that the basis for any plans for nuclear power in WA within the next two decades are political rather than economic. In the case of the Northern Territory this conclusion is even more apparent. Indeed, even in large grids the advantages of large electricity generating units may not be as great as commonly believed. (Abdulkarim & Lucas, 1977). (It can be argued that the basic motivations behind many large-scale power projects are vested corporate and bureaucratic interests and an unquestioning belief in the value of any large industrial development (Saddler, 1981).)

Although nuclear power has been compared with coal in this paper, in practice electricity supply planning should take into account a much wider range of options, including increasing the efficiency of energy use, industrial co-generation, the use of renewable power sources, load modification, and the possibility of alternative ways of satisfying needs now served by electricity. Such a wider analysis would need to go beyond the narrow capital and fuel-cycle costs used here and include environmental, political and social factors.

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Clearfelling versus Selective Logging in Uneven-aged Eucalypt Forest

J. B. Kirkpatrick and D. M. J. S. Bowman
Geography Department, University of Tasmania

Uneven-aged eucalypt forests used for pulpwood extraction are generally clearfelled. This method is not necessary to induce regeneration. Although few data are available to compare the effects of clearfelling and selective logging on these forests, it seems that clearfelling may be less expensive in the short term, but will result in a medium-term loss of sawlog, may be unsuited to extreme sites, may not be a more productive system than selection, and is likely to have more severe edaphic, aesthetic and biotic impact than selection. There may be a greater poential loss of productivity to wild fire with clearfelling than with selective systems.

The initiation of woodchip export industries in several Australian states during the decade 1970-79 met with considerable opposition, even to the point of sabotage, despite the assurances given by governments and government forestry departments as to the social, environmental and economic effects of such schemes. Much of the criticism of woodchip export schemes has related to the environmental impact of clearfelling operations, which have been argued to have severely deleterious effects on aesthetics, water quality, soils and native biota.

Clearfelling on a large scale has been a relatively recent development in Australian silviculture, and has been associated largely with logging operations which extract pulpwood; where only sawlogs are to be removed, the tendency in most states is still to use selective systems. In Australia, clearfelling was based on the research of Gilbert (1958) and Cunningham (1960) who showed that the baring of large areas of ground was necessary for satisfactory regeneration of eucalypts in forests with dense scrub or rainforest understoreys. The decade following this work saw large-area clearfelling, understorey felling, hot burning and aerial sowing being prescribed and applied to the wetter forests of Tasmania (Felton, 1976). These forests are usually even-aged, as a result of infrequent, intense wildfire, although often they can have two to three ages of tree where some of the previous generation survive conflagration.

In the drier parts of Tasmania most of the forests lack dense, tall understoreys and are distinctly uneven-aged, usually with a continuum of tree ages rather than with a number of distinct age classes. These forests are ecologically distinct from those occurring in the wetter areas.

Nevertheless, in the period 1971-72 with the granting of two large concessions over dry forests for the production of woodchips for export from Tasmania, the silvicultural system that had been developed for the wet forests was simply transposed to the dry forests. The regeneration of eucalypts in these forests definitely does not require clearfelling; the Australian group-selection system described by Jacobs (1955) is an adequate and proven alternative. Regeneration following the extraction of pulpwood from dry forests no more requires clearfelling than does that following the extraction of sawlog. In fact, the existence of a large pulpwood market makes the commercial upgrading of forests through selection much more feasible than can ever be the case with just a sawn-wood market, because sale for pulpwood eliminates the expense of disposing of those poor trees which, if left, would produce progeny that would downgrade the commercial quality of the forest. The question thus arises: why use clearfelling in uneven-aged eucalypt forests?

In this paper we critically discuss the arguments for and against clearfelling in such forests, and in doing so contrast the advantages and disadvantages of selective systems. We do not address ourselves to the important conflict between economic and intangible use of forests—that is, the case for no logging at all. We feel that the question we discuss is important nevertheless, given the large areas of our uneven-aged forest estate now devoted to the export of pulpwood and the prospect of further areas being added in Victoria. Our discussion relates mainly to Tasmania, where a significant shift from clearfelling of dry forests has recently been mooted by the Chief Commissioner of Forests.

