

High-country forestry: A conservation perspective

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The Department of Conservation was established under the Conservation Act 1987. As well as protected land and water management responsibilities, its functions include advocacy for the conservation of natural and historic resources generally. As defined in the Act, natural resources include all plants and animals and their habitats, ecosystems, landform and geological features, and landscape.

As the Government's conservation advocate, the department seeks to ensure that decision makers and land managers adopt policies and management approaches which will maintain or enhance conservation values. The department considers that forestry is a legitimate land-use activity within the high country, but one that should be placed in the context of the wider high-country landscape and its component values.

INTRODUCTION

Interest in commercial forestry in the high country has increased in recent years as a result of a decline in the fortunes of pastoral farming coupled with improved knowledge of the potential for forestry in the area. At the same time evidence of land degradation has led to a growing awareness that, in many areas, land-use change is necessary if the land resource is to be sustained and enhanced. Promotion of forestry as a land-use option within the high country raises a number of wider issues about future management arrangements for the area, the place of alternative land-use options, and the ways in which forestry can be integrated into the area without compromising significant conservation values.

THE HIGH-COUNTRY LANDSCAPE¹

The South Island High Country comprises the drier montane and intermontane areas

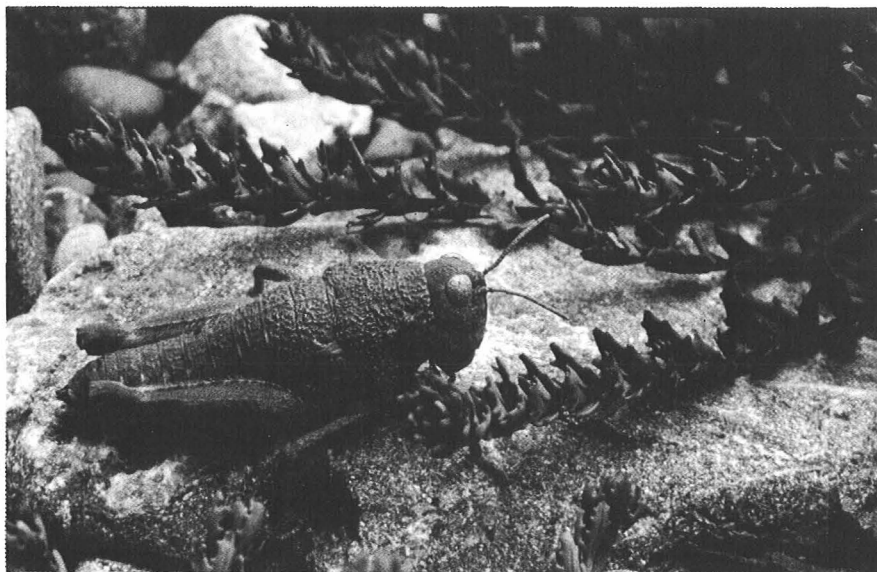


Dansey's Pass, a classic high-country landscape showing the dominance of landform and overall grassland cover.

of Otago, Canterbury and Marlborough, east of the Southern Alps. Much of the area was formerly forested, but natural fires, Polynesian and European burning, and grazing have resulted in the development of open grassland dominated rangelands.

The high country has a distinct identity that sets it apart from other parts of New Zealand. Contributing factors include the scale and youthfulness of the vast open montane landscapes, the distinctive fans, terraces, braided rivers, lakes and other fluvial and glacial features, and the overall

grassland cover which gives unity to much of the area and allows land form to dominate. The area has internationally important geomorphological values, and there is a wider range of other significant natural values including unique tussock, shrubland and remnant forest communities and habitat for indigenous invertebrates and lizards, birds and fish. Many of these areas have been identified as Recommended Areas for Protection (RAPs) from surveys carried out under the Protected Natural Areas Programme, or Special Sites of



Two endemic species adapted to the high country: *Brachaspis robustus* (robust grasshopper) and *Epilobium* spp. (Willow herb).

