lypts, and serves to illustrate the very high standard of forest research in Australia.

This publication is available by mail order from:
AGPS Mail Order Sales
GPO Box 84
Canberra
ACT 2601
AUSTRALIA
and costs $A44.95 in paperback (cat.no.880515 5 RRP) or $A59.95 in hardcover (cat.no.870157 2 RRP).

J.D. Allen

Safety Manual on Silviculture

Comprehensive safety on tree planting and silviculture, from agricultural chemicals to ultra-high pruning, is contained in a new booklet released by Occupational Safety and Health – a service of the Department of Labour.

The department's senior bush safety adviser, Leon McIsaac, said the booklet is a pocket-size manual for forest workers that will also be invaluable to farmers, parks and reserves staff and anyone who works in a small wood-lot or forest.

He said many people in the forest industry are seasonal workers and are not aware of hazards such as chemical sprays.

"It's a very strenuous type of work and injuries can easily occur if safe practices are not followed."

He said the code is a complete manual covering things such as the use of chainsaws and hand tools; rules for safe tree felling, pruning and thinning; fires and burnoffs; tractor and helicopter operations; and road construction and bridges.

It also covers the legal obligations of employers and people who let contracts for silvicultural work.

"It's also a good guideline for farmers, for example, who are going to let a contract and are not sure of their obligations and liabilities. They can specify in the contract that all sections of the code must be complied with."

Mr McIsaac said the booklet will be a basic text for forest workers and sets out safe work methods that meet the requirements of the Bush Workers Act. It will also be useful for forest workers who are sitting the certificate in forest skills issued by the Logging and Forest Industry Training Board.

Copies of the Safety Code for Forest Establishment and Silviculture are available from area offices of Occupational Safety and Health.

In our Contemporaries

Forest Industries

LOADRITE TWO YEARS ON

Ellis, J. Vol. 17(9): 36-39 (1986).
After three years' operation the Loadrite has proved to be a reliable and useful tool for weighing forest outturn. Operated in the recommended fashion, it provided estimates of forest outturn which are more accurate than hand measurement and in close agreement with a weighbridge.

******

Appita

CHEMIMECHANICAL AND THERMOMECHANICAL PULPS OF RADIATA PINE COREWOOD AND SLABWOOD. PT3. FACTORS DETERMINING PAPER QUALITY

Kibblewhite, R.P., Corson, S.R., Graham, K.L. (1987) Vol. 40(2): 121-131.
Factors are examined which determine the qualities of papers made from radiata pine corewood and slabwood chemimechanical pulps (CMP) of yield about 90%, and thermomechanical pulps (TMP) of yield about 98%. Major factors which determined CMP and TMP paper qualities were (a) fibre surface compositions, (b) the morphology and/or surface chemistry of the −200 fines and of the coarse fines-type material in the −50/+200 pulp fraction, and (c) probably fibre collapse behaviours.

******

New Zealand Journal of Botany

ECOLOGY OF *NOTHOFAGUS MENZIESII* IN THE CATLINS ECOLOGICAL REGION, SOUTH-EAST OTAGO (I) SEED PRODUCTION, VIABILITY, AND DISPERSAL

Allen, R.B., Vol. 25: 5-10 (1987).
Production, viability, and dispersal of *Nothofagus menziesii* seed in the Catlins Ecological Region were measured and found to be similar to records from elsewhere in New Zealand. Seed production was greater at a low (150m) than a high (450m) altitude site, but seed soundness was higher at the latter. Sound seed had a germination rate of 80-95%, dropping to 50% after two years' storage. Seed was dispersed at least 250m from the nearest parent plant at both sites, and dispersal was more effective downslope than upslope. The distribution of isolated stands of *N. menziesii* in the Catlins Ecological Region suggests that seed can be dispersed, probably by wind, up to 6km from the parent plant.

