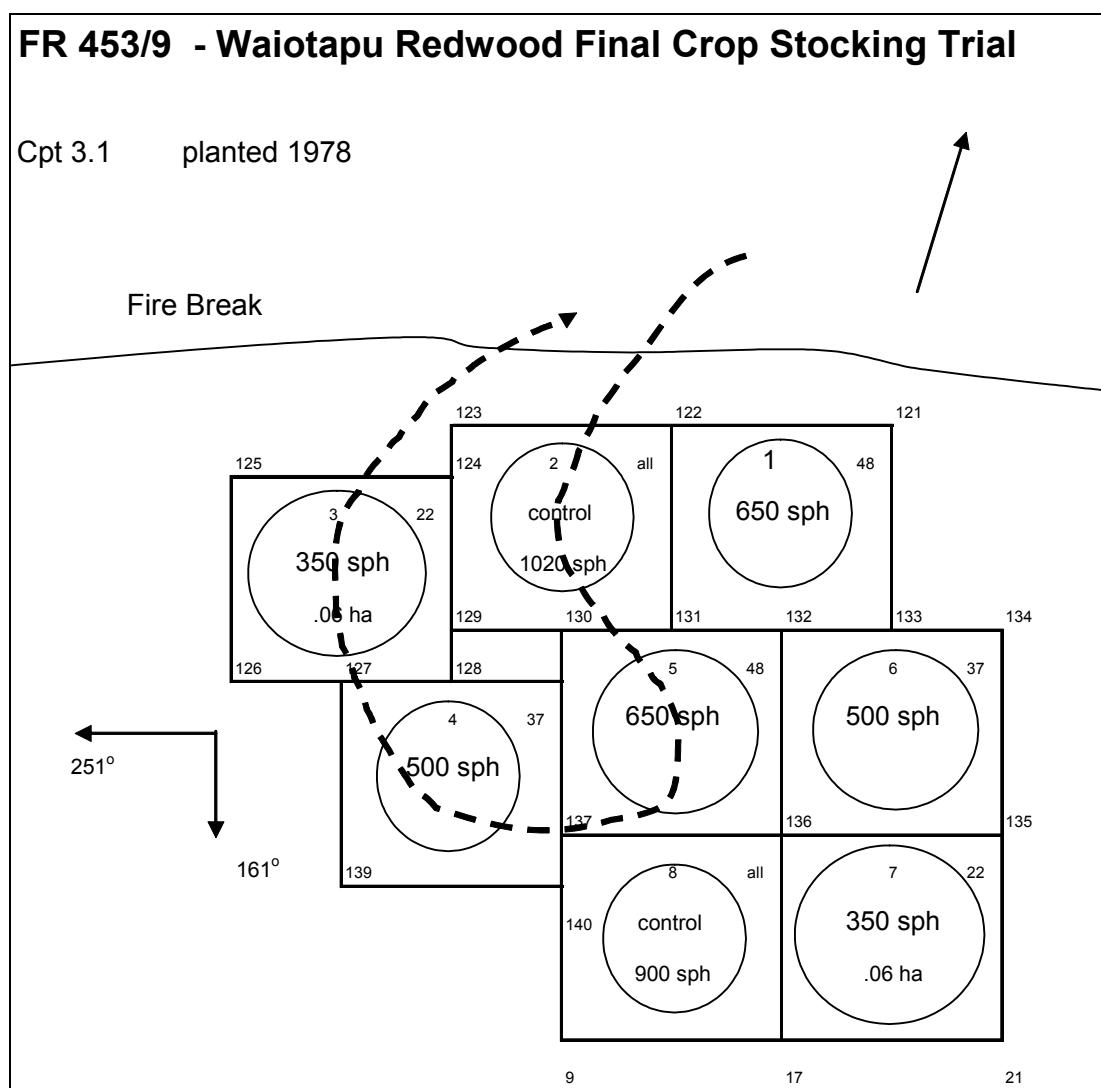


Figure 8. FR 453/9 - plot layout map



PART 2. PRUNING TRIALS

Introduction

Although there is considerable interest in growing and intensively managing Coast Redwood (*Sequoia sempervirens*, Lamb ex D. Don) in New Zealand little is understood of how it responds to the intensive silviculture commonly practiced with radiata pine in this country.

In 2004 a replicated randomised block design pruning trial for Coast Redwood was installed at Tutira in Hawkes Bay. A step out trial to investigate the effect of the season of pruning was installed in the same year at Te Wairengaokuri near Gisborne.

The details of treatments applied at each site follow below.

FR 475 – Tutira

In addition to the final crop stocking treatments described in section one, silviculture treatments covering a range of three pruning intensities have been applied. The treatments are summarised in Table 2.

Table 2: Stocking and Pruning Treatments

Treatment	Range		
Final crop stocking (Stems/ha)	350 (525)*	500 (750)	650 (975)
Stem calliper diameter (cm)	No prune	5.5 cm	9 cm
Replicates	2	3	2

* Total stocking including unpruned followers in brackets.

