

# The 2015 Banks Memorial Lecture: Advocating for nature conservation in New Zealand: Is there a dilemma?

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## Introduction

Given the many issues in nature conservation that I have been involved with as an aspect of my professional career as an academic plant ecologist over more than half a century, and despite many successes, it has become apparent over time that there are inherent dilemmas which must be accepted. For me there were two major research fields, both inherently controversial. The first involved my main research field of investigating the pure and applied ecology of the South Island tussock grassland high country. This research began with my MSc ecological study of Maungatua (a 980 m altitude range near Dunedin) in the mid-1950s, with an objective of defining their sustainable management from a runholder perspective. The second I refer to as a diversion since, immersed in the high country research, I was requested in 1969, by the New Zealand Electricity Department (via the DSIR Botany Division) to undertake an ecological study to describe the shoreline features of Lake Manapouri in Fiordland National Park ahead of government's proposed lake raising (by up to 26 m; the level of Lake Te Anau, upstream). The highly controversial nature of this proposal only became obvious to me over time.

Both of these issues introduced me to the field of 'ecopolitics': one aspect involving recommending changes to a highly traditional method of pastoral farming in order to address obvious land degradation and attempt to achieve sustainable management of the high country; the second contesting the aspirations of government politicians and senior engineering staff in two large government departments, Electricity and the Ministry of Works and Development. The first implicated some 20% of the area of the South

Island; the second the two largest lakes in Fiordland and the major gateway to New Zealand's most prestigious national park.

There were many other conservation issues along the way that I became involved with, by invitation or by my own initiative. These issues included the South-West New Zealand World Heritage Area proposal, the Lake Sumner damming proposal and the Denniston Plateau open-cast coal mining proposal, through the Forest and Bird Protection Society, and upper Clutha Hydro-electric development as a member of the Otago Catchment Board. Involvement with the Aramoana salt marsh/aluminium smelter proposal, proposed logging of the Waitutu forest sequence, the open-cast coal mining proposal in North Westland's Happy Valley (Cypress mine), the Nevis Valley hydro-electric development proposal and formation of the Wise Response Society were exercised more or less on my own behalf, but all with other like-minded concerned participants.

Each of these had their distinctive yet often similar aspects, as I will discuss in turn, and some (but not all) were associated with a range of dilemmas or 'brick-bats', not all necessarily obvious at the outset. One either adjusts and copes with these or seeks an alternative vocation. These aspects will be discussed together at the end of this article.

## South Island pastoral high country management: effects of burning and grazing

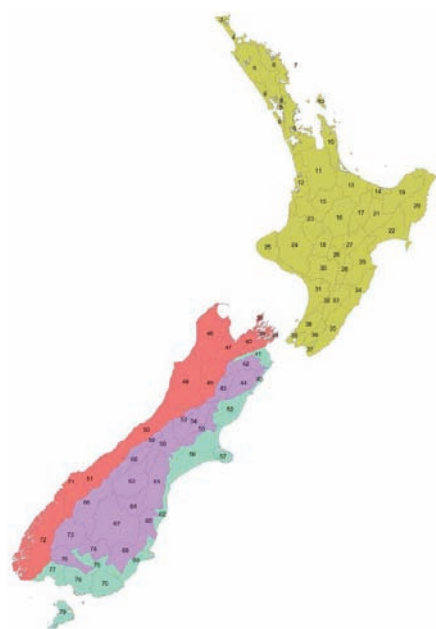
The comments of early surveyor Charles Kettle when he looked inland from Maungatua in 1847 were typical of many: the extensive grasslands to the west looked highly suitable for grazing purposes. But what he didn't know, and which was only revealed

much later, was that the large above-ground snow tussock biomass (of up to 8.7 kg m<sup>-2</sup>) had been accumulated over several years and was not the annual production. Nor would he have appreciated (as distinguished botanist Lucy Moore emphasised in the mid-1950s) that the tussocks are very long-lived, rivalling our oldest trees. I have even claimed the snow tussocks are 'potentially immortal' and if this is debated, my challenge is to 'find a dead one in a healthy tussock stand': they're rarely if ever present! They function like a perpetual motion machine. These features would justify recognition of our upland snow tussock grasslands as 'old-growth indigenous grasslands' such as recently proposed for 'the world's ancient grass-dominated biomes' in North and South America and Africa.

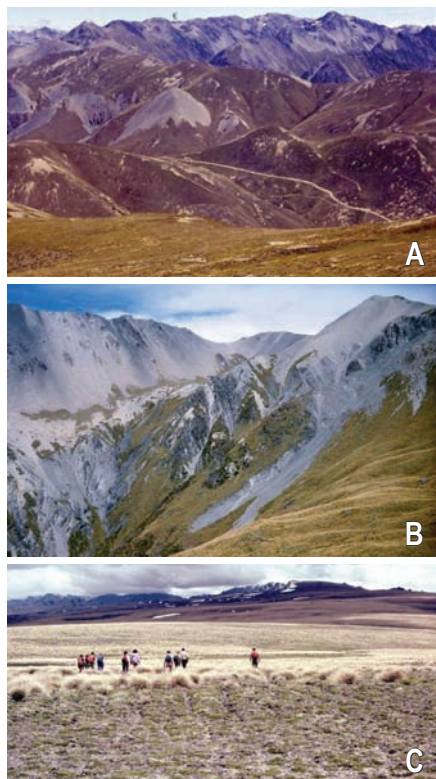
So from the earliest days of high country farming, which involved traditional practices of extensive grazing with mostly merino sheep and periodic large-scale burning, and negligible post-burn spelling (partly through inadequate fencing) there was concern with the obvious degradation. The botanist/artist John Buchanan was one of the first to record his concerns, noting in 1868 that "nothing can show greater ignorance of grass conservation than repeated burning which is so frequently practiced." However, nothing really changed and by 1910 agriculturist Alfred Cockayne and others reported on problems caused by burning. Distinguished plant ecologist Leonard Cockayne reported that indiscriminate burning had turned areas of tussock grassland "into stony debris". Lease conditions were modified to give greater security to the runholders (Fig. 1) but to little avail. Furthermore, the Tussock Grasslands Research Committee of senior government ecologists reported