******

ECOLOGY OF *NOTHOFAGUS MENZIESII* IN THE CATLINS ECOLOGICAL REGION, SOUTH-EAST OTAGO (II) SEEDLING ESTABLISHMENT

Allen, R.B., Vol. 25: 11-16 (1987).
Nothofagus menziesii seedling establishment in the Catlins Ecological Region was investigated with respect to microsite preference and the physical characteristics and vegetation of the surrounding site. The mycorrhizal status of wild seedlings was recorded. The germination and establishment was recorded. The germination and establishment of *N. menziesii* in different forest soils, which were sterilised and provided with mycorrhizal inoculum, were investigated. Site physical characteristics, and density and cover of woody plants, had little effect on *N. menziesii* seedling establishment. Raised, bryophyte-covered microsites provide optimum moisture and light conditions for *N. menziesii* establishment in the wild. *Nothofagus* seedlings can form effective mycorrhizal associations within both *Nothofagus* and other forest types in the Catlins. Under experimental conditions, seedling growth was best on relatively fertile podocarp forest soil, intermediate on *Nothofagus* forest soil, and poor on *Weinmannia-Metrosideros* forest soil. Performance on the last soil was due at least in part to the failure of seedlings to form mycorrhizal associations, despite provision of mycorrhizal inoculum and success in mycorrhizal establishment under similar conditions in the other two soils.

POPULATION DYNAMICS OF THE EMERGENT CONIFER *AGATHIS AUSTRALIS* (D. DON) LINDL. (KAURI) IN NEW ZEALAND (I) POPULATION STRUCTURES AND TREE GROWTH RATES IN MATURE STANDS

Ahmed M., Ogden J. Vol. 25: 217-229 (1987)

Twenty-five plots of mature kauri *Agathis australis* (D. Don) Lindl., covering the range of the species in northern New Zealand, were sampled for density, basal area, and species composition using a modified point-centred quarter technique. Two increment cores were taken from at least ten trees at most sites, and used to estimate tree ages and growth rates. The density of kauri stems ≥cm D.B.H. ranged from 17 to 416 ha^{-1}, and the basal area from 23 to 127 m^2 ha^{-1} in the 25 stands. Diameter distributions ranged from highly skewed and unimodal to flat and multi-modal with all size classes represented in most plots. Combined frequency distributions suggest that two or three kauri generations (cohorts) may be present on many sites.

There is only a weak relationship between age and diameter; individuals in the same 10 cm diameter class may vary in age by 300 years, and the largest individual on the site is often not the oldest. Mean annual diameter increments range from 0.15 to 0.46 cm yr^{-1} on different sites with an overall average of 0.23 cm yr^{-1}, equivalent to 8.7 annual rings per cm of core, about half the commonly quoted figure for growth rate. Periodic mean annual increment and mean annual increment curves are presented. It is concluded that the "normally attainable age" is >600 years. Individuals >2 m D.B.H. probably often exceed 1000 years, but there is no reliable evidence for trees >2000 years in age.

******

OCCURRENCE OF *ARMILLARIA* RHIZOMORPH POPULATIONS IN THE SOIL BENEATH INDIGENOUS FORESTS IN THE BAY OF PLENTY

Hood, I.A., Sandberg, C.J., Vol. 17(1): 85-99 (1987).

