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Sustainable Harvesting of Tropical Rainforests: Reply to Keto, Scott and Olsen

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This paper refutes the Keto *et al.* proposition that the Queensland selection logging system is neither ecologically nor economically sustainable. The key requirements of this system are: (1) that logging guidelines are sympathetic to the silvicultural characteristics of the forest, ensuring adequate regeneration of commercial species and discouraging invasion by weeds; (2) tree-marking by trained staff specifies trees to be retained, trees to be removed and the direction of felling to ensure minimal damage to the residual stand; *(3)* logging equipment is appropriate and driven by trained operators to ensure minimal damage and soil disturbance, compaction and erosion; *(4)* prescriptions ensure that adequate stream buffers and steep slopes are excluded from logging; (5) sufficient areas for scientific reference, feature protection and recreation are identified and excluded from logging; and (6) that deficiencies in an evolving system are recognized and remedied, leading to an improved system. Many studies of the effects of logging in these forests have been published and collectively provide a unique demonstration of one possible approach to sustainable timber harvesting.

Keywords: tropical rainforest, sustainability, Queensland, Australia.

1. Introduction

We are all concerned at the rate and extent of tropical deforestation and degradation of forested lands. However, the presentation by Keto *et al. (1990)* may do little to alleviate the problem. There are indications that, with appropriate management, sustainable timber harvesting can be achieved with minimal environmental impact (e.g. Jonkers and Schmidt, *1984;* Dawkins, *1988). To* try to convince tropical timber producers otherwise is to invite the broadscale conversion of rainforests to other land uses! A more effective way to ensure the conservation of the world's tropical rainforests may be to promote sustainable harvesting of timber and other forest products (Colinvaux, *1989;* Stocker, *1989;* Vanclay, *1991c).* This view is not restricted to foresters and forest services, but is also promoted by some conservation groups (Thompson, *1988).*

Keto *et al.'s (1990)* critique of the Queensland model of sustainable timber production is largely restricted to questioning the validity of the permanent sample plots which form the basis for timber yield estimates. They suggest that the basis of the model is harvesting an amount equivalent to the growth between harvests. Whilst such harvesting may be necessary to ensure sustainability, it is not sufficient. Prediction and harvesting of a sustained yield is only part of a sustainable timber production system. The main requirement of the Queensland sustainable timber production system is that the forest is left in "good" condition, and this requires that:

1. Logging guidelines are sympathetic to the silvicultural characteristics of the forest, viz. ensuring retention of vigorous advance growth, harvesting only defective and mature trees, providing for adequate regeneration of commercial species and discouraging invasion by weeds, such as bamboo and climbing vines.
2. Treemarking by trained staff specifies trees to be retained, trees to be removed and the direction of felling to ensure minimal damage to growing stock and minimal opening of the canopy.
3. Logging equipment is appropriate and driven by trained operators to ensure minimal damage to the residual stand and minimal soil disturbance, compaction and erosion.
4. Prescriptions ensure that adequate stream buffers and steep slopes are excluded from logging.
5. Sufficient areas for scientific reference, feature protection and recreation are identified and excluded from logging.
6. Deficiencies in an evolving system are recognized and remedied, leading to an improved system.

Provided that these principles are adhered to and the forest is left in good condition, it may not matter if the sustained yield is exceeded for a short time. In Queensland, it was government policy to stimulate industrial development by exceeding the sustained yield during harvesting of the virgin resource, but it was realized as early as 1949 that the harvest would ultimately need to be reduced. Throughout the period 1948-1978, the allocation was set at 207 000 cubic metres per annum, and was progressively reduced to the estimated sustainable yield of 60 000 m^3/annum in 1986. Yet, despite this apparent overcutting, the region was still considered worthy of inclusion on the World Heritage List in 1988. Clearly, this harvest (207 000 m^3/annum) could only be maintained for so long because it was the first harvest from virgin stands. This gradual introduction of sustainable harvesting in north Queensland parallels the experience in North America (Clawson and Sedjo, 1983; Parry *et al.,* 1983).

Contrary to Keto *et al.'s* (1990) claims, the second harvest had commenced in north Queensland: 28 941 ha of forest previously logged under "cutter selection" to specified girth limits during 1939-1955 were relogged to the treemarking guidelines prior to the 1988 logging ban and yielded economically viable harvests. Whilst some of this harvest came from species previously considered less desirable, or from areas simply missed or passed over during the first harvest (logging under cutter selection was typically very selective and restricted to easily accessible areas), some of the harvested volume may be attributed to actual growth on trees which were too small at the time of first harvest.

Simple arithmetic demonstrates the feasibility of the sustained yield. A yield of 60 000 m^3/annum from 160 000 ha (Preston and Vanclay, 1988) implies an average annual increment of only 0•375 m^3/ha/annum, which is a reasonably conservative estimate. Assuming a 40-year nominal rotation implies that 4000 ha would be logged annually, and that the average yield per hectare would be 15 m^3/ha. This is a realizable volume consistent with volumes attained in recent recut areas. However, some recut areas have realized much higher yields (e.g. Beatrice Logging Area averaged 40 m^3/ha).

2. **Permanent sample plots**

The main thrust of Keto *et al.'s* (1990) paper was a criticism of the permanent sample plots maintained by the Queensland Forest Service (QFS) in north Queensland. Whilst it is easy to be critical, it is appropriate to bear in mind that some of these plots were established as early as 1948, before the advent of computers and simulation systems, during an era when there was little doubt that the rainforests should be exploited. It is not easy to foresee, at plot establishment, all the possible uses to which plot data may be put, and their exact measurement requirements. Indeed, Whitmore (1989) records that he had to abandon one of his projects in the Solomon Islands because the plots he established in 1964 did not record sufficient detail. In this light, the QFS database of 247 plots (see Appendix 1) has shown stability and versatility. Most plots have been measured every 5 years (sometimes more frequently) for up to 40 years, with only one change in measurement procedure (in 1981 the minimum size for inclusion was changed from 6 m height to 10 cm diameter). All trees have been individually numbered and tagged so that the development of each individual tree could be reliably traced. Whilst this is essentially simple, it involves a huge amount of data, a considerable budget and dedication and diligence by field and office staff.

Keto *et al.* (1990) conveyed the impression that yield estimates for Queensland's rainforests were derived by estimating average plot volume growth and extrapolating this increment to the whole forest estate. Were this the case, it would be necessary to ensure that plots were typical and representative. In fact, a more sophisticated and flexible methodology has been used, and was described in three of the references quoted by Keto *et al. (i.e.* Vanclay, 1983; Preston and Vanclay, 1988; Poore, 1989). This approach employed these permanent sample plots only to develop a growth model, a computer simulation system which predicts growth and change in the rainforest under a wide variety of conditions (e.g. Vanclay 1989a). The present state of the forest is determined from a large number (319 in Preston and Vanclay's study, 518 in more recent unpublished studies) of temporary inventory plots, and yields are determined by repeatedly simulating the growth and harvesting of each of these inventory plots (Vanclay and Preston, 1989). With this growth modelling approach, it is important to sample the widest possible range of stand conditions (Box, 1966; Vanclay, 1991a), not merely the "typical" stands.