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in 1954, based only on observations (Fig. 2A–C), that the upland snow tussocklands lacked regenerating tussocks and were assumed to be relic, out of phase with the prevailing climate, and pastoral farming was merely hastening the inevitable demise of these grasslands.



**Fig. 1** Map showing the outline of the South Island high country (purple) in relation to the western (red) and eastern (green) major regions of the South Island. High country lessees have rights to the pasturage, quiet occupation of the land, trespass protection and renewal of the 33 year lease upon expiry; their privileges are to burn, cultivate, plant trees, fence, change stocking rates, etc.



**Fig. 2** Examples of rangeland degradation. **A**, Molesworth. **B**, Craigieburn Mountains. **C**, Garvie Mountains.



**Fig. 3** Eastern slope of the central Old Man Range, Central Otago, showing the major vegetation zones in relation to patterns of measured annual precipitation and mean air temperature.



**Fig. 4** Snow tussock reciprocal transplant. **A**, 'top garden' on the crest (1590 m) of the Old Man Range. Portions of the same 20 tussocks from each of (left to right) Old Man 1590 m, 1220 m, 910 m and Maungatua 850 m, were planted at each of these four sites, as well as in the Botany Garden, in Dunedin (10 m). **B**, the same snow tussocks four years after transplanting to Dunedin, showing the prolific flowering of plants of all populations at this low-altitude site.



**Fig. 5** Study site at 1220 m, Old Man Range, showing various treatments, some separated by a firebreak (**A**) built in 1961: unburnt since c. 1945 and grazed (**B** & **D**); unburnt since 1945 and ungrazed since 1961 (inside enclosure) (**C**); burnt 1961 & 1992 and heavily grazed after 1992 fire (note the sparse snow tussock and numerous smaller tussocks of unpalatable *Festuca matthewsii*) (**E** & **F**).

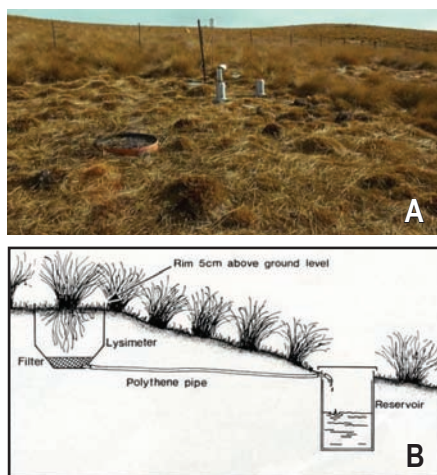
But there had been no detailed studies of the dominant tussock grasses. These began with Kevin O'Connor of Lincoln and me, funded by the Hellaby Indigenous Grasslands Research Trust, in Otago. These studies, however (Fig. 3), showed that the tussocks were highly adapted to their environments, even with local ecotypes adapted to a particular elevation on the mountainside, so that their irregular flowering was synchronous across a mountainside and related to relatively warm summer temperatures at a particular elevation (Fig. 4A–B). They also showed tolerance, even adaptation to periodic burning, but post-burn grazing was a different story (Fig. 5). While the snow tussocks were recovering from a fire their new foliage was nutrient-rich and very palatable, but extremely vulnerable to heavy grazing over these first 1–2 years of regrowth. This lack of tolerance of heavy post-burn grazing by sheep (or cattle) is perhaps not surprising since New Zealand ecosystems evolved with the absence of mammalian grazing. The runholders' apparent ignorance of this aspect seemed to be the main reason for the widespread degradation of the upland snow tussocklands under pastoral farming. It seemed traditions died hard among some runholders and as a consequence they contested my results and recommendations.

### Tussock grasslands and water production

Some runholders tried hard to undermine my credibility with the sustainable management recommendations of post-burn spelling



based on these studies and even more so, our findings on water yield from these upland snow tussocklands. We found from two student projects over more than ten years that the unmodified tall snow tussocks maximised water production on the eastern Otago uplands compared with any alternative cover, even bare soil. Our use of small tanks, lysimeters, containing single tussocks or other types of cover (Figs. 6A–B), meant we could have adequate replicates at each of the seven sites we studied, ranging from 490 m on the Lammerlaw Range to 1340 m on the upper slopes of the Rock and Pillar Range. To our surprise, we found that the tall snow tussock grassland yielded the maximum water, from 50 to 86% of the measured rainfall at most sites above 700 m, whereas short blue tussock (*Poa colensoi*) grassland yielded significantly less. Grassland recovering from burning or severe grazing also yielded less but the yields increased over the recovery period to equal that of the normal tussocks when fully recovered. The contribution of fog, which is efficiently intercepted by the long fine leaves of a snow tussock (we could catch up to half a litre of water an hour with a single snow tussock from a thick fog when no rain was falling), was the most controversial aspect of our conclusions, even though we later confirmed this by analysing the stable heavy isotopes of oxygen and hydrogen (which are more enriched in fog than rain). This debate continues but there is now no disputing that the tall snow tussocklands maximise water yield from the uplands, where most of the rain falls and fog often lingers (7A–B).