¹ The term 'landscape' is used here to mean the reflection of the cumulative effects of physical and cultural processes. This definition encompasses both the physical resource and people's relationship with that resource.

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Wildlife Interest (SSWIs) as a result of habitat surveys. However, survey work is incomplete and very few identified areas have legal protection.

While the dominance of landform and predominantly indigenous nature of the vegetation cover gives the area an overall natural character, the high country reflects past human activities and more recent impositions arising from farming, hydro-electricity development, settlement and tourism development, and limited forestry. Much of the high country is Crown land farmed under extensive pastoral leases, although there are areas of freehold land associated with more intensive farming on the easier country.

Many high-country landscapes are nationally significant for tourism and recreation. The area has immense symbolic and cultural attachment for New Zealanders which is reflected in their associations with the area, and in books, television, films, and paintings (Boffa Miskell and Lucas Associates, 1993; Ashdown, 1987).

SUSTAINABILITY ISSUES

Significant land degradation is considered to have occurred in some areas of the high country through depletion of the dry tussock grassland communities (Parliamentary Commissioner for the Environment, 1991). This process has been attributed to a number of factors including burning, overgrazing, high rabbit numbers, and the spread of *Hieracium* and wilding pines. There has been a decline in natural values, and the viability of extensive pastoralism has been considerably reduced (ibid).

Plantation forestry has been proposed as one solution to land degradation within the high country. Forestry is likely to be economically viable in the easier and wetter parts of the high country, particularly as there is an established infrastructure and research effort to support it. Research has shown that growth rates for commercial forest species in the high country compare well with other parts of the country (Forest Research Institute, 1985; Belton, 1991). Forestry is also promoted as enhancing overall sustainability through improved soil fertility, reducing soil erosion, and creating an environment less favourable to rabbits and *Hieracium* (Belton, 1993).

Plantation forestry has played a significant role in stabilising mass movement and soil loss in the unstable soft rock systems of the East Coast of the North Island, which are characterised by slope failure following removal of the original forest cover (Trotter, 1988; Parliamentary Commissioner for the Environment, 1988). However, land degradation problems in the South Island high country are, in many

respects, more subtle and complex than those in the North Island and are likely to be less amenable to single land-use solutions such as forestry.

The Department of Conservation raised a number of matters concerning the relationship between forestry and high-country sustainability at the recent Mackenzie Forestry Change hearings in Fairlie. The Plan Change sought to liberalise forestry in the Mackenzie basin, partly on the grounds that plantation forestry would assist in reducing land degradation within the area. While strongly supporting moves to reduce land degradation in the high country, the department argued that there was the need to distinguish between the promotion of forestry for economic purposes and arguments based on resource sustainability. In the department's view, insufficient emphasis has been placed on the potential adverse effects of forestry on the sustainability of the high-country landscapes and their components, while the contribution of forestry to improved land-use sustainability may be overemphasised.

The most visible evidence of land degradation in the high country is vegetation depletion and areas of bare ground, particularly in the semi-arid areas, reflecting a reduction in soil organic material, fertility, soil moisture and soil structure. This degradation reflects the interplay of a number of factors over time, including burning, grazing management and weed and pest spread, and institutional and economic considerations such as inadequate pest control, property location and size, fluctuations in farm income and the failure of the Land Act (Parliamentary Commissioner for the Environment, 1991). The spread of *Hieracium* has reduced the viability of extensive pastoralism but also reflects an ecological response to the loss of indigenous vegetation and provides a measure of ground cover.