Contrary to the claims of Keto *et al.* (1990), records of treatment history and intensity are available for all permanent sample plots (except for the 1929 treatments). Treatment was not "often repeated and of unknown intensity", but applied once, twice and in few instances on three occasions (see Appendix 1). These treated plots were not used in the development of Vanclay's (1989a) growth model or in Preston and Vanclay's (1988) yield calculation. These data have subsequently been used in a revised growth model (Vanclay, 1991b), but do not detract from the utility of that model as it contains an expression to account for the effects of treatment. Whilst it may be surprising to many readers that so many plots were subjected to treatment and/or underplanting, it should be recognized that, at plot establishment, there was no doubt that the rainforests were to be exploited, and the great research question was how commercial timber production could be increased in a cost-effective way (Henry, 1960).

Rarely has regeneration been unsuccessful in these rainforests. On the contrary, regeneration has been so abundant that it provoked a whole series of thinning trials to identify optimal spacings (see Appendix 1). However, underplanting and enrichment planting have been less successful. Red cedar *(Toona australis)* underplantings have been successful only on State Forest 191 from plantings in 1914, and in Experiment 166 from plantings during the 1950s. Hoop pine *(Araucaria cunninghamii)* showed promise as an underplant only with regular weed control to eliminate competition. *Flindersia* species have also shown little promise (Keys, 1979). Planted trees have been so identified in the data, and statistical analyses revealed no significant difference in growth rate (compared to natural regeneration) once trees had attained 10 cm diameter. Although enrichment planting on permanent sample plots may alter species composition of these plots, it can have no influence on yield estimates, as individual species are identified on the permanent sample plots, in the growth simulation model, and in the inventory plots used in calculations (Vanclay and Preston, 1989).

Whilst prism plots sample only arboreal vegetation and thus provide limited utility for detailed ecological studies, there is no reason to doubt their efficacy in providing growth data of forest trees (Myers and Beers, 1968). The method is highly efficient in estimating variables such as stand basal area and volumes, and is the most efficient way to enumerate tree frequencies by diameter class in tropical forests (Schreuder *et al.,* 1987). The eight prism plots in question were initially established to investigate the effects of logging on the residual stand, and have fulfilled that purpose adequately (Vanclay, 1989b). Keto *et al.* (1990) argue that most of the remaining permanent plots should be discarded because they are less than 0.4 ha. Certainly, it is preferable that plots should have a standard size (ideally 0.4-0.5 ha), but smaller plots are in no way invalid, and still contribute useful growth information. Larger plots may be impractical, as "it is difficult to find many sites in the region larger than 0•5 ha which do not include major physical or floristic discontinuities" (West *et al.* 1988).

Keto *et al.* (1990) contend that several of the unlogged plots are not representative of virgin rainforest, but represent successional communities dominated by secondary species (e.g. *Acacia aulacocarpa).* However, *A. aulacocarpa* has never been recorded on Plot 626/2 (prior to 1981 all stems exceeding 6 m height were measured, but since 1981 only stems exceeding 10 cm diameter have been measured), although it is abundant on roadsides in the vicinity of the plot. Similarly, no *A. aulacocarpa* has ever been recorded on the virgin plot at Mt Windsor (679/2). This plot contains several trees over a metre in diameter, and the largest trees exceed 135 cm. Large trees in this plot include *Cardwellia sublimis, Ceratopetalum succirubrum, Flindersia pimenteliana, Planchonella papyracea* and *Syzygium wesa,* which are fairly typical of these granite soils.

Keto *et al.* (1990) rejected several plots because they had no large commercial stems. However, one characteristic of Culpa Lands (south of Koombooloomba) where some of these plots are located, is the absence of large trees. Thus these plots may well be typical of a considerable area. Not all rainforest has big trees!

Many of the plots were originally half-acre (0•2023 ha) plots measuring two chains by two and a half chains (c. 40 x 50 m) or one chain by five chains (c. 20 x 100 m). Thus, the great majority of plots are 40 m or less in width. Keto *et al.* (1990) reject as "too small (0• 12-0-15 ha) and/or too narrow (10-20 m)" several plots (e.g. 608/1, 610/1, 623/ 1) which are exactly the same size and dimensions as the two plots (612/1, 613/1) accepted by Keto *et al.* as "usable".

Keto *et al.* (1990) also rejected many plots which "were reduced in effective area by roads, snig tracks, creeks and impeded drainage" or by granite boulders and landslips. Large granite boulders, landslips and cyclones are all natural phenomena in north Queensland, as in most tropical moist forests, and should be represented in an unbiased sample. Similarly, snig tracks, creeks and areas of impeded drainage are common phenomena and should be included in samples. Any system of permanent plots which failed to sample these phenomena could be accused of subjective bias. No permanent sample plots include permanent roads, although some may have been traversed by temporary logging extraction tracks. In any case, data collected prior to disturbance (landslip, cyclone, inundation) is not lost, and continues to provide suitable predisturbance baseline data.

Keto *et al.* (1990) reject several plots which have fewer than 16 years of measurement, claiming that these are of "dubious statistical validity". Whilst such short measurement histories will not enable the detection of subtle long-term trends, they still provide good growth data, and there is no reason to doubt their statistical validity simply because of their relatively short history. In contrast, some biometricians argue that there are statistical gains to be attained by measuring plots for a few years only, before abandoning these and establishing new plots elsewhere (e.g. Tennent, 1988).

Keto *et al.* (1990) conclude their criticism of plots with a quote from Vanclay (1983, p. 161) which suggested that available data were often inadequate for detailed growth modelling studies. However, that quote is out of context. Vanclay was not referring to the rainforests of north Queensland, nor to the then Queensland Department of Forestry, but commenting on the difficulties generally facing modellers of indigenous forests everywhere. At that time (1983), Vanclay had no first-hand knowledge of the data from north Queensland.

We make no claim that the QFS has a perfect database for all timber yield and ecological studies, but few resource managers are lucky enough to have complete and perfect information. The art of land use planning and resource management is to make the best possible use of incomplete and imperfect information. The QFS database is deficient in increment data for *Backhousia bancroftii,* a major commercial species, and the database used to construct the revised growth model (Vanclay and Preston, 1989; Vanclay, 1991b) employed data from the CSIRO EP series of plots (West *et al.,* 1988) to overcome this deficiency. We hope that additional plots will be established to extend the present database further. There should be no stigma in admitting a weakness in a database or management system; the very process of improvement requires that deficiencies are recognized and remedied.