**Fig. 6** Water yield study of a range of cover types in upland snow tussock grasslands. **A**, lysimeter site. **B**, lysimeter profile.



**Fig. 7** A paired catchment water yield study at Glendhu, Lammerlaw Range, initiated by the FRI, now managed by Landcare Research, which has shown the long-term effects of exotic afforestation in significantly reducing water yield. **A**, *Pinus radiata* afforestation site. **B**, snow tussock grassland site.

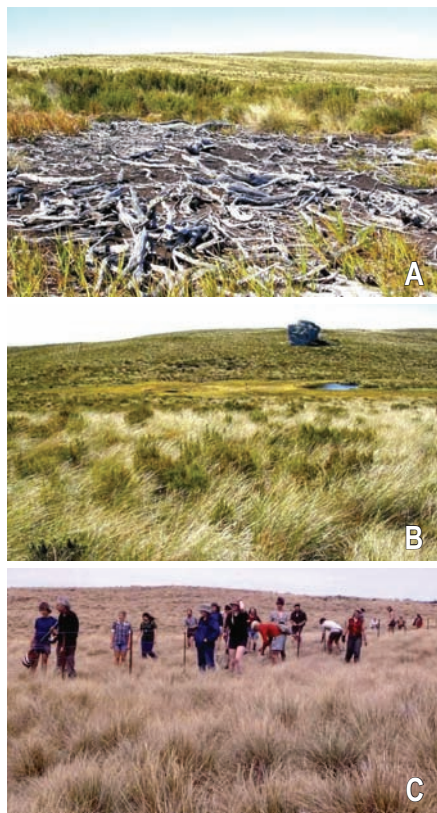
### Conservation of high country tussocklands: Maungatua Scientific Reserve

One of the problems I faced in researching the native snow tussocklands of the South Island high country was that there were no reserved areas, protected from the pastoral practices of burning and grazing. All 2.6 million hectares had been allocated to pastoral farming (so often referred to by the American term, rangelands) and so had been modified to some extent. This meant there were no areas available as baselines with which to compare the effects of various types of pastoral management, singly or in combination.

My first opportunity to begin correcting this situation came on Maungatua, my MSc study area. Soon after I began my research with the Hellaby Trust, when I had chosen Maungatua as an eastern region (and the Old Man Range, Fig. 3, and Coronet Peak as central and western regions, respectively), Alan Weatherall, who had a central lease on Maungatua's upper eastern slope, decided not to renew his lease when it was due for renewal in 1960, since he considered it uneconomic. I discussed with him and he agreed on the possibility of having it formally reserved, so I approached the Lands and Survey Department in Dunedin. The Forest Service also showed an initial interest which delayed progress for a year

or two but when they lost interest my proposal was given serious consideration and I visited the area with Reserves Ranger Colin Bassett who undertook to proceed with the proposal. Meanwhile I had discussed it with two adjoining neighbours, Archie Reid of the Allendale Run to the west and his brother Ken Reid of Horsehoof to the east. Their father had been the first lessee on Maungatua and all had a real affection for the area. Both Archie and Ken were interested in contributing to the proposal, Archie the remainder of the crest, including many cushion bogs and the largest area of sub-fossil bog pine-pine (Fig. 8A) woodland (the boundary fence ran along the summit and he planned to run cattle on his top block) and Ken an area of cushion bog and a large rock tor near his boundary (Fig. 8B); neither requested compensation. So I provided Lands and Survey with three options: all three areas; minus Ken's piece; and minus both Reid areas before leaving for my first overseas study leave early in 1966. I was assured of a 'prompt response' by Lands and Survey but on revisiting late that year I was dismayed to find a new fence along Archie's legal boundary and cattle causing obvious damage to old shrubs of inaka (*Dracophyllum longifolium*) and the large daisy *Celmisia semicordata* subsp. *aurigans*, and also serious pugging of the cushion bogs. Ken had already re-fenced and excluded his promised area. Archie had given up in despair, but offered to remove his cattle if the fence could be shifted, which it shortly was. Finally, the first formally protected area of c. 660 ha was achieved in the South Island pastoral leasehold high country (Fig. 8A–C). I couldn't persuade the department on a scenic reserve; no perceived scenic values meant it had to be a scientific reserve but it later achieved scenic status when areas of native forest were added at both ends in the 1970s.





**Fig. 8** Maungatua tussockland reserve, the first achieved from the South Island pastoral leasehold lands. **A**, subfossil *Halocarpus biformis* and *H. bidwillii*. **B**, summit plateau. **C**, boundary extension.