While there is evidence of soil erosion occurring, information on rates and severity of soil degradation within the high country is currently limited. The principle forms of degradation appear to be a reduction in soil fertility arising from vegetation depletion and loss of litter, wind erosion, and sheet erosion. However, erosion and deposition events have been a factor in shaping the eastern South Island soils for many thousands of years, and many erosion features predate European and Polynesian settlement (McSaveney and Whitehouse, 1989). The extent to which wind erosion events constitute a redistribution of soil material as opposed to an outright loss from the system has yet to be determined. On some of the fluvio-glacial outwash terrace soils in what is considered to be the most depleted part of the

Mackenzie basin, there is evidence from soil profiles that these soils are now relatively stable (Webb, 1993).

In areas where soil degradation is evident, improved ground cover is likely to be critical in maintaining and enhancing soil organic material, fertility, and moisture. Forestry can provide ground cover in these situations, but grassland recovery through de-stocking and pest control, and options such as land improvement and fodder crops are also potential options, which may impose less impact on sensitive natural and cultural values.

While improvements in surface soil fertility arising from forestry are cited as improving overall sustainability (Belton, 1993) it is not clear to what ends improved phosphorus levels will be directed. The likely destruction of the indigenous grassland communities through afforestation means that nature conservation alternatives will not be the beneficiaries of this improved fertility.

High rabbit numbers are a significant contributor to land degradation and have probably contributed more to depleted ground cover than any other cause. While plantation forests produce an environment less conducive to rabbits, factors such as the ability to attract finance, runholders' attitudes, soil limitations and planning requirements for setbacks from roads etc. mean that full coverage of rabbit-prone areas by forests is unlikely. These factors, together with the need to protect seedling trees, mean that rabbits will continue to need to be controlled, regardless of which land-use options are chosen for degraded areas.

While forestry may provide a viable alternative economic land use in parts of the high country, climatic limitations mean that it is unlikely commercial forestry will locate in the semi-arid areas where land degradation is the most severe. Commercial forestry may therefore be more successful in improving the economic viability of properties in moister parts of the high country rather than addressing land degradation problems in the depleted semi-arid areas. While subsidised forestry may have a place in these areas, alternative land uses such as de-stocking, forage crops, tussockland restoration and tourism will also need to be considered, particularly where landscape values are sensitive to change.

FORESTRY AND CONSERVATION VALUES

Generally plantation forestry is incompatible with the retention of conservation values, in terms of both its effects on the landscape and impacts on their natural and cultural components.

Closed canopy plantation forestry is

likely to significantly alter or destroy the ecological functioning of indigenous plant and animal communities through clearance and ground disturbance arising from forest establishment and harvesting activities; shading and microclimatic changes; litter accumulation from needles; and altered soil nutrient status and chemical composition and fauna (Davis, 1993).

Savannah-type plantings and agroforestry are also likely to have adverse effects on natural sites, although shading effects and other microclimatic effects would be less pervasive. In addition to the range of effects previously outlined, an increase in pasture species (through shading and perhaps oversowing and top-dressing) would be to the detriment of indigenous species, as would increased stocking to take advantage of increased grazing opportunities (*ibid*).

Interception and increased evapo-transpiration associated with forestry has been well documented (Fahey, 1993). New plantings may affect freshwater habitat through reductions in flows and changes in water quality of the smaller, rain-fed rivers in the high country (Young, 1993). Where forests are planted around or close to bogs, flushes, seepages or tarns, transpiration may result in their drying up and subsequent alteration in species composition. Sedimentation and siltation of water bodies during harvesting is also a potential problem, especially in steeper areas where soils are erodible. Intense rainfall events could compound the problem.

Unless managed effectively, afforestation is likely to result in increased numbers of wilding trees (Ledgard, 1991). The spread of wilding trees already imposes significant management costs for natural areas and can ultimately result in similar adverse effects to those associated with



Burkes Pass: an example of a mature plantation (subsequently felled) located in an area of high historic and visual value, which also obscures the first views of the Mackenzie Basin.

planted forests.