3. Ecological sustainability

The effect of disturbance on rainforest structure, species diversity and species richness is controversial, and research findings are very much subject to sample size and degree of disturbance. Whilst Keto *et al.* (1990) suggest that several overseas studies support their contention that repeated logging will lead to a reduction in species diversity and richness, they omit any reference to alternative views and discussions in the literature [e.g. Whitmore's (1984) response to Denslow (1980), and Nicholson *et al.'s* (1990) reply to Saxon (1990)]. Boyce (1988) and Brunig (1988) argue that selection logging actually increases diversity. Crome *et al.* (1990) found no loss of species as a result of logging. In north Queensland, the rare marsupial *Antechinus godmani* has a restricted distribution, but is abundant in an area logged twice and traversed by two major roads. Wyatt-Smith (1988) concluded that "The polycyclic selection logging system of management as currently practiced in northern Queensland rain forest cannot in any way be considered to pose a threat to the continued existence of `threatened' species of fauna or flora".

An important component of the Queensland selection logging system is the exclusion of logging from scientific areas, feature protection areas, steep slopes and stream buffers, and the effect of this is to create a mosaic of logged and unlogged forest. In addition, logging does not completely destroy the canopy. Guidelines prescribe that not more than 50% of the canopy should be disturbed, and recent studies indicated that 40 to 60% of the area actually designated for logging could remain completely undisturbed (Applegate, 1989). Crome *et al.* (1990) found that less than 25% of the canopy was lost as a result of logging. Rainforests may be more resilient than is popularly believed. One small study (King and Chapman 1983) found that 25 years after clearfelling of all merchantable stems in *a Ceratopetalum-dominated* warm temperate rainforest, all flowering plants, ferns and mosses that were originally present could again be found. In north Queensland, Stocker (1981) found that 82 tree species regenerated within 2 years of felling and burning rainforest. A comprehensive literature review (Horne and Hickey 1991) found that few quantitative studies of the effects of selection logging had been made, but concluded that the environmental impacts may be minor. Baur (1988) concluded that "Whilst more checking and research are necessary, there seem good grounds for believing that the selective logging system, with its mosaic of disturbed and undisturbed patches and with its similarity to the natural processes experienced in the rainforest, represents no threat to the survival of any plant or animal species".

In appraising the impact of logging, it is necessary to specify whether the sample comprises only areas where the canopy was actually removed in logging, or whether it encompasses the adjacent less disturbed area. The former is likely to indicate massive structural changes and a great reduction in diversity and richness. The latter requires a larger sample and is likely to reveal small structural changes and increased diversity and richness. Nicholson *et al.* (1988) also commented on the importance of sample size, and observed that a large sample (2 ha) of logged forest would reveal no loss of species as a result of logging.

The impact of selection logging on these forests has been extensively studied. The effects on fauna

(Crome and Moore, 1989), flora (Nicholson *et al.,* 1988, 1990; Saxon, 1990; Crome *et al.,* in press), hydrology (Gilmour, 1971), soils (Gillman *et al.,* 1985) and timber production (Vanclay and Preston, 1989; Vanclay, 1990) have been studied, and provide no indication that such harvesting is not sustainable.

4. Economic sustainability

The net economic benefit or cost of rainforest logging cannot be estimated by a simple financial examination of QFS revenues and expenditure. Keto *et al.* (1990, table 2) overstate actual QFS expenditure associated with rainforest harvesting by including expenditure on plantation establishment and maintenance. The costs and revenues recorded during the last full year of rainforest logging operations were the only data recorded on a programme basis, and showed a small profit for the rainforest subprogramme.

The rainforest-based forestry and timber industry of north Queensland was an important and economically viable part of the north Queensland economy (ACIL Australia, 1987). Independent studies (Harris, 1987; Cameron McNamara, 1988) identified some 2000 jobs directly or indirectly linked to rainforest logging in north Queensland, whilst value adding by the industry was estimated at $25 m. per annum (Harris, 1987).

Long-term total economic losses to individuals, industry and Government from the cessation of rainforest logging have been estimated at $400 m. (Cameron McNamara, 1988, table 1.1). Cameron McNamara (1988) further indicated that lost rainforest exports and imports of replacement products would cost an estimated $30 m. annually. These costs far outweigh any subsidy provided by the Queensland Government to maintain QFS operations in north Queensland.

5. Conclusion

Keto *et al.* (1990) contend that "future timber supplies can ultimately only come from plantations", but we ask if minimal impact selection logging is not sustainable, how can these more intensive plantations be sustainable? We agree with Keto *et al.* that "protection of remaining forests will be essential", but suggest that production may provide protection for many of these forests (Vanclay, 1991c).

Keto *et al.* (1990) have not fulfilled their stated objective to "examine that model, its deficiencies and the potential for application to developing countries". Rather, they have criticized several specific aspects. The importance of the Queensland example lies in the successful implementation and co-ordination of many components including reliable resource inventory, estimating the sustained yield, determining areas to be logged, planning the required extraction infrastructure, supervising felling and extraction, ensuring adequate erosion controls on completion of logging, and maintaining reliable management records. These practices and principles, which have been developed to satisfy operational requirements in north Queensland, could serve as examples to other tropical countries and have formed the basis for the ITTO guidelines (ITTO, 1990). The recent World Heritage listing of 97% of these tropical rainforests which have been used for timber production for more than a century (and more intensively managed during the past 40 years) is testimony to the standard of management and the success of the Queensland selection logging system.

The data derived from the permanent sample plots in north Queensland can provide no useful information for other tropical countries; they will need their own plots to predict yields and monitor changes. The Queensland permanent sample plots can merely demonstrate a proven methodology for data collection, management and analysis which may be used elsewhere. Queensland foresters are privileged to have over 40 years' experience in the establishment and maintenance, not only of a permanent sample plot system, but of an integrated forest management system.

Keto *et al.* (1990) have not demonstrated the failure of the "north Queensland logging model" to produce a sustainable harvest of timber, and their criticism of permanent sample plots is flawed. Whilst the Queensland selection logging system is not the only means to ensure a sustainable harvest, it remains one of the best demonstrations visible today. Many other examples (Dawkins, 1988) have been lost through changes in land use.

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Appendix 1

The following is a list of permanent sample plots in the Queensland Forest Service rainforest database. Geological types are Alluvial (AL), Acid Volcanic (AC), Basic Volcanic (BV), Coarse-grained Granite (CG), Sedimentary and Metamorphic (SM) and Tully fine-grained Granite (TG). Site quality was determined using Vanclay's (1989c) equation 13. Rainforest structural types follow Tracey and Webb (1976). Brief descriptions of the origin of the various plot types are given below.

Notes.