### Later tussockland reserve efforts leading to tenure review

My next opportunity for a tussockland reserve came with the development of the Black Rock area as part of the Lands Departments programme of agricultural intensification, for settlement of returned servicemen following World War II. Black Rock on the eastern slopes of the Lammerlaw Range provided an opportunity to protect a mid-altitude area ahead of development. A 120 ha reserve was achieved despite a prediction by the Department's reserves adviser, Prof. Lance McCaskill of (the then) Lincoln College, that the area would soon revert to a boxwood (*Hebe/Veronica odora*) dominated shrubland, if not grazed, periodically burned and top-dressed. I disputed this and undertook to monitor it if reserved which it was in 1972. Subsequent monitoring in 1986 and 2003 has shown increasing height and cover of snow tussock, negligible co-dominant shrubs, but, unpredictably, a significant increase in several sub-dominant native shrubs and abundant moss (*Hypnum cupressiforme*) as a ground cover. Significantly hawkweeds, which are generally aggressive in open tussock grasslands, remain rare here (Fig. 9).



**Fig. 9** Black Rock low-mid altitude snow tussockland reserve, showing temporal changes in the biomass index (BI) and height of snow tussock, co-dominant shrubs, sub-dominant shrubs and moss ground cover. Species names have been abbreviated.

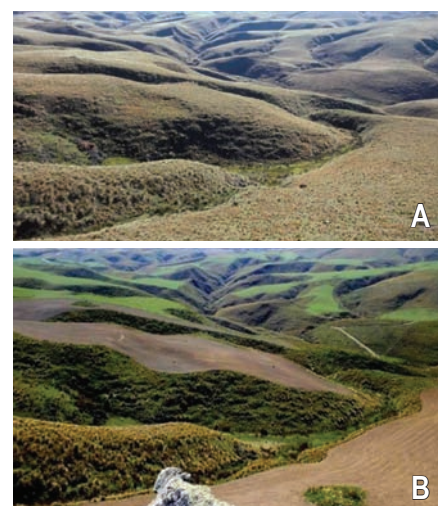
The **Nardoo catchment** was next in line when Lands and Survey Department acquired the adjoining Waipori Station (15,624 ha) for intensive farm development in 1974. Environmental Impact Statements were now required for all major government developments (an outcome of the Manapouri controversy). It provided for protection of 400 ha, mostly riparian strips and lakeshore verges, but also the only stand of native forest, a 10 ha stand of silver beech in the Nardoo catchment. A group of nine local scientists, university and government, submitted a proposal for much of the c. 1050 ha Nardoo catchment to be set aside as a representative regional reserve for baseline research and conservation: it well satisfied the established criteria for such a reserve. Our proposal was endorsed in both a subsequent independent audit and by a department scientist, as well as the Royal Society and Ecological Society. However, these endorsements were not mentioned when the department later announced its intention to protect only the upper half: the lower half was said to be too valuable for development. Dissatisfied with this outcome, we took the issue to the Ombudsman, who accepted our view: his first case dealing with a conservation issue. After several exchanges of information, which delayed the development, he recommended in 1982 that the whole catchment be reserved for 15 years, and then its value as a scientific reserve be reviewed. This was rejected by the Land Settlement Board on

### Monitoring results: Mean of 4x1ha. Ht- Frequency method

		1972	1988	2002
Ch. rigida	BI	287	690	810
"	" Ht	65	85	100
He. odora	BI	13	8	16
Drac. long.	BI	1	2	14
Ozo. lept.	BI	2	3	1
Cop. che.	BI	13	80	162
Gau. mac.	BI	72	106	116
Hyp. cup.	BI	8	38	111

Mark & Dickinson. 2004. *N.Z.J. Bot.* 41: 655-68.

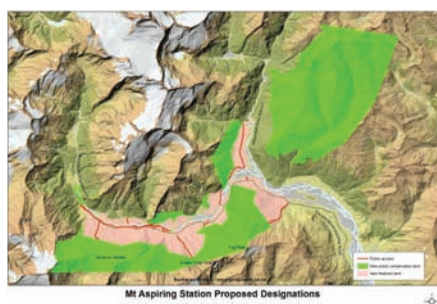
the basis that the lower part of the catchment could not be justified as a reserve and that deferment would detrimentally affect the development plans. And so the lower catchment was developed, despite further attempts to protect it (Fig. 10A–B).



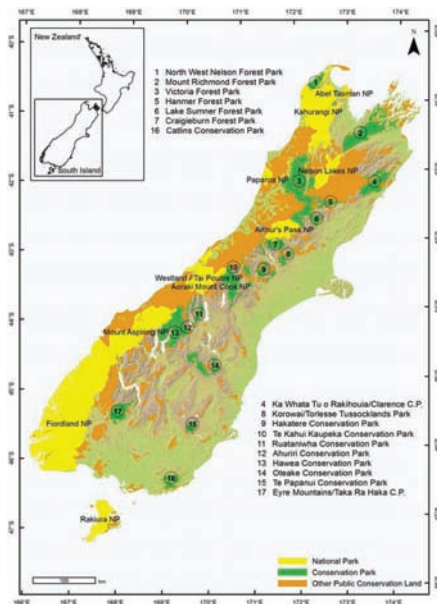
**Fig. 10** The controversial Nardoo case study. **A**, pre-development (1982). **B**, post-development of the lower catchment (1987).