There are some problems in defining clearfelling and selective logging, because although the extremes are clearly different they are linked by a continuum of systems. Perhaps the simplest way of drawing a line between these two extreme silvicultural systems is to call a system selective if it aims at maintaining a diversity in age and size of trees in a forest stand, and clearfelling if it aims to produce stands containing trees of one or two ages only. In selective systems a stand is at all times recognisable as a forest, whereas with clearfelling forest is not present in the structural sense for some variable proportion of the period between harvests.

Economic arguments

Clearfelling is generally thought to have short-term cost advantages (e.g. Forwood, 1974, pp 42-3; Gilbert, 1972). We know of no Australian studies that have verified this; American studies quoted by Routley and Routley (1975, p 327) draw the opposite conclusion. However, Gilbert and Cunningham (1972) have stated that leaving the young well-formed trees in the generally degraded dry Tasmanian forests would result in higher logging costs, and in higher roading costs in the initial years of the operation.

The practice in Tasmania has been to leave clearfelled compartments separated by areas of untouched forest, with the aim of building up a mosaic of stands of regeneration of different ages. This practice aids fire management, reduces aesthetic impact and evens out transport costs through time. In the case of selective logging, such a separation of logging areas by uncut forest would not be as necessary on aesthetic grounds, although a spread of cutting would still be desirable for evening out transport costs through time, and might be desirable in fire management. The cost differential in roading would depend on the spatial patterning of the selectively cut areas in relation to that of the alternative clearfelled areas. If a high degree of dispersion is regarded as essential for clearfelling operations but not for selective logging operations, the initial roading costs may be very similar. If it is thought necessary to disperse both types of operation, clearfelling has a clear economic advantage. The ultimate road density would probably be similar in both cases.

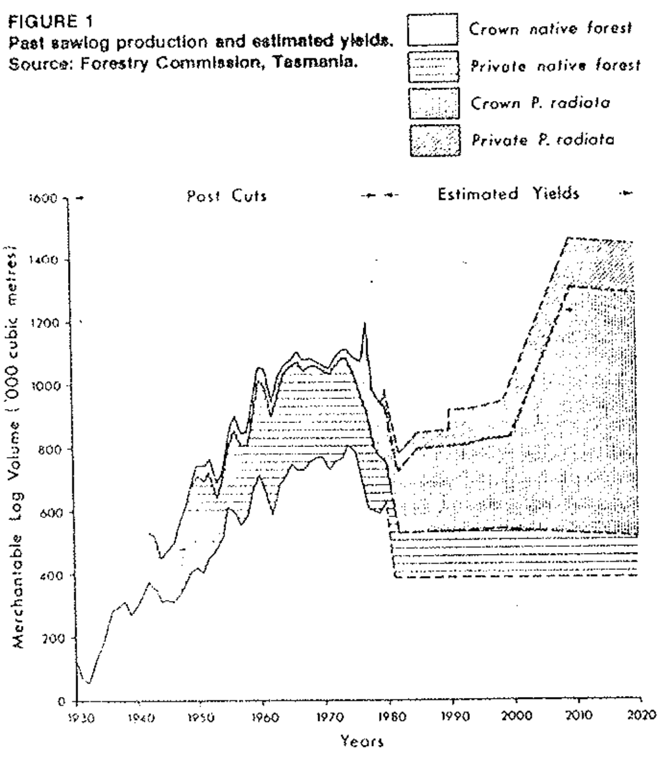
It seems reasonable to suppose that logging costs would be higher in selective than in clearfelling operations. With clearfelling the distance travelled in felling and snigging and the care taken in transportation to the truck would be somewhat less, and the movement of machinery from site to site would be less frequent.

Administrative costs would certainly be higher with selective systems, because of the extra labour required for planning, marking trees for cutting or retention, supervising operations and predicting yields. However, some of this extra work could substitute for the work and expense involved in collecting and aerially sowing seed after clearfelling, and some of it could be done when other work was lacking. The relative costs of regeneration burns following clearfelling, and of top disposal burns—a possible option with uneven-aged management—are not known.