1. Paired treatment plots comparing growth with and without silvicultural treatment. 2. Plots monitoring the development of regeneration.
3. Experiments monitoring development of enrichment plantings following thinning to various spacings.
4. Experiments monitoring development of rainforest following application of different silvicultural treatment prescriptions.
5. Experiments monitoring development of enrichment plantings.
6. Experiment examining benefits of silvicultural treatment 10 years prior to logging, with a view to getting more regeneration.
7. Experiments monitoring effects of retreatment 15 years after initial silvicultural treatment. 8. Treatment of unproductive rainforest attempting to produce a viable timber harvest. 9. Logging damage studies.
10. Plots monitoring development of dense stands of rainforest.
11. Plots monitoring growth and yield in rainforest under routine management. These plots were deliberately located to sample good, average and poor rainforest. 12. CSIRO growth monitoring plots described in West *et al.* (1988).

Expt No.	Plot No.	State Forest	UTM Grid Ref. Zone	East	North	Area (ha)	First measure	Last measure	Geol. type	Site quality	Alt. (m)	Aspect	Slope (deg.)	Rain (mm)	Struct. type	Years logged	Years treated	Plot type
69	1	185	55	349700	8101050	0·4047	48	59	SM	5·0	670	WSW	5	1320	6	43		1
77	1	185	55	348800	8101300	0·4047	48	57	SM	6·0	670	N	10	1320	6	43		1
77	2	185	55	348860	8101300	0·4047	48	57	SM	7·4	670	N	10	1320	6	43, 52	52	1
78	1	185	55	349690	8100330	0·4047	48	87	BV	7·8	680	NNW	5	1320	6	43		1
78	2	185	55	349690	8100290	0·4047	48	87	SM	2·0	680	NNW	5	1320	6	43, 49	49	1
79	1	185	55	349100	8101300	0·4047	49	57	SM	4·9	670	N	10	1320	6	43	51	1
79	2	185	55	349160	8101300	0·4047	49	57	SM	5·5	670	N	10	1320	6	43	51	1
89	1	191	55	340090	8082800	0·0405	51	64	BV	9·0	680	—	0	1400		27	51	2
89	2	191	55	340090	8082780	0·0405	53	64	BV	9·7	680	—	0	1400		27	51	2
99	1	191	55	339030	8082560	0·1036	52	70	BV	—	680	—	0	1400		28	53	2
99	2	191	55	339030	8082560	0·1036	52	70	BV	—	680	SE	5	1400		28	53	2
99	3	191	55	339030	8082560	0·1012	52	70	BV	—	680	—	0	1400		28	53	2
99	4	191	55	339030	8082560	0·1012	61	73	BV	—	680	—	0	1400		28	53	2
99	5	191	55	339030	8082560	0·0838	52	70	BV	—	680	SE	5	1400		28	53	2
99	6	191	55	341100	8082510	0·0979	52	87	BV	—	680	—	0	1400		28	52	2
99	7	191	55	341190	8082580	0·1024	52	87	BV	—	680	—	0	1400		28	52	2
110	2	310	55	361090	8086740	0·1012	52	68	BV	5·6	670	N	5	2000		30, 68	30, 53	3
111	1	185	55	350120	8099160	0·1578	52	68	SM	5·5	680	N	10	1320	6	39		4
111	2	185	55	350020	8099130	0·1348	52	68	SM	—	670	W	10	1320	6	39	52	4
111	3	185	55	350200	8099090	0·1643	52	68	SM	7·6	680	SE	10	1320		39	52	4
137	1	194	55	331410	8086410	0·1060	54	77	CG	4·6	1080	W	5	1650		53, 80	53, 57	5
159	1	191	55	339670	8082920	0·1012	54	70	BV	3·7	680	—	0	1400	5b	33	54, 62	5
159	2	191	55	339580	8082900	0·1012	54	70	BV	1·4	680	—	0	1400	5b	33	54, 62	5
159	3	191	55	339580	8082990	0·1012	54	70	BV	5·0	680	—	0	1400	5b	33	54, 62	5
159	4	191	55	339660	8083000	0·1012	54	70	BV	3·0	680	—	0	1400	5b	33	54, 62	5
159	5	191	55	339650	8083080	0·1012	55	70	BV	4·6	680	—	0	1400	5b	33	54, 58, 62	5
159	6	191	55	339610	8083070	0·1012	55	70	BV	2·0	680	—	0	1400	5b	33	54, 58, 62	5
159	7	191	55	339570	8083060	0·1012	55	70	BV	7·6	680	—	0	1400	5b	40	54, 58, 62	5
166	1	251	55	347980	8038080	0·4047	69	83	BV	7·0	720	W	10	1800		55	56, 57, 62	5
166	2	251	55	347960	8038060	0·4047	69	83	BV	7·1	720	W	10	1800		55	56, 57, 62	5
167	1	194	55	331660	8086520	0·3541	54	63	CG	4·0	1060	—	0	1656		53	54	5
167	2	194	55	331640	8086570	0·2023	55	63	CG	7·2	1060	—	0	1650		53	54	5