However, the Ombudsman's statement "I am aware that tussock grasslands are seriously under-represented in the reserves system" proved most useful in future conservation campaigns. Moreover, the Ombudsman's comment on the lack of scientific representation on the Board was corrected with the new Labour Government in 1983, when Allan Evans, then President of Federated Mountain Clubs and I were appointed for the last three years of the Board's existence.





**Fig. 11** Outcome of Mt Aspiring Station's tenure review, showing a typical outcome of the lower slopes and valley floor being free-holded (pink) and the upper slopes transferred to Crown ownership (green), to be managed by the Department of Conservation.



**Fig. 12** Map of the ten South Island conservation parks, totalling 581,167 ha, established partly or wholly through the outcome of tenure reviews since 2000, in relation to the other seven, mostly forest parks.

Concerns with privatisation of some pastoral leases in the Teviot region of Central Otago in the early 1980s led to the Clayton Committee (1983) assessment of public interest in the high country: they recommended public involvement in any future freeholding. Trial studies in Marlborough (Awatere Ecological District), Canterbury (Mackenzie Ecological Region) and Otago (Rock & Pillar Ecological District), confirmed this and the subsequent tenure review process, initiated in the early 1990s, provides for this. Tenure review is an ongoing process, aimed at addressing land degradation and the multiple inherent values (landscape, ecological, biodiversity, recreation, historic, cultural) in the South Island high country. Formalised with the Crown Pastoral Land Act 1998, this review process is the largest land



**Fig. 13** Aspects of Te Papanui, a 20,590 ha Conservation Park, opened in March 2003 and the first in Otago. **A**, opening day with fog. **B**, the 'Waterland Park'. Photo: G. van Reenen. **C**, snow tussocklands and wetlands. **D**, Dunedin City's water catchment.

reallocation exercise in the country's history. To date (January 31, 2015) 99 of the 303 pastoral leases (involving 7.9% of New Zealand's land area) had completed reviews (Fig. 11), 17 were near completion and five properties had been purchased outright, involving 738,739 ha, of which 56.4% had been acquired as conservation lands, mostly at higher elevations, and 43.6% had been made freehold, sometimes with conservation covenants included. Despite the importance and often contentious nature of this process, there has been relatively little public interest, though most conservation and recreation organisations are involved. In addition to the establishment of ten tussockland conservation parks, totalling 581,167 ha since 2000 (Fig. 12), some notable conservation



**Fig. 14** Aspects of the 60,815 ha Oteake Conservation Park, on the Otago-Canterbury divide and opened in 2010. **A**, Park opening in Manuhierikia Valley. **B**, Hawkdun Range SW slope. **C**, Hawkdun Range summit plateau (1800 m). **D**, boulderfield crest (1830 m).

parks include Te Papanui on the Lammerlaw Range, eastern Otago uplands, often referred to as the 'Waterland Park' (Fig. 13A–D), Oteake in North Otago (Fig. 14A–D), the Eyre Mountains / Taka Rā Haka in northern Southland (Fig. 15A–E) and numerous conservation areas (total area unknown) (Fig. 16A–B).

Several important wetlands in the high country, including Nokomai (Fig. 17) and Teviot Swamp, have not yet been protected through tenure review. However, many smaller wetlands, important for their biodiversity and hydrological values, particularly water regulation (Fig. 13A–D), have been included.





A



B



C

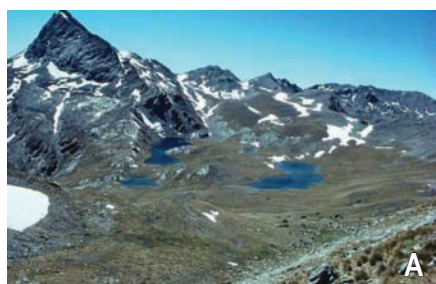


D



E

**Fig. 15** Aspects of the 65,160 ha Eyre Mountains / Taka Rā Haka Conservation Park in northern Southland, opened in 2003, and a biodiversity hotspot. **A**, entrance to park. **B**, altitudinal sequence. **C**, *Celmisia philocremna*. **D**, *Celmisia thomsonii*. **E**, *Ranunculus pilifera*.



A



B

**Fig. 16** Other rangeland conservation areas, mostly derived through tenure review. **A**, Remarkables Conservation Area. **B**, Old Woman Range Conservation Area.



**Fig. 17** Nokomai patterned low-alpine wetlands of c. 220 ha in the upper Roaring Lion catchment on the southern Garvie Mountains, ranked as internationally significant, but still within a pastoral leasehold property.