Routley and Routley (1975, p 327) conclude that 'clearcutting may be favoured not because it is necessary or substantially more economical, but because it is administratively simpler (see also Jacobs, 1975), easier to apply with unskilled labour, more suited to the heavier equipment being introduced, preferred by the pulp industry, and most importantly maximises volume of wood produced'. All except the first (discussed above) and last points seem indisputable. However, whether clearfelling maximises growth of wood volume per unit time and area in uneven-aged eucalypt forests is uncertain (see below) and clearfelling on rotations of 40 to 50 years, as planned for much of the Tasmanian uneven-aged forests, will not maximise sawlog production in the long term.

Jacobs (1955, p 186) wrote that 'A position has arisen where Australia cannot afford to lose the groups of regeneration and the stimulated trees near the gaps (which will) provide the mill logs of the future.' Clearfelling on sites with any sawlog potential destroys the sawlogs of the next few decades—a point of considerable concern to sawloggers, who feel that not only is their product more socially and economically beneficial to the state than pulpwood, but also that their acceptance of past restraints on cutting operations in order to perpetuate the sawlog resource will not meet with a due reward (Kemp, 1981). In contrast, selective systems allow the growth of trees to any multiple of the period between cuts, thus enabling both small and large logs to be produced at the same harvest. The modification of clearfelling that involves the retention of pole-sized trees that could become sawlogs at the next cut almost necessitates the abandonment of hot regeneration burns.

FIGURE 1
Past sawlog production and estimated yields.
Source: Forestry Commission, Tasmania.



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Quite substantial areas of the Tasmanian uneven-aged forest estate have little or no potential to produce the relatively large logs, of suitable species, needed for sawing; here, pulpwood is the only possible wood product. However, in eastern Tasmania topographic and edaphic (soil) variation occurs at such a large scale that 'pulpwood forest' and 'sawlog forest' are often found within the same coupe. Much of the forest from which sawlog has been harvested, both recently and in the past, is now classified as short-rotation pulpwood forest because it can produce sawlogs only at an unacceptably slow rate.

Gilbert (1972) regarded rotation times of 85-100 years as prohibitively uneconomical, and suggested that sawlog would have to be grown more rapidly by relatively intense cultural practices on the best sites. Pulp thinnings in long-rotation clearfelled forest and uneven-aged management of some dry forest were suggested as options by Felton and Cunningham (1971). At present however, the economics of thinning seem dubious, and most of the dry forests are planned to be clearfelled on 40-to-50-year rotations. There is some immediate compensation for sawmillers: some sawlogs are recovered from unlikely-looking trees in the course of pulpwood operations, and others have been made economically extractible by the infrastructure provided for and by the pulp companies; but these gains are strictly temporary, in a situation where sawlog quotas have been and will be drastically reduced (Walker, 1981) and where predictions of a return to higher sawlog production are predicated on continuing yields from private land (Figure). (This latter assumption is demonstrably invalid, with the greater proportion of felled private forests going to pasture or wasteland (Everett and Gentle, 1977).)

Productivity

It is widely believed that even-aged management generally results in greater productivity than uneven-aged management (Gilbert, 1972; Felton and Cunningham, 1971; Opie, Curtis and Incoll, 1978; Assman, 1970). Among these authors, nevertheless, Opie, Curtis and Incoll (1978) felt that it was not proven that uneven-aged management was less productive for eucalypt forests; and the available evidence on a global basis is remarkably scant (Assman, 1970). For Australian uneven-aged forests the question is difficult to resolve, because large-area clearfelling is a very recent development. Gilbert (1972) stated that even-aged management might not be appropriate for very dry forests, and Franklin and DeBell (1973) suggest in their review of the effects of different harvesting methods on forest regeneration that continuous clearfelling aggravates regeneration problems where environmental conditions are severe (that is, near the tolerance limits of seedlings of the economically-preferred tree species). In subalpine *Eucalyptus delegatensis* forests the nature of regeneration after clearfelling tends to substantiate this suggestion. Growth check is evident on many sites, possibly related to the increased severity of frost in the absence of a canopy (Nunez and Sander, 1981). *E. delegatensis* uneven-aged forests which form a large proportion of the uneven-aged Tasmanian timber resource, occur extensively on plateau country close to the upper altitude limits of the species.