174	1	310	55	361450	8086720	0·1010	54	68	BV	5·3	670	SSW	5	2000		29, 68	29, 54	3
174	2	310	55	361450	8086720	0·1008	54	68	BV	5·0	670	ESE	5	2000		29, 68	29, 54	3
178	1	1229	55	350960	8146940	0·0283	55	62	SM	0·2	440	—	0	2090	12c	70, 78	55, 62	5
178	2	1229	55	350980	8146940	0·0809	55	76	SM	3·2	440	N	5	2090	12c	50, 78	55, 62	5
178	3	1229	55	351060	8146940	0·0348	55	62	SM	3·7	440	—	0	2090	12c	50, 78	55, 62	5
180	1	1229	55	351300	8147000	0·0769	56	78	SM	5·7	440	—	0	2030	2a	51, 77	56	5
184	1	310	55	357970	8090050	0·4047	55	68	BV	4·7	720	—	0	2030	1b	58	59	1
184	2	310	55	358100	8089950	0·4047	55	68	BV	6·2	720	—	0	2030	1b	58	59	1
207	1	194	55	332850	8087000	0·1012	56	68	CG	8·8	1130	N	5	1650	9	68		6
222	1	310	55	361180	8086730	0·1036	58	68	BV	6·2	670	NNW	5	2000		28	29	3
222	2	310	55	361130	8086680	0·1012	58	68	BV	5·8	670	NNW	5	2000		28	29, 58	3
222	3	310	55	361060	8086610	0·1012	58	68	BV	5·8	670	NNW	5	2000		28	29, 58	3
222	4	310	55	361110	8086680	0·1004	58	68	BV	5·9	670	NNW	10	2000		28	29, 58	3
224	1	310	55	361470	8086320	0·1012	58	68	BV	7·4	670	SW	10	2000		28	29	3
224	2	310	55	361470	8086390	0·1000	58	68	BV	8·0	670	SW	10	2000		28	29, 58	3
224	3	310	55	361560	8086360	0·1012	58	68	BV	6·1	670	SW	5	2000		28	29, 58	3
224	4	310	55	361580	8086360	0·1012	58	68	BV	5·9	670	SW	5	2000		28	29, 58	3
224	5	310	55	361330	8086390	0·1008	58	68	BV	6·0	670	NE	5	2000		28	29, 58	3
224	6	310	55	361330	8086440	0·1020	58	68	BV	7·1	670	NE	5	2000		28	29, 53	3
226	1	310	55	358520	8090320	0·0777	58	74	BV	5·2	670	NNE	5	1800		57	58	5
241	1	310	55	358600	8090400	0·1267	59	75	BV	6·4	720	NE	25	2030	1b	58	59	5
242	1	194	55	331700	8084050	0·1117	59	74	AV	4·6	1035	N	25	1650	9	58	58	5
243	1	194	55	332870	8089170	0·2598	59	74	CG	3·8	980	W	10	1650		54	56, 59	5
245	1	1229	55	349910	8147220	0·2068	59	72	SM	3·2	440	—	0	2030	2a	58	59	5
245	2	1229	55	349880	8147260	0·2262	59	72	SM	4·2	440	—	0	2030	2a	58	59	5
245	3	1229	55	349940	8147260	0·1941	59	72	SM	2·3	440	—	0	2030	2a	58	59	5
246	1	1229	55	351480	8146450	0·2582	59	79	SM	3·4	440	—	0	2030	12c	52	58	5
246	2	1229	55	351480	8146450	0·2145	59	79	SM	4·1	440	—	0	2030	12c	52	58	5
246	3	1229	55	351750	8146450	0·2307	59	79	SM	4·4	440	W	10	2030	12c	52	58	5
246	4	1229	55	351750	8146540	0·1959	59	79	SM	7·1	440	W	10	2030	12c	52	58	5
250	1	1229	55	352220	8145720	0·1214	60	75	SM	4·1	430	ESE	5	2030	2a	49	59, 61, 70	5
250	2	1229	55	352300	8145580	0·1012	60	75	SM	4·7	430	N	5	2030	12c	49	59, 61, 70	5
282	1	194	55	331950	8084360	0·1068	61	74	AV	7·6	1040	W	15	1650	9	60	60, 61	5
282	2	194	55	331950	8084460	0·1166	61	74	AV	9·2	1040	W	15	1650	9	60	60, 61	5
282	3	194	55	332040	8084460	0·1216	61	70	AV	—	1040	W	15	1650	9	60	60, 61	5
283	1	194	55	332750	8089530	0·1445	61	74	CG	9·6	1040	W	5	1650	9	57	57, 61	5
283	2	194	55	332750	8089550	0·1538	61	74	CG	6·9	1040	W	5	1650	9	57	57, 61	5
283	3	194	55	332750	8089590	0·1194	61	70	CG	7·4	1040	W	5	1650	9	57	57, 61	5
310	1	310	55	358300	8090150	0·0911	55	75	BV	4·1	670	W	5	2030	1b	55	55, 65	5
311	1	194	55	332200	8084450	0·1012	61	87	AV	9·2	1040	SW	15	1650	16c	60	60	5
317	1	185	55	349950	8101010	0·1012	62	67	SM	4·1	730	—	0	1320		43, 51	62	5
321	1	185	55	354030	8105410	0·1012	61	71	SM	5·0	730	NE	10	1650		45, 60	60	5
322	1	1229	55	351060	8145760	0·1012	61	79	SM	7·2	488	WNW	15	2030	2a	56	61, 75	5
324	1	1229	55	349920	8146860	0·0777	63	74	SM	5·4	460	E	5	2100		48	62	5
329	1	1137	55	400400	8026150	0·1590	63	82	SM	6·6	30	—	0	4000	2a	60	62, 65	5
329	2	1137	55	400450	8026250	0·1348	63	82	SM	—	30	SW	15	4000	2a	60	62, 65	5
331	1	185	55	352940	8105580	0·1012	61	71	CG	8·9	730	SE	15	1650		58	62	5