### Threats to the indigenous tussock grasslands: wilding conifers

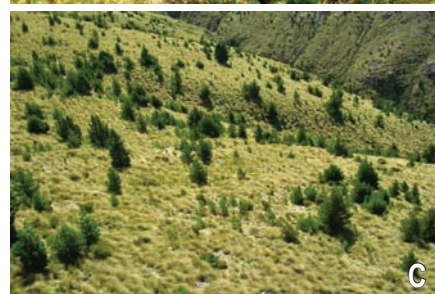
One of the greatest threats to the indigenous tussock grasslands is wilding conifer invasion, sourced from plantings made in the past for various reasons including commercial or land-restoration plantations, shelter belts or gardens. The problem has been steadily increasing, and it is now widely accepted as a national issue in urgent need of addressing. Indeed, a national wilding conifer management strategy was recently developed by the Ministry of Primary Industries (MPI), aimed at addressing the spread and containing or eradicating established infestations by 2030. The cost of inaction and procrastination has been enormous. Typical of the problem is at Mid Dome in northern Southland where some 250 ha of mostly lodgepole pine (*Pinus contorta*) was planted by central and local government agencies (Ministry of Works and Southland Catchment Board) in the 1960–1970s, on and



A



B



C



D

**Fig. 18** The wilding pine threat to the South Island high country is demonstrated on Mid Dome, northern Southland. **A**, sprayed trees in the background. **B**, volunteers at work. **C**, an area before clearance. **D**, after clearance.

around the eroded upper western slopes of previously mismanaged pastoral leasehold land. The eroded slopes remained bare but seedling pines readily established among the snow tussocks, downwind, in generally remote country. By the time corrective action began, some 80,000 ha was infested and consolidating fast into dense stands, eliminating most native cover. Not only was the upland landscape affected, but future options for land use and predictably water yield are both seriously reduced. I was invited to join the Mid Dome Wilding Trees Trust when established in 2007 to more effectively address the issue. A strategic 12-year eradication plan, estimated to cost c. \$12 million, was established, based on both manual and chemical methods using professional foresters and helicopters (for both access and boom spraying). But at year-7 we are behind schedule, mainly through limitation of funding and also because of less





**Fig. 19** Planting of conifers for commercial purposes continues, despite an acknowledged wilding threat to an adjoining tussockland conservation park downwind; a 180 ha Douglas fir planting by Landcorp on their Waipori Farm, Lammerlaw Range, upland eastern Otago.

than effective sprays. However, with recent development of more effective chemicals, an 'Armageddon brew', more precise GPS-assisted flying and aided by periodic volunteer assistance (Fig. 18A–D), we remain hopeful of achieving our mission here, though perhaps later than the 2019 target.

Control measures are also in place elsewhere but forestry encouragement loans, the Climate Change Response Act 2002 and the Emission Trading Scheme (ETS) all still encourage plantings for carbon sequestration as well as timber production. And with locally inadequate planning restrictions there are still cases of commercial plantings that carry a serious wilding threat. An example is Landcorp's planting of 180 ha of Douglas fir in 2012 on the upper slopes of their Waipori Farm on the Lammerlaw Range, eastern Otago, only 250 m upwind of wilding-free Te Papanui Conservation Park (Fig. 19) and despite their consultants advising that the wilding threat would be serious.

### Loss of low-to-mid altitude ranglands

With tenure review of the high country leasehold lands achieving most of its protection on the more vulnerable uplands, there inevitably has been relatively little conservation of low-to-mid altitude areas and once freeholded there may be inadequate constraint on intensification of development. The Mackenzie Basin is one region where this has resulted in extensive modification, mostly for dairying, with associated irrigation and serious loss of indigenous plants and invertebrates unique to this particular environment (Fig. 20). This has been recently addressed by the main stakeholders in a 'Shared vision forum' which reached a compromise, 'The Mackenzie Agreement', that is yet to be implemented.



**Fig. 20** Free-holding of lower elevation pastoral leasehold high country often results in its intensive development and the loss of unique biodiversity and landscape values, as shown in the Lower Mackenzie Basin, c. 500 m.

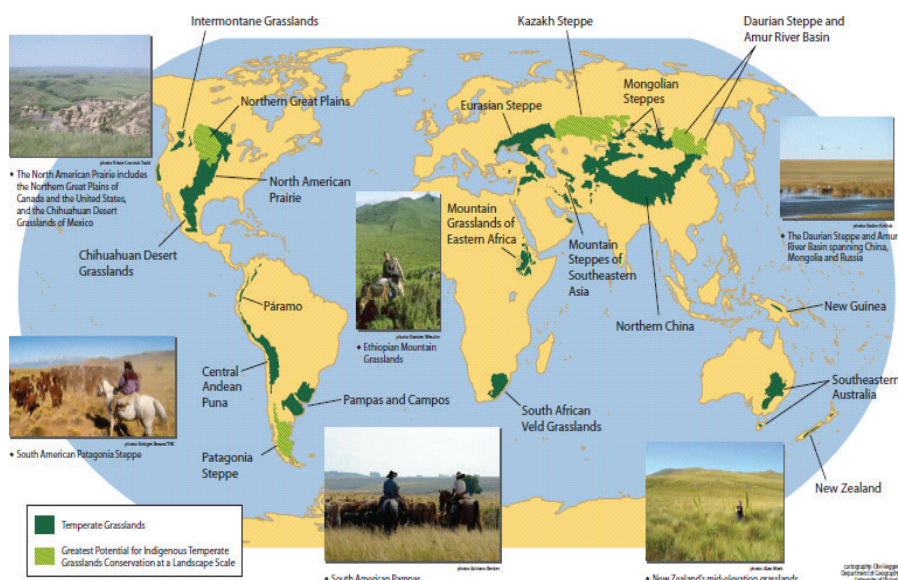
The lower Nevis Valley in a remote part of Central Otago, recognised for its outstanding landscape, unique native galaxiid fauna and white-water rafting, was saved from the threat of inundation for hydro-electric development when contested in

the courts. But various forms of development, viticulture, agriculture and lifestyle housing are the more common outcomes of these lower areas following tenure review.