The openness and high visibility of the high country means that many landscapes are vulnerable to changes brought about by afforestation. As well as an overall change of character, these impacts include the loss of indigenous natural values, the contrasting colour associated with exotic trees (particularly conifers), the masking of details in what is a relatively young landscape with vivid landform, inappropriate pattern and scale arising from poorly designed plantings, a loss of views and sense of openness, and impacts associated with wilding spread (Ashdown, 1987; Boffa Miskell, 1992; Findlay, 1994). Plantings also have the potential to mask historic features and destroy archaeological site stratigraphy.

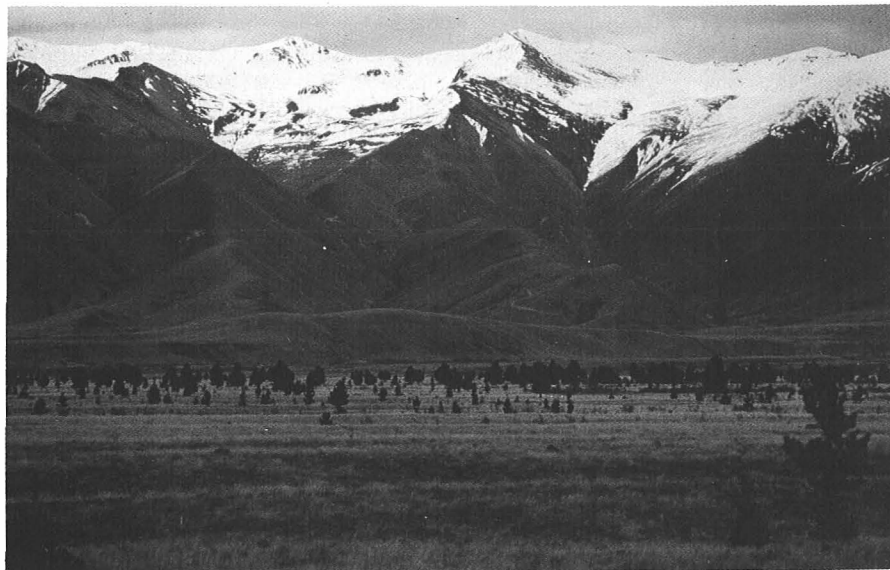
While exotic trees can enhance parts of

the high country where they have come to form part of the character of the area (such as Naseby, Queenstown, Tekapo and Hanmer), they have also resulted in the loss of natural features such as glacial landforms and rock outcrops. Harvesting could also have significant adverse effects on the visual amenity provided by exotic plantings.

MANAGEMENT CONSIDERATIONS

The scale and overall natural character of the high country means that for many of its conservation values, management is most appropriately considered at the landscape level. A number of important landscapes have been identified within the Canterbury high country in recent studies. These include the Kaikoura Ranges, Molesworth/Upper Clarence area, the Lewis pass, the upper Hurunui lakes, the Waimakariri basin, the upper Rakaia, the Upper Rangitata/Heron Basin, the Mackenzie/Waitaki basin, the Lindis Pass (Boffa Miskell, 1991; Boffa Miskell/Lucas Associates 1993.) There are a number of other places that are important tourism and recreation settings or have significance for their natural and historic values including the Molesworth area, Danseys Pass, the Lake Wakatipu and Lake Wanaka Basins, the Mavora lakes, and the schist/block mountains of Central Otago.

Landscapes are always changing, both naturally and through intervention, and landscape protection and management is arguably the most difficult issue to deal with in relation to plantation forestry in the high country. Much of the high country is a culturally-induced landscape that is neither completely natural nor com-



Wilding conifer spread, Pukaki Downs, Mackenzie Basin.

pletely modified but rather represents something in between. It is this combination of natural and cultural attributes that makes the high-country landscape of such importance for New Zealanders, but at the same time presents significant problems for management because of the ecological disequilibrium and tension between conservation and production values that change has created. This is well illustrated by the conflicts that have arisen over the relative priorities for natural and cultural values and water yields on the one hand, and commercial forestry on the other, in the Mackenzie Forestry Change process.