Expt No.	Plot No.	State Forest	UTM Grid Ref. Zone	East	North	Area (ha)	First measure	Last measure	Geol. type	Site quality	Alt. (m)	Aspect	Slope (deg.)	Rain (mm)	Struct. type	Years logged	Years treated	Plot type
332	1	1229	55	351630	8144880	0·1012	62	79	SM	7·0	560	W	10	2080		57	72, 74	5
333	1	310	55	360510	8089250	0·1064	61	78	SM	2·5	670	SW	10	2090		58	61, 73	5
347	1	310	55	358110	8089430	0·1012	59	74	BV	7·2	670	WNW	5	2000		55	55, 59	5
350	1	458	55	351100	8024380	0·2015	65	66	CG	8·1	600			1500		64	65	5
352	1	185	55	352590	8101460	0·2764	65	75	SM	7·8	680	SE	5	1320		30	65, 71	5
370	1	605	55	351150	8024300	0·2023	69	84	TG	5·0	760	NE	5	2000	8	52		1
370	2	605	55	351200	8024300	0·2023	69	80	TG	2·5	760	NE	5	2000	8	52	65, 68	1
380	1	1229	55	351300	8146920	0·0405	66	84	SM	0·6	440	SE	5	2030		52, 77	54	7
380	2	1229	55	351280	8146910	0·0405	66	84	SM	4·4	440	SE	5	2030		52, 77	54	7
380	3	1229	55	351360	8146850	0·0405	66	84	SM	4·1	440	SE	5	2030		52, 77	54	7
380	4	1229	55	351360	8146790	0·0405	66	84	SM	3·2	440	SE	5	2030		52, 77	54, 68	7
380	5	1229	55	351300	8146830	0·0405	66	84	SM	1·6	440	SE	5	2030		52, 77	54, 68	7
380	6	1229	55	351240	8146870	0·0405	66	84	SM	2·5	440	SE	5	2030		52, 77	54, 68	7
380	7	1229	55	351290	8146770	0·0405	66	84	SM	4·5	440	SE	5	2030		52, 77	54, 68	7
380	8	1229	55	351180	8146770	0·0405	66	84	SM	0·6	440	SE	5	2030		52, 77	54, 68	7
380	9	1229	55	351230	8146740	0·0405	66	84	SM	2·0	440	SE	5	2030		52, 77	54, 68	7
380	10	1229	55	351360	8146720	0·0405	66	84	SM	6·7	440	SE	5	2030		52, 77	54	7
380	11	1229	55	351310	8146690	0·0405	66	84	SM	5·6	440	SE	5	2030		52, 77	54	7
380	12	1229	55	351350	8146650	0·0405	66	84	SM	6·1	440	SE	5	2030		52, 77	54	7
380	13	1229	55	351340	8146570	0·0405	66	84	SM	4·8	440	SE	5	2030		52, 77	54, 68	7
380	14	1229	55	351320	8146620	0·0405	66	84	SM	7·0	440	SE	5	2030		52, 77	54, 68	7
380	15	1229	55	351250	8146640	0·0405	66	84	SM	5·4	440	SE	5	2030		52, 77	54, 68	7
380	16	1229	55	352200	8146660	0·0405	66	84	SM	3·4	440	SE	5	2030		52, 77	54, 68	7
380	17	1229	55	351180	8146720	0·0405	66	84	SM	1·4	440	SE	5	2030		52, 77	54, 68	7
380	18	1229	55	351120	8146710	0·0405	66	84	SM	4·0	440	SE	5	2030		52, 77	54, 68	7
381	11	194	55	332350	8085780	0·0405	66	84	CG	8·9	1180	SE	10	1650		56, 80	53	7
381	12	194	55	332330	8085790	0·0405	67	84	CG	6·8	1180	NE	10	1650		56, 80	53	7
381	17	194	55	331950	8085970	0·0405	67	84	CG	8·4	1180	SW	5	1650		56, 80	53, 67	7
381	18	194	55	331950	8085920	0·0405	67	77	CG	5·2	1180	SW	10	1650		56	53, 67	7
381	21	194	55	331790	8085870	0·0405	67	84	CG	2·5	1180	SE	5	1650		56, 80	53, 67	7
381	22	194	55	331750	8085890	0·0405	67	84	CG	6·0	1180	SE	5	1650		56, 80	53, 67	7
381	24	194	55	331930	8086000	0·0405	67	84	CG	—	1180	SW	5	1650		56, 80	53, 67	7
381	25	194	55	331910	8086000	0·0405	67	84	CG	2·5	1180	SW	10	1650		56, 80	53, 67	7
381	26	194	55	331730	8085970	0·0405	70	84	CG	—	1180	E	10	1650		56, 80	53, 67	7
381	27	194	55	331750	8085920	0·0405	67	84	CG	3·9	1180	E	5	1650		56, 80	53	7
381	28	194	55	331650	8085970	0·0405	67	84	CG	8·6	1180	NE	10	1650		56, 80	53	7
381	29	194	55	331640	8085900	0·0405	71	84	CG	4·7	1180	E	10	1650		56, 80	53, 67	7
381	30	194	55	331640	8085930	0·0405	71	84	CG	7·2	1180	E	10	1650		56, 80	53, 67	7
408	41	194	55	331690	8087040	0·2023	69	75	CG	6·2	1130	S	10	1650		69		4
408	42	194	55	331600	8086960	0·2023	69	75	CG	6·1	1130	SW	10	1650		69		4
408	43	194	55	331500	8087040	0·2023	69	75	CG	3·7	1130	S	10	1650		69	69	4
408	44	194	55	331400	8086960	0·2023	69	75	CG	3·8	1130	S	10	1650		69	69	4
408	45	194	55	331300	8087040	0·2023	69	75	CG	4·4	1130	SW	5	1650		69	69	4
408	46	194	55	331210	8086960	0·2023	69	75	CG	4·8	1130	SW	5	1650		69	69	4
408	47	194	55	331400	8087220	0·2023	69	75	CG	3·9	1130	NE	5	1650		69	69	4
408	48	194	55	331500	8087170	0·2023	69	75	CG	4·7	1130	NE	5	1650		69	69	4
423	1	756	55	354920	8052880	0·2023	68	76	BV	3·0	820	NE	20	2500		45, 64	68	5
423	2	756	55	355080	8052650	0·2023	68	73	BV	3·0	820	NE	20	2500		45, 64	68	5
423	3	756	55	355030	8052720	0·2023	68	73	BV	6·2	820	NE	20	2500		45, 64	68	5
423	4	756	55	354970	8052800	0·2023	68	73	BV	—	820	NE	20	2500		45, 64	68	5
423	5	756	55	355020	8052860	0·2023	68	73	BV	8·9	820	NE	20	2500		45, 64	68	5
423	6	756	55	354960	8052920	0·2023	68	73	BV	6·6	820	NE	20	2500		45, 64	68	5
423	7	756	55	355200	8052740	0·2023	68	73	BV	—	820	SW	10	2500		45, 64	68	5
423	8	756	55	355140	8052800	0·2023	68	73	BV	6·2	820	SW	10	2500		45, 64	68	5
423	9	756	55	355130	8052950	0·2023	68	73	BV	5·7	820	SW	10	2500		45, 64	68	5
423	10	756	55	355190	8052830	0·2023	68	73	BV	7·4	820	SW	10	2500		45, 64	68	5
423	11	756	55	355260	8052780	0·2023	68	73	BV	6·2	820	SW	10	2500		45, 64	68	5
423	12	756	55	355070	8053020	0·2023	68	73	BV	4·8	820	SW	10	2500		45, 64	68	5
431	1	1137	55	401150	8025700	0·1012	64	87	SM	7·2	30	—	0	4000	2a	50	56, 64	1
431	2	1137	55	400700	8025700	0·1012	64	87	SM	6·9	30	N	5	4000	2a	50	56, 64	1
434	1	310	55	361160	8086590	0·2023	70	83	BV	6·5	670	W	10	2000		30, 69	29	3
434	2	310	55	361160	8086630	0·2023	70	83	BV	5·8	670	SE	10	2000		30, 69	29, 70	3
434	3	310	55	361150	8086830	0·2023	70	83	BV	5·9	670	W	10	2000		30, 69	29, 70	3
434	4	310	55	361150	8086920	0·2023	70	83	BV	6·5	670	W	10	2000		30, 69	29, 70	3
434	5	310	55	361270	8086670	0·2023	70	83	BV	6·1	670	W	10	2000		30, 69	29, 70	3
434	6	310	55	361360	8086673	0·2023	70	83	BV	6·2	670	W	10	2000		30, 69	29, 70	3
434	7	310	55	361410	8086630	0·2023	70	83	BV	6·5	670	S	10	2000		30, 69	29, 70	3
434	8	310	55	361410	8086550	0·2023	70	83	BV	9·4	670	N	10	2000		30, 69	29, 70	3
434	9	310	55	361550	8086550	0·2023	70	83	BV	5·8	670	S	10	2000		30, 69	29, 70	3
434	10	310	55	361500	8086620	0·2023	70	83	BV	6·6	670	S	10	2000		30, 69	29	3
434	11	310	55	361630	8086590	0·2023	70	83	BV	5·6	670	S	20	2000		30, 69	29, 70	3
434	12	310	55	361630	8086520	0·2023	70	83	BV	5·2	670	SE	20	2000		30, 69	29	3
450	1	310	55	366880	8079880	0·2023	70	84	BV	1·2	760	NW	5	2000		51, 70	70, 73	5
450	2	310	55	366735	8079950	0·2023	70	72	BV	1·4	760	NW	5	2000		51, 70	70, 73	5
450	3	310	55	366770	8079830	0·2023	70	84	BV	2·2	760	NW	5	2000		51, 70	70, 73	5
450	4	310	55	366690	8079855	0·1214	70	72	BV	—	760	NW	5	2000		51, 70	70, 73	5
450	5	310	55	366675	8079805	0·1214	70	72	BV	4·5	760	NW	5	2000		51, 70	70, 73	5
450	6	310	55	366760	8079770	0·1214	70	72	BV	5·4	760	NW	5	2000		51, 70	70, 73	5
450	7	310	55	366830	8079750	0·1214	70	72	BV	7·3	760	NW	5	2000		51, 70	70, 73	5