The distribution of rhizomorphs of species of *Armillaria* was determined in indigenous forests at three sites up to 80 km apart in the Rotorua-Bay of Plenty district, New Zealand, by systematically taking cylindrical soil core samples 16 cm diameter by 22 cm deep. There was significant between-site variation in the frequency of occurrence of rhizomorphs (4-19%; $p < 0.05$). At one site with four plots (36 × 28-36 m; up to 1.4 km apart), there was between-plot variation in rhizomorph frequency (13-31%; $p<0.01$), mean rhizomorph length per unit area of soil surface (2-9 m/m^2; $p<0.01$), and yield of isolates from samples containing rhizomorphs (41-89%; $p<0.01$). Distribution of viable rhizomorphs was clustered in two plots ($p<0.05$). Cultural techniques were used to identify species and intercompatibility groups among isolates made from rhizomorphs and basidiomata. Plots contained 19-93 groups of *A. novae-zelandiae* (Stevenson) Herink per hectare and 15-56 groups of *A. limonea* (Stevenson) Boesewinkel per hectare. Dimensions of intercompatibility group clusters varied from less than 4 m to at least 30 m across. Five out of eight billets of *Beilschmiedia tawa* (A. Cunn.) Kirk and *Pinus radiata* D. Don, protected from soil rhizomorphs by plastic shields, were each colonised by *Armillaria* species 20-22 months after being partially buried 1-5m from a dense cluster of sporulating basidiomata of *A. novae-zelandiae*. This result, together with the high numbers of intercompatibility group density, suggests that basidiospores may play an important role in the establishment of infection centres in New Zealand forests.

******

POPULATION DYNAMICS OF THE EMERGENT CONIFER *AGATHIS AUSTRALIS* (D. DON) LINDL. (KAURI) IN NEW ZEALAND (II) SEEDLING POPULATION SIZES AND GAP-PHASE REGENERATION

Ogden J., Wardle G.M., Ahmed M. Vol. 25:231-242 (1987)

The view that kauri *(Agathis australis)* is a successional species which does not regenerate in mature forest is entrenched in the New Zealand literature. However, seedling and sapling populations ranging from *c.* 200 to >2000 stems ha^{-1} were recorded in 25 mature kauri stands throughout the species' range in the North Island. Higher densities were recorded in gap-phase and successional communities. Gaps created by the fall of mature kauri trees at Trounson Kauri Park averaged 0.04 ha, and a few contained abundant kauri seedling and sapling populations. Denser seedling aggregates were sometimes associated with rotting stumps or logs on the forest floor. Trays placed in gaps showed kauri germination and survivorship rates greater than those placed beneath adjacent canopies.

Our data support a "cohort regeneration model" in which dense regeneration occurs in successional communities following large-scale disturbance. This leads to self-thinning "ricker" stands in which seedling recruitment is rare, producing a localised "regeneration gap". Continued mortality, increasing as the initial survivors begin to senesce, creates a higher frequency of canopy gaps, allowing a second less synchronous wave of recruitment to occur. However, many gaps may be lost to hardwood species so that succeeding cohorts are less dense. Despite a low efficiency of gap capture, the great longevity of kauri (≥ 600 years) implies that the species will survive on any site for 1500 to 2000 years – long enough for large-scale stochastic disturbance by landslip, storm, or fire to reinitiate the process.

******

DENDROECOLOGICAL STUDIES IN NEW ZEALAND 1. AN EVALUATION OF TREE AGE ESTIMATES BASED ON INCREMENT CORES

Norton, D.A., Palmer, J.G., Ogden, J. Vol. 25: 373-383 (1987).

Tree-ring counts from increment cores are widely used in ecological studies for determining tree ages. In New Zealand many canopy trees are slow-growing and long-lived, and have extremely narrow rings. Single rings or groups of rings may be absent on some radii. Such narrow and absent rings cause difficulties in ring counting and necessitate careful sample preparation.

The errors associated with age estimates derived from cores which do not reach the chronological centre of the tree (partial cores) are discussed. Four partial core lengths and three methods of estimation were used on cross-sections of known age from *Agathis australis, Libocedrus bidwillii, Nothofagus solandri,* and *Prumnopitys taxifolia.* It is concluded that mean errors may be less than ±10% where the core length represents 90% of the geometric radius (half eccentric growth, age dependent growth variations, and other growth variations. greater errors may apply to individual estimates, up to ±78% in one case. Moreover, the direction of the error (above or below the true value) is largely dependent upon the early growth conditions and is unpredictable. These errors appear to occur for three main reasons: eccentric growth, age dependent growth variations, and other growth variations.