### New Zealand as part of the world's temperate indigenous grassland resource

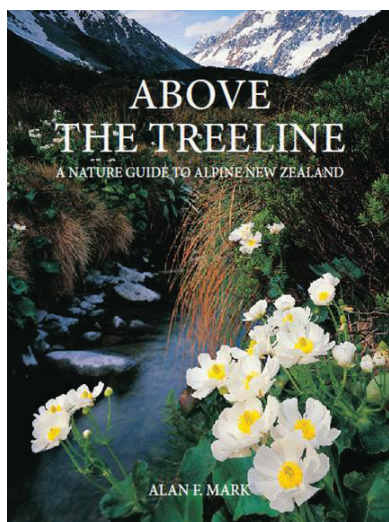
Despite its small size, New Zealand makes a notable contribution to the temperate indigenous grasslands of the globe, with its unique biodiversity and with some 15.4% of the baseline (1840) extent of 82,436 km (c. 31% of the land area) formally protected, based on an assessment in 2007. This compares favourably with the world average of c. 5% protected, as of 2008 (Fig. 21). We have gained some 2.6% since 2002, largely through tenure review, but as in the rest of the world both the areas remaining (all modified to varying extent with human influences) and also the level of protection, increase with elevation reflecting the lower productive potential associated with the temperature decline as altitude increases.

Of the lower elevation (montane and subalpine) grasslands, some 25% of the original short (silver-fescue) tussock grassland remains with only 5% of this protected, while c. 20% of the tall red/copper tussock (*Chionochloa rubra*) grassland persists with 21% of it protected, and c. 84% of the tall snow tussock (*Chionochloa* spp.) remains with 39% of it protected. At higher (low-alpine) altitudes, some 98% of the original tall tussock grasslands persist with 61% of it



**Fig. 21** New Zealand is a small but nevertheless significant component of the world's temperate indigenous grasslands.





**Fig. 22** My books on New Zealand's unique alpine flora, initially illustrated by the late botanical artist Nancy Adams, but recently with photographic images, have highlighted the regional variation, including the South Island pastoral leasehold lands.

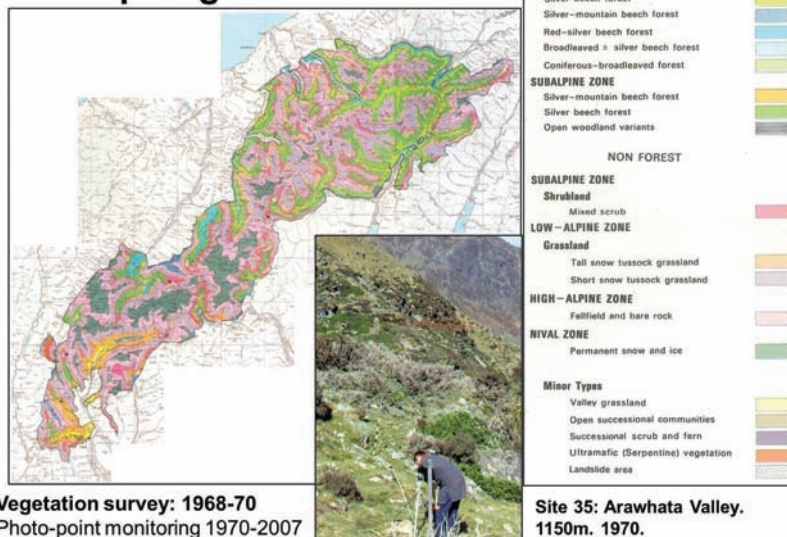
formally protected. Not surprising, the South Island high country region has somewhat lower levels of protection than in the North Island and also the South Island western region, along and west of the main divide, where most of our national parks are concentrated.

Many of our native plants confined to the rangeland areas, and the alpine plants here (Fig. 22) can be quite diverse but are generally smaller, less showy and, as might be expected, generally less palatable to introduced herbivores than those which occur in the higher rainfall western regions. Here the more palatable snow tussocks (mid-ribbed tussock, *Chionochloa pallens*) and some of the large herbs, such as the buttercups (*Ranunculus lyallii* and *R. buechananii*), snow marguerite (*Dolichoglottis scorzonoides*), *Anisotome haastii*, *Astelia petriei* and *Ourisia* spp., are now returning to their earlier prominent role following the control of feral deer, as I have found since surveying the Mount Aspiring National Park in the late 1960s (Fig. 23, 24) when very effective commercial hunting using helicopters was introduced. The future of these spectacular alpine plants will depend on continuation of effective animal control.

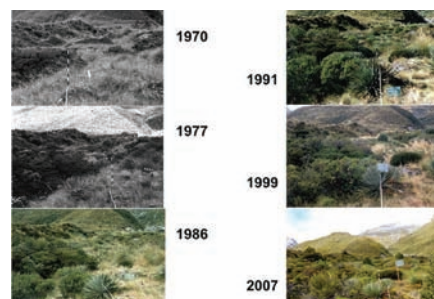
### A diversion: the Lakes Manapouri – Te Anau controversy

When a request to the University of Otago from the New Zealand Electricity Department came, in late 1969, for an ecological study of the

## Mt Aspiring National Park



**Fig. 23** Mount Aspiring National Park vegetation map based on a survey in 1968–1970 when the more remote areas were seriously degraded by uncontrolled red deer. Some 89 representative sites were established at this time for periodic photo-point monitoring.