Expt No.	Plot No.	State Forest	UTM Grid Ref. Zone	East	North	Area (ha)	First measure	Last measure	Geol. type	Site quality	Alt. (m)	Aspect	Slope (deg.)	Rain (mm)	Struct. type	Years logged	Years treated	Plot type
456	2	194	55	331660	8086520	0·1518	69	77	CG	8·8	1060	N	5	1650		54	54	5
469	11	607	55	353550	8126520	0·1619	70	82	CG	4·8	460	S	5	1800		59	70	8
469	12	607	55	353560	8126500	0·1619	70	82	CG	4·6	460	S	5	1800		59	70	8
469	13	607	55	353570	8126500	0·1619	70	82	CG	3·4	460	S	5	1800		59	70	8
469	14	607	55	353540	8126520	0·1619	70	82	CG	5·1	460	S	5	1800		59	70	8
469	21	607	55	353510	8126510	0·1619	70	82	CG	4·9	460	W	5	1800		59	70	8
469	22	607	55	353530	8126490	0·1619	70	82	CG	6·2	460	W	5	1800		59	70	8
469	23	607	55	353510	8126480	0·1619	70	82	CG	6·5	460	W	5	1800		59	70	8
469	24	607	55	353540	8126500	0·1619	70	82	CG	9·1	460	W	5	1800		59	70	8
469	31	607	55	353530	8126530	0·1619	70	82	CG	1·9	460	SW	5	1800		59	70	8
469	32	607	55	353540	8126510	0·1619	70	82	CG	5·2	460	SW	5	1800		59	70	8
469	33	607	55	353550	8126530	0·1619	70	82	CG	6·1	460	SW	5	1800		59	70	8
469	34	607	55	353560	8126510	0·1619	70	82	CG	6·2	460	SW	5	1800		59	70	8
576	1	756	55	362000	8038200	PRISM	78	87	BV	—	760	SW	10	2500		77		9
577	1	144	55	294450	8198710	PRISM	77	86	CG	—	1006	E	18	1036		77		9
582	1	144	55	292680	8200130	PRISM	77	87	CG	—	1070	S	13	1970		77		9
591	1	607	55	353600	8115540	0·4087	52	84	CG	8·2	730	SW	15	2200	8/9			10
594	1	310	55	357900	8089980	0·0741	51	83	BV	7·0	720	NE	5	2030	1b			10
594	2	310	55	357900	8090000	0·1437	51	83	BV	8·3	720	NE	5	2030	1b			10
594	3	310	55	357900	8090020	0·0660	51	83	BV	7·1	720	NE	5	2030	1b			10
595	1	310	55	361020	8086910	0·3237	51	83	BV	5·9	670	SW	10	2000		29	29	10
598	1	755	55	358550	8073100	PRISM	78	85	BV	—	520	SW	5	2540		62		9
606	1	185	55	357120	8098500	0·1012	50	83	BV	7·5	720	SW	5	1850		16	53, 65	11
608	1	310	55	364300	8078600	0·2023	51	87	BV	7·4	760	N	5	2290	1b	49		4
608	2	310	55	364300	8078600	0·1955	53	87	BV	6·9	760	E	5	2290	1b	49, 72	53, 66	4
608	3	310	55	364300	8078600	0·2064	56	87	BV	6·4	760	E	5	2290		49	56, 66	4
609	1	251	55	343480	8041060	0·1518	51	87	AV	5·6	770	S	10	1700	9	50		4
609	2	251	55	343520	8041040	0·2003	52	87	AV	3·8	770	S	20	1700	9	50	52	4
610	1	1229	55	352380	8145710	0·2023	51	87	SM	7·3	440	E	5	2030	12c	49		4
610	2	1229	55	352340	8145750	0·2023	52	87	SM	5·8	440	E	5	2030	12c	49	52, 66	4
610	3	1229	55	352320	8145780	0·2023	55	87	SM	6·0	440	NE	5	2030		49	55	4
611	1	VCL	55	376200	8022500	0·2023	51	68	AL	3·4	20	N	5	3800	1a	50		4
611	2	VCL	55	376250	8022500	0·2064	52	68	AL	5·2	20	N	5	3800	1a	50	52, 58	4
611	3	VCL	55	375700	8022500	0·2023	55	68	AL	6·4	20	N	5	3800	1a	50	55	4
612	1	268	55	409800	7904700	0·2023	51	86	CG	7·3	550	N	5	1900	8/6	51		4
612	2	268	55	409700	7904600	0·2023	52	86	CG	5·1	550	N	5	1900		51	52, 66	4
612	3	268	55	409800	7904700	0·2023	55	86	CG	7·1	550	N	5	1900		51	55, 73	4
613	1	344	55	367550	7987550	0·2023	51	86	CG	6·8	600	E	5	1300	2a	47		4
613	2	344	55	367530	7987570	0·2023	52	86	CG	3·3	600	E	5	1300	2a	47	52, 66	4
613	3	344	55	367580	7987590	0·2023	55	86	CG	7·2	600	E	5	1300		47	55, 66	4
614	1	1137	55	401650	8020500	0·2193	52	87	SM	3·8	30	E	15	4000	2a	50		4
614	2	1137	55	401650	8020620	0·2193	52	87	SM	5·0	30	E	20	4000		50	52	4
614	3	1137	55	401560	8020410	0·2023	55	87	SM	5·6	30	SSW	20	4000		50	55, 66	4
615	1	194	55	335650	8079850	0·2023	52	85	CG	7·7	1100	E	20	1650		47, 54, 77	52, 66	4
615	2	194	55	335600	8079900	0·2024	52	85	CG	8·4	1100	E	20	1650		47, 54, 77	52, 66	4
615	3	194	55	335100	8079600	0·2185	52	85	CG	8·4	1100	W	10	1650	14a	47, 54		4
615	4	194	55	334700	8079200	0·2023	52	85	CG	7·2	1100	S	5	1650		47	52, 66	4
615	5	194	55	334600	8079300	0·2023	52	85	CG	9·1	1100	S	5	1650		47, 54	52, 66	4
615	6	194	55	334650	8079200	0·2064	52	85	CG	9·8	1100	S	5	1650	14a	47, 54		4
616	1	194	55	332050	8086220	0·2084	52	87	CG	9·2	1100	NE	5	1650	9	51, 80		4
616	2	194	55	332070	8086280	0·2023	52	87	CG	7·1	1100	NE	5	1650	9	51, 80	52, 66	4
616	3	194	55	332050	8086280	0·2023	52	87	CG	6·8	1100	NE	5	1650	9	51, 80	52, 66	4
617	1	194	55	331850	8086100	0·1012	53	87	CG	7·6	1130	E	10	1650		51, 80	53	4
617	2	194	55	331800	8086150	0·1012	53	87	CG	7·7	1130	E	10	1650		51, 80	53, 60	4
617	3	194	55	331700	8086150	0·1016	53	87	CG	5·7	1130	—	0	1650		51, 80	53, 60	4
617	4	194	55	331700	8086100	0·1016	53	87	CG	8·3	1130	E	20	1650		51, 80	53, 60	4
617	5	194	55	331750	8086100	0·1028	53	87	CG	6·6	1130	E	20	1650		51, 80	53, 60	4
617	6	194	55	331900	8086050	0·1416	53	87	CG	3·9	1130	NE	5	1650		51, 80	52, 60, 66	4
618	1	251	55	348080	8038100	0·2003	54	87	BV	9·1	740	—	0	1800	5a	52, 67		4
618	2	251	55	348060	8037340	0·2023	56	87	BV	6·2	760	SE	5	1800	5a	52, 67	56	4
618	3	251	55	348080	8038050	0·2023	56	87	BV	6·5	740	—	0	1800		52, 67	56	4
619	1	458	55	375500	7928410	0·3966	54	86	CG	8·7	600	NW	5	1500	8	47, 73		4
619	2	458	55	375500	7928350	0·4047	54	66	CG	7·7	600	NW	5	1500	8/6	47	54	4
619	3	458	55	375550	7928350	0·1619	66	86	CG	4·9	600	NW	5	1500	8/6	47, 73	54, 66	4
619	4	458	55	375450	7928350	0·1619	66	86	CG	5·6	600	NW	5	1500		47, 73	54, 66	4
620	1	1229	55	351180	8146840	0·4047	55	87	SM	3·0	440	E	10	2030	12c	52, 76	55, 76	4
621	1	194	55	332710	8087400	0·2023	68	85	CG	7·4	1100	W	15	1650	9	64		4
621	2	194	55	332450	8087360	0·2023	68	85	CG	4·7	1100	SE	15	1650	9	64	68	4
622	1	310	55	360500	8091400	0·2023	68	85	BV	6·0	640	NW	5	2030	1b	67		4
622	2	310	55	360620	8091400	0·2023	68	85	BV	6·6	640	SE	10	2030	1b	67	68	4
623	1	1229	55	349600	8148520	0·2023	68	84	SM	6·1	430	NW	5	2030	2a	57		4
623	2	1229	55	349680	8148550	0·2023	68	84	SM	7·4	430	NW	5	2030	2a	57	68	4
623	3	1229	55	349660	8148580	0·02023	68	84	SM	7·5	430	NW	5	2030	2a	57	68	4
624	1	605	55	352200	8025050	0·2023	68	84	TG	5·8	760	NE	20	2000	8	51		11
624	2	605	55	351980	8024650	0·2023	68	84	TG	6·6	760	NE	5	2000	8	52		11
624	3	605	55	352980	8024550	0·2023	68	84	TG	4·7	760	SW	15	2000	8	51		11
624	4	605	55	352680	8024180	0·2023	68	84	TG	7·2	760	W	25	2000	8	51		11
624	5	605	55	349850	8024060	0·2023	68	84	TG	5·8	760	SW	5	2000	8	52, 80		11
625	1	185	55	354400	8106740	0·2023	68	84	CG	9·6	700	W	15	1650	8	52		11