In forest types in which both even-aged and uneven-aged management are practicable in the short term, there seems little doubt that uneven-aged management results in a lesser volume per unit area in the regrowth trees (Opie, 1968; Opie, 1969; Incoll, 1979); the suppressive influence of standing canopy trees has been calculated as extending to three times the crown diameter for *E. sieberi* and 4.6 times the crown diameter for *E. obliqua* (Incoll, 1979). In an *E. pilularis* stand the greatest volume increments were obtained when the basal area of the larger trees was too great for the recruitment of seedlings into the sapling class (Curtin, 1963). However, these findings need to be seen in the context of the overwhelming importance of the canopy trees in volume increment. In a dense *E. obliqua* forest, Curtin (1968) found that the 51% of dominant and co-dominant trees accounted for 96% of the total gross basal area increment. In the 'wheatfield' regeneration that can follow clearfelling very little of the volume increment can be considered as productive in the economic sense, as mortality consequent upon the high density of the stand is enormous. Thus, the less-than-optimum volume increment provided by the felling of sufficient trees to allow sapling recruitment (if the results of Curtin (1963) are relevant to Tasmanian forests) may be greater than the ultimately useful volume increment that is gained in the years after clearfelling. In the typical situation of slash-burning followed by aerial seeding, the year or two between the initiation of harvesting and the establishment of a new crop contributes virtually nothing to the economic volume increment of the next crop, while a less thoroughly logged forest would be making good growth. The suppressive effect of the large remaining individual trees is unimportant if the increment that would otherwise go to seedlings occurs in the larger trees as a result of lowering of competition, and if vigorous replacement in gaps is sufficient to maintain a desirable density in the forest. It is important only if a large proportion of culls remain in the tallest stratum, a situation that should be avoided in uneven-aged silvicultural management. Figures 2 and 3 in Incoll (1979) show that basal area per unit area differs little beyond one canopy width from the trunk of suppressing trees, and that mean height differs little outside of the direct influence of the canopy. Thus, a forest could be expected to be adequately stocked with vigorous regrowth in all areas outside the tree canopies.

Fire

An argument based on fire requirements (Gilbert and Cunningham, 1972; Mount, 1976; Felton, 1976) has been used to justify the large size (200-400 ha) adopted for each clearfelled coupe in the east of Tasmania. In its simplest form the argument is that large coupes are necessary as it would otherwise be impossible to achieve the annual regeneration target with the few suitable days available for firing. Firing is assumed to be necessary to eliminate a hazard created by slash, and is thought to provide the cheapest and best seed-bed. Nevertheless 11% of the total area of coupes in the east coast forests have not been burned and aerially sown (Bowman and Jackson, 1981). Where there is a reasonable density of advanced growth and coppicing stumps, growth on the unburned sections of coupes appears to be superior to that on burned sections, where such growth is destroyed or severely set back. In general, however, there is no evidence of superiority of either type of treatment. Adequate stocking can be achieved in at least some Tasmanian uneven-aged forests without slash burning (see Felton and Cunningham, 1971; Bowman and Jackson, 1981), and on many sites—as evidenced by the 11% of unburned coupes—also without extra mechanical disturbance. Thus, the fire 'argument against uneven-aged management systems rests almost solely on the fire hazard created by logging slash and the assumed difficulty of hazard-reduction burning in such forests. However, it is hard to believe that the burning of slash in uneven-aged forests is very difficult; it is common practice in parts of New South Wales, and it was also common in the northeastern highlands of Tasmania to burn the grounded heads in selectively logged forests—a practice that has been repeated in experimental areas in the last year (E. Rolley, pers. comm.). At Eden in New South Wales the slash on small coupes has been left unburned, because it is not thought to be a serious problem compared with the unavoidable accumulation of fine fuel (leaves and twigs less than 6 mm thick) that occurs under young stands which cannot be burned (Bowman and Jackson, 1981).