Each pruning treatment at the 350 and 650 stems/ha stocking is replicated twice and three times for the 500 stems/ha final crop stocking. Because of the severe early pruning each treatment is thinned to 1.5 times the prescribed final crop stocking. The followers will not be removed following until well after the final pruning lift.

The pruning treatments were applied using a stem calliper in January 2004.

Figure 9. 5.5cm stem gauge pruning treatment applied at 975 stems/ha. Photo taken June 2004



Figure 10. 5.5cm stem gauge pruning treatment applied at 975 stems/ha. Photo taken Nov 2005



FR 453/3 – Te Wairengaokuri

Trial location (NZMG): Gentle Annie State highway 36, near Gisborne
2930105 m East, 6270377 m North

Owner Gisborne District Council

Manager PF Olsen &Co Ltd

Contact person Nick Bunting
Ph (06) 868 5427
Email:

Soil type Taupo ash over marine sediments

Geology

Annual Rainfall 1200mm

Stand details Planted 1998
Initial stocking: 1200 stems/ha
Two year old bare rooted seedlings ex Puha nursery
Trial installed: January 2004.

Trial description

Ex pasture site located adjacent to a Eucalyptus and Poplar species trial in the Gentle Annie soil conservation area.

Some blackberry present which may become a significant hindrance in the future. Tree form is good.

At this site treatments include four split plots at the central 500 stem/ha final crop stocking to investigate the effect of season of pruning (Spring vs autumn) with and without followers (250 stems/ha)

Treatments imposed are summarised in Table 3.

Table 3: Stocking and Pruning Treatments – Waerengokuri

	No trts	Range	
Stocking (Stems/ha @P1/ Stems/ha FCS)	2	500	750/500
Stem calliper diameter (cm)	1	5.5 cm	5.5 cm
Replicates		2	2
Season of pruning	2	Spring/autumn	Spring/autumn
Total plots	4	2	2

Figure 11. FR 453/3 - trial location map

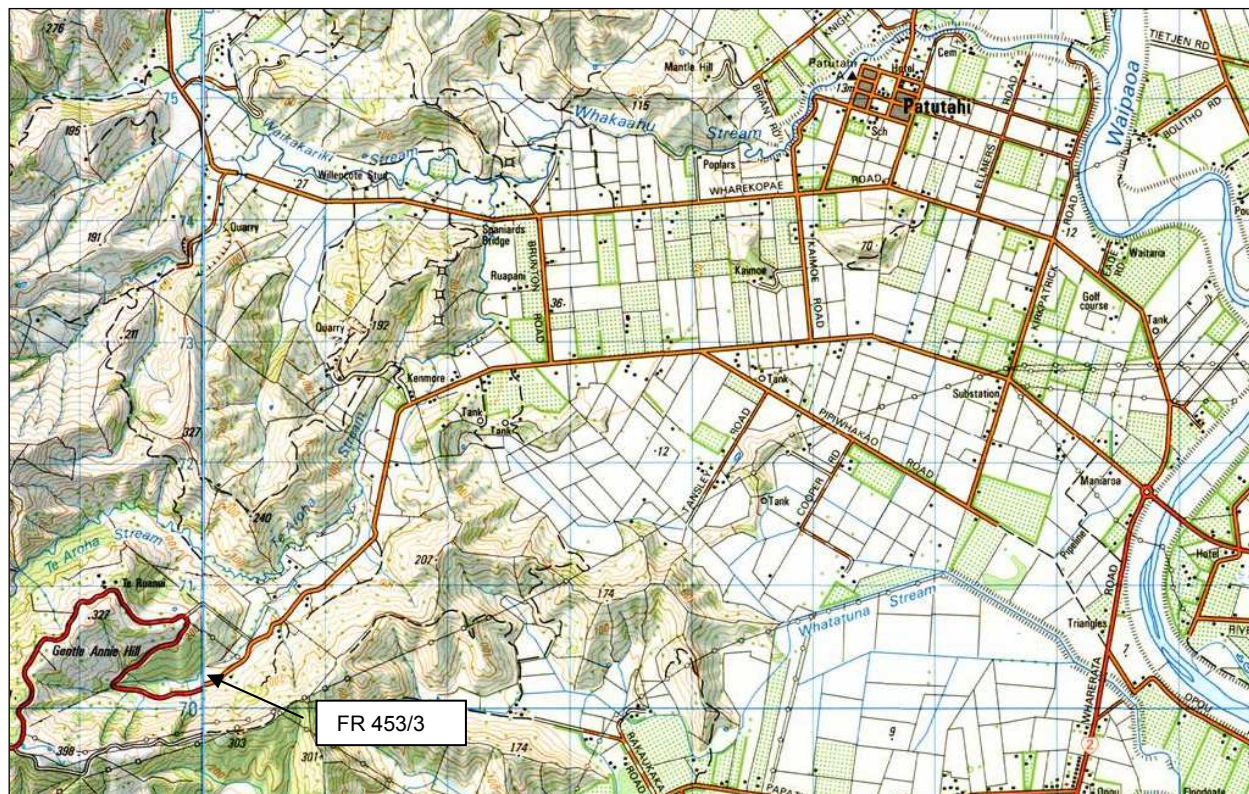


Figure 12. FR 453/3 - plot layout map