Expt No.	Plot No.	State Forest	UTM Grid Ref. Zone	East	North	Area (ha)	First measure	Last measure	Geol. type	Site quality	Alt. (m)	Aspect	Slope (deg.)	Rain (mm)	Struct. type	Years logged	Years treated	Plot type
625	2	185	55	350510	8107810	0·2023	69	84	CG	8·8	945	S	25	1650	8/9			11
625	3	185	55	352310	8108900	0·2023	68	84	CG	8·8	1065	SW	25	1650	9	65		11
625	4	185	55	351200	8107360	0·2023	68	84	CG	6·9	790	E	15	1650	8/9	52		11
625	5	185	55	351150	8106620	0·2023	68	84	CG	7·2	730	SE	20	1650	8	70		11
626	1	1229	55	355500	8143090	0·2023	69	87	SM	5·4	360	SSW	5	2030	2a	54		11
626	2	1229	55	354760	8143540	0·2023	69	87	SM	7·0	360	NE	10	2030	2a			11
640	1	756	55	361100	8052500	PRISM	79	86	BV	—	720	N	15	2000		62, 80		9
679	1	144	55	290900	8201600	PRISM	80	85	CG	—	1100	N	5	1036		80		9
679	2	144	55	290600	8201700	PRISM	80	85	CG	—	1060	NE	5	1036				9
701	1	756	55	371650	8047300	PRISM	85	88	CG	—	400			2000		87		9
EP	2	185	55	349550	8103510	0·5000	71	87	CG	—	720	SE	5	1200		43		12
EP	3	607	55	350290	8110090	0·5000	71	87	CG	—	1120	NE	15	2400				12
EP	4	933	55	337490	8129060	0·5000	72	88	CG	6·4	80	SW	5	2500		59		12
EP	9	185	55	354440	8106960	0·5000	72	88	CG	—	710	E	20	1650		63		12
EP	18	143	55	311100	8169830	0·5000	73	87	CG	—	1100	W	5	2500				12
EP	19	750	55	368800	7954780	0·5000	75	87	CG	—	620	SE	10	2000				12
EP	29	650	55	345710	8059260	0·5000	75	87	AV	—	1200	SE	15	2700				12
EP	30	144	55	293260	8199380	0·5000	76	88	CG	—	980	W	5	1500				12
EP	31	755	55	375510	8061530	0·5000	76	88	SM	6·0	80	S	5	4000				12
EP	32	TR 14	54	752330	8479700	0·5000	75	87	SM	2·8	450	SW	5	2000				12
EP	33	452	55	348100	8088250	0·5000	76	88	BV	—	720	—	0	1400		52		12
EP	34	755	55	369440	8074860	0·5000	76	88	AL	—	380	SW	5	4000				12
EP	35	TR 55	55	322210	8190920	0·5000	77	87	SM	—	230	SE	10	2900				12
EP	37	679	55	660835	7649387	0·5000	77	87	BV	—	920	SE	5	2400				12
EP	38	194	55	338220	8073460	0·5000	77	87	AV	—	1000	SE	10	1800				12
EP	40	144	55	297320	8198970	0·5000	78	88	CG	—	800	N	10	1300				12
EP	41	NP	55	333200	8215260	0·5000	77	87	AL	—	15	SE	5	3500				12
EP	42	CL	55	745020	8590560	0·5000	77	87	AL	—	30	SE	10	2200				12
EP	43	194	55	333560	8085620	0·5000	78	88	AV	—	1120	S	20	2000				12
EP	44	194	55	295120	8205880	0·5000	80	88	CG	—	880	NW	5	2500				12