If it is assumed that hazard-reduction burning is a necessary tool in the management of dry forests, a valid assessment of even-aged as opposed to uneven-aged management would need to take the following factors into account:

(*a*) the arrangement and duration of fire-free periods desirable to safeguard the crop and to prevent charcoal reducing the value of the wood;
(*b*) ignition hazard in the period between successive harvests (which depends on fuel dryness, arrangement and flammability, and the likelihood of unprescribed fire);
(*c*) fuel loads in the period between successive harvests—total fuel being taken as all ignitable matter up to wood of arm thickness;
(*d*) the likely impact of uncontrolled fire on the wood values of the forest;
(*e*) the cost and practicability of preventing and containing wild fire.

For the purposes of this comparison we assume that the uneven-aged forest has been subject to a light fuel-reduction burn two years before a harvest, plus other burns described below, and will be logged at 25-year intervals. We compare this form of management with that outlined by Mount (1969): clearfell, slash-reduction burn, aerial sowing and subsequent fuel-reduction burns.

Mount (1969) suggests that the first hazard-reduction burn in clearfelled forests should take place at year 15, followed by burning at 10-year intervals. This prescription recognises the virtual impossibility of hazard reduction in young even-aged stands where the production of fine fuels is rapid and inflammable foliage is close to the ground. In uneven-aged management, the regrowth in gaps created by logging would presumably require the same fire-free period, although if the gaps have been filled by advanced growth rather than newly established seedlings the period may be less. The fuel-reduction burn 2 years before the next logging operation could complete the uneven-aged cycle, the maximum period between fuel-reduction burns being only 2 years greater than for the clearfell system, and the average period being 12.5 as opposed to 10 years (if the disposal of heads by fire is not counted). As the rate of fuel accumulation declines rapidly from a peak value reached soon after fire (McArthur, 1967; Van Loon, 1969, 1977) this difference may not be of much practical importance.

A hot slash-reduction burn after clearfelling provides 2-to-3 years of almost absolute fire protection because flammability and fine fuel loads are low. Between 3 and 15 years after logging the amount of inflammable fine fuel will be large, and the eucalypts must be considered as secondary fuel (fuel requiring the burning of fine fuel to ignite). If a fire occurs in this period, virtually all the accumulated potentially merchantable volume will be destroyed. The structure of regenerating forest normally moves from heath to scrub to forest in this period, and the two former vegetation types are usually set back to ground level by fire. The potential new recruits to the tree stratum in the uneven-aged forest do not enjoy the same 2-3 years absolute protection from fire after logging, but fire hazard will be substantially reduced where the heads have been burned and many of the potential recruits will have enjoyed the low fire-hazard period after the prelogging burn. Fuel loads on the ground are likely to be higher in the uneven-aged forest than in the even-aged forest for the fifteen years after logging, because of the lower intensity of the preceding fire, the extra two years since a burn, and the contribution that can be expected from the unlogged trees. However, the secondary fuel component is likely to be much smaller, with unlogged trees gaining protection from fire by the height of their canopy above the ground fuel layer.

Gilbert and Cunningham (1972) suggested that in a selective system the buildup of fuel beneath groups of regenerating trees would be augmented by litter from standing trees, thus making it impossible to conduct hazard reduction burns until the regrowth was 15-20 years old. This added litter, they suggested, would result in a fire hazard that would be impossible to handle. There are no data on this subject, but it is interesting to note that the seedling-to-sapling transition appears to take place in the Eastern Tiers forests with a 6-15 year interval between fires, and that there are find stands of *E. delegatensis* in the northeastern highlands that have resulted from selective logging followed only by the burning of heads. Fires of moderate intensity in small patches of young regrowth often have a thinning effect, with only the tallest and most vigorous of the group retaining foliage or resprouting from the upper branches. Also, with the low understoreys typical of most of the dry forests, isolated released seedlings and saplings, typical of many gaps, seem soon to gain immunity from hazard-reduction fires.

The age structure and geometry of the uneven-aged forest is such that most of the potentially merchantable wood volume will survive all but the severest fire. Even after severe fire, mortality is generally low, with all but the trees in the heath and scrub height classes re-establishing their canopies. Salvage logging is also possible. Thus, uneven-aged management may act as an insurance against disaster, as it does not have the risk of the large loss of wood volume that can occur between ages 3 and 15 in even-aged stands, because a higher proportion of the ultimately harvestable trees are beyond the susceptible age and size classes.