The conservation values of the high country are unlikely to be protected without intervention, as there is no commercial incentive for private landholders to avoid adverse effects on their values, while the cumulative effects of individual decisions could significantly change the landscape, through, for example, shelter-belt planting. Market failure also means that, in many areas, commercial forestry is likely to be favoured over other economic values of the high country landscapes such as tourism and recreation. Although mechanisms such as voluntary codes of practice, and community initiatives such as Landcare groups could play a role, coordinated and effective planning will be required to ensure that as far as possible environmental costs of afforestation are avoided and landscape change is managed so that important natural and cultural values are protected.

A number of management techniques to avoid or mitigate the adverse effects of forestry have been proposed (Boffa Miskell, 1992; Ashdown, 1987; Belton, 1989; Bennett, 1992; Ledgard, 1991). These approaches can be specified through District and Regional Plans to ensure that forestry is integrated with the high-country landscape. They include:

- identification of visually sensitive areas, and significant natural sites and cultural values (such as RAPs, SSWIs and other important habitat areas, natural features, archaeological sites, and wetland areas) which are to be avoided;
- performance and siting and design standards including: planting in sympathy with landforms, appropriate planting patterns and wetlands and other natural sites, harvesting conditions, and forestry management plans;
- wilding control conditions: including avoidance of take-off points, selection and planting patterns of species, and bonds and other conditions to ensure management of wilding spread;
- requirements for resource consents and environmental assessment procedures (for example, for effects on amenity values or hydrology).

The forestry development land-use study (Belton, 1989), and subsequent planning conditions for forestry on Tui Station in the Upper Rangitata, is a good example of an approach to afforestation which has taken underlying landscape values into account.

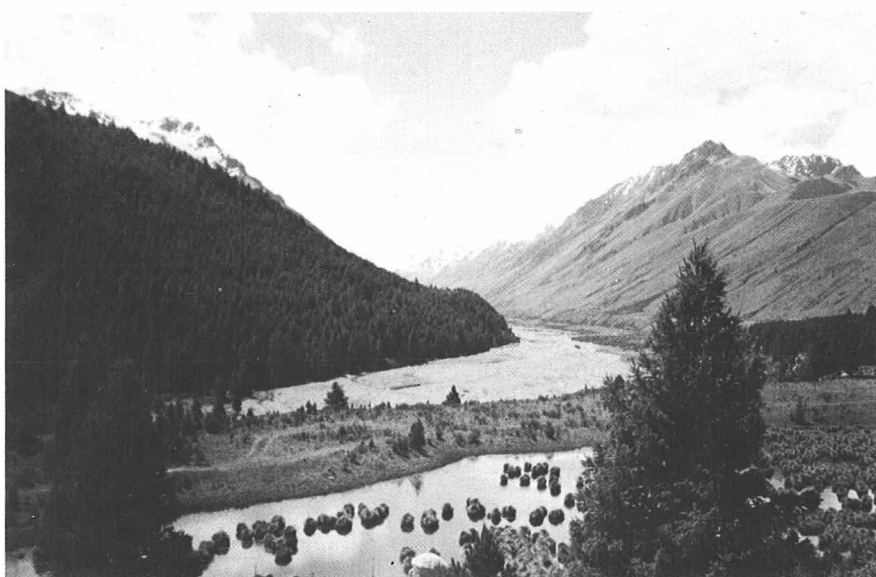
Despite the passing of the Resource Management Act, responsibility for the high country is still divided between a number of different agencies. These include District and Regional Councils (land and water resource management, weed and pest management), Ministry of Agriculture and Fisheries (Policy advice, Rabbit and Land Management Programme, regulation), Ministry of Forestry (Policy advice, forestry advocacy and regulation), and the Department of Conservation (Conservation estate management, protected species, freshwater habitat and wild animal management, conservation advocacy). The Office of Crown Lands, with Landcorp as their agents, play a key role through their administration of pastoral leases and other Crown land, while Crown Research Institutes play an important role in research and information dissemination. Currently, there are no formal coordinating mechanisms between these agencies.