The containment of wild fire is much easier in heath and scrub than in forest, because tall eucalypts tend to propagate fire through the spotting mechanism, they provide much greater fuel loads and thus temperatures, and fire break construction and back-burning are more complex and hazardous. However, on blow-up days fires are almost impossible to contain in vegetation of any structure, and in other conditions most fires are containable. In the Tasmanian situation fire protection may be more effective where adjacent private land-holders (a major source of fire) can perceive a crop, as after clearfelling, than when the forest, albeit selectively-logged, remains. However, even with clearfelling they remain an important source of fire.

Browsing

Felton and Cunningham (1971) demonstrated that sheep-grazing was capable of inhibiting or preventing regeneration in the dry forests, and that the marsupial herbivores also have an important effect. They suggested that large coupes should reduce the intensity of wallaby browsing, but that a total annual clearfelling program was likely to increase the wallaby population. Gilbert (1972) stated that control of sheep-grazing would be difficult in uneven-aged forests, presumably because the sheep would be more dispersed and less easily visible. However, fencing of State Forest boundaries, careful allocation of grazing leases and a punitive approach to illegal grazing should be able to solve this problem, which is tackled by the same means after clearfelling. Nevertheless the management authorities may incur extra costs in the prevention of sheep grazing with selective systems.

Soils

A critical consideration when assessing the desirability of different silvicultural systems for a particular forest type is the relative impact of the systems on the long-term productivity of the soil. In their discussion of this topic Langford and O'Shaughnessy (1976) conclude that soils which are relatively infertile, poorly structured, and low in non-capillary porosity, infiltration capacity and aggregate stability are most susceptible to deleterious effects as a result of forestry operations.

To be sustainable in the long term, the clearfell, burn and aerial-sow silvicultural regime adopted for the majority of the Tasmanian forests may require fertile and erosion-resistant soils. Regeneration burns result in a large atmospheric export of the above-ground nutrient capital (Harwood and Jackson, 1975), possibly followed—on poor soils—by increased losses to streams in the form of transported solubilised ash (Gilmour and Cheney, 1968). Better soils may have the ability to trap released nutrients (Kriek and O'Shaughnessy, 1974). Until complete nutrient input-output analyses are available we will not be able to assess whether Raison (1980, 1981) or Turner and Lambert (1980) and Nielson and Ellis (1981) are correct in relation to their implicit predictions of the future nutrient status of soils subjected to normal Tasmanian silvicultural practice. However, it is worth noting that none of the calculations assume any loss to streams following burning; that all assume that the total atmospheric input is trapped; and that none assume any input from weathering. Thus, at least for poor soils, the calculations of Raison (1980) may be highly conservative. However, if fire is not necessary after clearfelling, as suggested by Grose (1961) and Bowman and Jackson (1981), or if firing is used in uneven-aged management, the differences in nutrient loss between uneven-aged and even-aged management will be reduced broadly to those associated with differences in soil erosion.

Although soil erosion can be considerably reduced by the adoption of simple management prescriptions (Reinhart and Eschner, 1962), the amount of soil lost per unit area, with all else equal, is likely to be directly related to the proportion of biomass removed in the harvesting operation. This variable is closely related to the amount of soil disturbance and the removal of surface vegetation. The lesser the vegetation cover and biomass, the lesser are transpiration losses, and thus the greater is the amount of water available for runoff and erosion. Clearfelling also creates an environment in which there are far fewer obstacles to long-distance movement of water-transported soil particles than in the selectively logged forest environment, where bared areas are separated by those still vegetated and undisturbed. Gilbert (1972) suggests that the removal of large trees in clearfelling leads to an increase in ground cover compared with no logging, which in turn would *decrease* erosion. However, there are few dry-forest types in Tasmania where ground cover of vegetation, litter and rocks is not complete, and bared soil seems largely to result from burning even in these types, most of which cannot be considered as economically suitable for logging. Even in the few instances where increased ground cover may result from clearfelling, the same would presumably also result from selective logging. In any case, this purported advantage has to be balanced against the widespread mechanical disturbance and fire-baring of soil that occurs during and after harvesting.