While Regional and District Councils have responsibility for integrated land and water management, they lack expertise and experience in landscape management. In addition, their planning functions under the Resource Management Act do not extend to issues such as tenure, funding landscape enhancement, the cumulative effects of existing uses, or tourism or recreational planning. These factors and the key role played by Crown agencies in the high country mean that integrated planning and management at the land-

scape level is problematic. Improved coordination is likely to be required between district, regional and central government if the area's outstanding landscapes are to be protected, particularly where a significant land-use change such as afforestation is being considered.

In recent years there has been growing international interest in the sustainable management of heritage landscapes: areas of significant natural and cultural value which are managed to protect these values in conjunction with their resident communities (Lucas, P., 1992). The category of a Protected Landscape put forward by the International Union for the Conservation of Nature (IUCN) is designed to provide, within designated areas, for appropriate social and economic activity, resident communities and the protection and enhancement of ecological, cultural, and visual values (*ibid*). The approach recognises that many conservation values are located within developed and semi-developed areas, and that support of people and communities is critical for the retention of valued landscapes.

Given the high landscape values of the high country, and its significance both as a productive resource and for its natural and cultural values, there is scope for the application of the protected landscape approach to the area. Such an approach is likely to require legislative and financial support because of the vulnerability of purely bottom-up approaches to change (Lucas, 1992), and constraints to integration through District and Regional Planning. However inter-agency agreements and improved coordination, possibly through the framework provided by Regional Policy Statements and Plans, could provide a starting point.



The picturesque Jollie valley, on Mount Cook Station, with wilding European larch forest covering the western lea slopes of the lower valley. Photo: M. Belton.

Many outstanding landscapes are focused on the intermontane basins and valleys and reflect, to a large extent, communities of interest, and provide a focus for identity. Protected landscapes could represent a way of mediating between competing land uses (such as forestry and nature conservation) in these areas by overcoming some of the institutional barriers which currently exist to integrated land-use planning and management for the high country.

CONCLUSIONS

Forestry can provide a viable economic land-use option for parts of the high country which, in conjunction with other land-use options, may assist in reducing land degradation in some areas. However, climatic limitations mean that commercial forestry is unlikely to locate in semi-arid areas where degradation is most pronounced.

The potential impacts of forestry on the outstanding natural and cultural values of the high country mean that forestry proposals should not proceed without careful assessment of their environmental effects. Plantation forestry should be designed, sited and managed to fit in with the landscape and prevent impacts on important plant and animal communities, adjacent lands and waterbodies. Forestry should be avoided where it is likely to impact on visually-sensitive areas or significant natural or cultural values.

Current institutional arrangements for resource management in the high country may not adequately meet the challenges to landscape planning posed by afforestation. A protected landscapes approach may represent the best method for integrating forestry with other land uses within those parts of the high country which have been identified as having special significance.

REFERENCES

- Ashdown, M., D. Lucas, 1987, Tussock Grasslands Landscape Values and Vulnerability; New Zealand Environmental Council, Wellington.
- Belton, M., S. Thompson, 1989; Butler Downs Afforestation Land Use Study; Ministry of Forestry, Christchurch.
- Belton, M., 1991; Options for Forestry as a land use in the Mackenzie Rabbit and Land Management Area; Report for the Canterbury Regional Council; Ministry of Forestry, Christchurch.
- Belton, M., 1993; Evidence before the hearing for the Mackenzie District Plan Proposed Change 21 (Mackenzie Basin Forestry), September 6, 1993; Ministry of Forestry, Christchurch.
- Bennett, E., D. Lucas, 1992; Upper Waimakariri Basin Landscape Study Guidelines; Prepared for the Malvern District Council.
- Boffa Miskell Partners Ltd, 1992; Landscape