The significance of the likely increased accelerated erosion associated with clearfelling undoubtedly varies with soil types and slope. A karst geomorphologist has suggested that the shallow soils on limestone in the Florentine Valley may not last many clearfell rotations (A. Goede, pers. comm., 1981). Complete downslope movement of the eluvial horizons of a podzol soil has been observed by one of us (JK) on a clearfell and planted site in the Dazzler Range, and the soils formed on granite in the northeast are highly susceptible to erosion (Pinkard, 1980). Soils formed on basalt, dolerite and the sedimentary Mathinna beds seem relatively resistant to erosion, although the latter soils are subject to slumping. Even with these soils, losses may still outweigh weathering gains on all but gentle slopes. There are no available data as to whether a balance in inputs and outputs is being maintained, but it seems reasonable to expect that soil outputs would increase as a result of mechanical disturbance not present in the natural ecosystem. Whether these increased losses would be compensated by a resultant increased weathering rate is not known. However, on most rock types soils are naturally shallow on even gentle slopes, suggesting that the weathering rate has been low. Natural forest cover provides one of the best protections against erosion (Langford and O'Shaughnessy, 1976), but this cannot be taken to mean that there is little or no danger of the disappearance of soils as a result of forestry operations, as areas left under forest are concentrated on slopes too steep and soils too poor to support agriculture and the erosion following clearfelling and burning is more severe than for the most similar natural disaster, wildfire.

Aesthetics

One of the major disadvantages of clearfelling is the ugliness that persists from the inception of logging at least until the new crop of trees forms a moderately dense canopy. In the case of short rotations this ugliness may affect up to ten percent of the area managed in this fashion. Whether an even-aged forest is more or less aesthetically attractive to the population in general than an uneven-aged forest, it may be safely assumed that selective systems create less of an impact on scenic amenity than clearfelling systems, as a perceptible forest stand is constantly present.

Nature conservation

There are few data available with which to assess the impact of clearfelling systems on the nature conservation values of uneven-aged forests. Duncan (1981) has shown that, on soils formed on sandstone near Buckland, clearfelling of vegetation has not eliminated any of the understorey species but promises to drastically change the composition of the dominant stratum towards the more commercially-desirable tree species. The Tasmanian Forestry Commission (1978) prescribes the proportions of species in seed mixtures with a deliberate bias towards the ash species, and suggests that in some cases it may be desirable or necessary to substitute non-local for local species. For example, the Commission recommends a twenty percent proportion of *E. tenuiramis* seed for resowing stands containing *E. sieberi* (Forest Commission, 1978), although the two species never naturally occur in association. The seed sown on to clearfell coupes is frequently not of the local provenance, which may have some advantage in increasing heterozygosity and thus avoiding the possibility of inbreeding depression, but risks the adverse consequences of using unsuitable species and/or provenances, or of using seed from a limited range of genotypes. In contrast, selective systems relying on natural regeneration perpetuate the local gene-pool and species composition, and do not require expensive collection and aerial sowing of seed.

The structural change that results from the conversion of uneven-aged to even-aged forests may have effects on the forest fauna. Those animals and birds which require the nesting sites provided by the older, malformed trees or which feed upon predators of the older trees are most likely to be deleteriously affected. Surveys which find no qualitative differences in the fauna of the coupes from that in adjacent control areas cannot be taken as conclusive unless it can be demonstrated that the full habitat requirements of all species will be provided during the course of the rotation.

Conclusions

The lack of relevant data and analyses on most of the questions discussed above, and the variability of the uneven-aged forest estate, make an overall assessment of the desirability of clearfelling and selective systems somewhat difficult. We believe, however, that such evidence as there is suggests that:

(*a*) in the short term, clearfelling may be less expensive than selective logging;
(*b*) in the medium term, clearfelling could result in economic losses associated with the loss of present potential sawlogs;
(*c*) there may be no medium-term productivity advantage from the use of clearfelling;
(*d*) some areas of the uneven-aged forest estate of Tasmania may be ecologically unsuited for clearfelling;
(*e*) the potential loss of productivity to wild fire may be greater with clearfelling than with selective logging;

(*f*) there is no cause to be sanguine in regard to the effects of clearfelling on most soils;
(*g*) aesthetic and nature-conservation values are likely to be least diminished by selective systems.

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