- change in the Mackenzie/Waitaki Basins; Prepared for the Steering Group, Christchurch.
- Boffa Miskell Limited and Lucas Associates, 1993; Canterbury Regional Landscape Study; Prepared for the Canterbury Regional Council, Christchurch.
- Davis, M., 1994; Evidence before the hearing for the Mackenzie District Plan Proposed Change 21 (Mackenzie Basin Forestry), September 6, 1993; Department of Conservation, Christchurch; communication.
- Fahey, B.D., D. Whitehead, 1993; An initial assessment of the impact of forestry on the water resources of the Mackenzie basin; Forest Research Institute; Report prepared for ECNZ, Dunedin.
- Findlay, C.M., 1994; personal communication.
- Forest Research Institute, 1985; "Exotic Forestry in the Canterbury High Country" in What's New in Forestry Research, No 134; FRI, Rotorua.
- Ledgard, N.J., E.R. Crozier, 1991; Guidelines for the control and management of wilding trees in the Canterbury High Country; Forest Research Institute Contract Report: FWE 91/4; Forest Research Institute, Christchurch.
- Lucas, P.H.C., 1992; Protected Landscapes A guide for policy-makers and planners;

- Chapman and Hall, London.
- McSaveney, M.J., I.E. Whitehouse, 1989; "Anthropic Erosion of Mountain Land In Canterbury" in New Zealand Journal of Ecology, Vol 12 (Supplement), 1989.
- Parliamentary Commissioner for the Environment, 1991; Sustainable land use for the dry tussock grasslands in the South Island; Office of the Parliamentary Commissioner for the Environment, Wellington.
- Parliamentary Commissioner for the Environment, 1988; Inquiry into flood mitigation measures following Cyclone Bola; Office of the Parliamentary Commissioner for the Environment, Wellington.
- Trotter, 1988; "Cyclone Bola: the inevitable disaster" in New Zealand Engineering July 1, 1988.
- Webb, T.H., G.G. Hunter, 1993; Notes on Soil Erosion in the Upper Waitaki Basin; Unpublished report to the Department of Conservation.
- Young J.R., 1993; Hydrological consequences of Afforestation in the Mackenzie basin; Canterbury Regional Council Report presented as evidence before the hearing for the Mackenzie District Plan Proposed Change 21 (Mackenzie Basin Forestry), 6 September 1993.

High-country pastoralism – 'The King is Not Dead'

D. Scott*

INTRODUCTION

Pastoral agriculture from the South Island high country was one of the foundations of New Zealand, and has been an important component of its economy for most of its history. Pastoral runs in New Zealand presently make up about 20% of the land area; they carry about 5% of the national stock and 3-8% of New Zealand net farm income, depending on how fine wool is selling. That there are some present difficulties is admitted, but to put it in perspective, the present debate on the high country, on decreasing vegetation stature, decreasing nutrients, and decreasing productivity, is very similar to the debate at the turn of the century in the North Island following forest clearance. The difference is that the North Island squandered their resources in 30 to 50 years whereas the high country has spun that out to a century and a half. The answer may be the same in both instances – fertiliser.

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PRODUCTION POTENTIALS

The tussock grasslands were grasslands because they were either too cold or too dry to support continuous forest cover. Originally there was probably a larger shrub component. While forests may have been more extensive in the warmer interglacial period prior to the tenth century, it is unlikely that they ever extended into the central basins, which are now the problem areas. Log remains and isolated stands which have persisted should probably be regarded as relics from that earlier warmer period, rather than an indication of general forest suitability during the colder period from the tenth to the present century. Trees have probably become generally more suitable with the temperature warming since the turn of this century.

My view is that the potential organic matter production of a site is determined more by environmental conditions than by species per se. The four most important environmental factors for pastoral purposes are soil moisture, temperature, soil fertility and the interaction of grazing and