**Fig. 24** One of the photo-point monitoring sites, here in the upper Dart Valley, showing the obvious recovery of the alpine vegetation; increased height, cover and diversity, over 37 years with greatly reduced deer numbers, achieved mostly with efficient commercial hunting using helicopters.



**Fig. 25** View northwest across Lake Manapouri to the Kepler Mountains from The Monument, showing the steep glaciated terrain and a few small sandy beaches among a generally forested landscape.

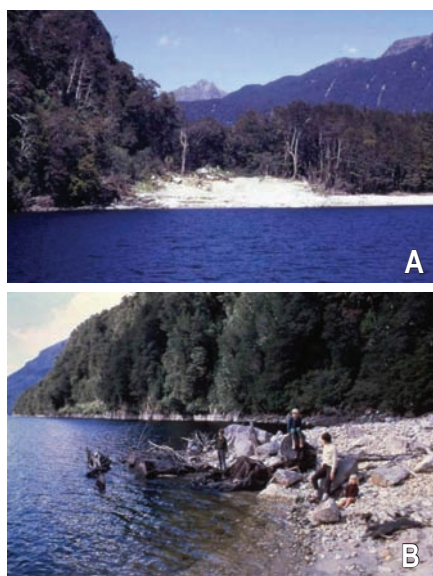


**Fig. 26** Schematic view of the Manapouri-Te Anau catchment system from the southwest, showing the planned development: two control structures and the Power Station and associated tunnels, as well as the natural lake level variations for each lake.

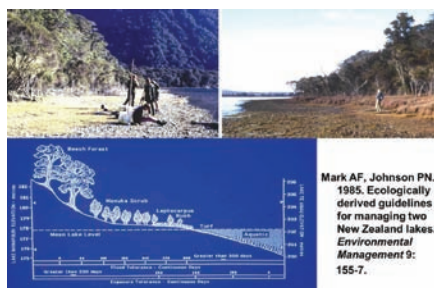
Lake Manapouri shoreline (Fig. 25) pursuant to raising the lake some 28 m, to that of Te Anau, as provided for in the Manapouri-Te Anau Development Act of 1963 (Fig. 26), it landed on my desk. Encouraged by a student interested in wetlands, Peter Johnson who was looking for an Honours project and interested in this exercise, I accepted the request. We first visited together in October 1969 and initially looked at the trial clearing at the head of South Arm which had just been completed with heavy equipment accessed via the new Monowai-West Arm access road. When later quizzed by a Radio NZ reporter I aired my reasons for being unimpressed (Fig. 27A–B) and when these were later broadcast with the quite contrary views of the Electricity Department's general manager, I was concerned with the possible implications. Fortunately the Vice Chancellor of my University was reluctant to accept cancellation of the contract and requested we continue. Indeed we had completed the study before being advised in May 1970 that the contract was off, and the report was duly submitted. It was later endorsed by four senior government ecologists for the Manapouri Officials Committee and so became a basis for several public meetings on the controversy.

Meanwhile Lake Te Anau had received little attention with a general assumption that effects of the scheme there would be minor. This was found to be otherwise when its proposed levels were found to contravene a





**Fig. 27** The controversial Manapouri lakeshore clearance exercise at the head of South Arm. **A**, soon after completion (December 1969). **B**, 15 months later (March 1971) when previously buried tree stumps were exposed along the lake edge.



**Fig. 28** The lakeshore vegetation survey and results in relation to the natural lake level variation for both lakes. This information was later applied to achieve sustainable management of the lakes while using their large water resource for hydro-electric generation.

major clause in the agreement that the township was not to be affected by the scheme. Concerned when Colin Bambery, Deputy DG of the Electricity Department, stated that their plan would be just to raise the lake 'slowly', I contacted the MP for the region, Hon Brian Talboys, who replied he was unwilling to take any action since a petition was then in the hands of a select committee. However, Hugh Templeton, National Party MP for Awarua contacted me with his concern and a suggestion that I organise a study of the Te Anau lakeshore similar to ours of Manapouri. When he organised the funding, again from the Electricity Department, I accepted and organised a comparable study with several senior botany students over the 1971 May 'vacation'. Results of this study confirmed those from Manapouri, aided by a 27-year Ministry of Works record of daily lake

levels, in indicating the distinctive lakeshore zonation of vegetation was driven largely by the natural variation in lake levels: 4.8 m for Manapouri and 3.5 m for Te Anau (Fig. 28).

Clearly the lake-raising proposals bore no relation to the natural lakeshore, which a 1970 government 'white paper' revealed would increase the electricity generation by a mere 4.6%, which seemed not to be critical for the viability of the aluminium smelter, for which the Fiordland power scheme was designed. These issues were relevant to the 'Save Manapouri' campaign which had been launched and also to the Commission of Inquiry which the National Government established in 1970, based on its pre-election promise by Prime Minister Keith Holyoake in 1969. Appearing before this Commission as part of a three-person Royal Society Otago Branch delegation, I was questioned by government's Legal Counsel, the Solicitor General, as to the ethics of using the finances of a government department to obtain information to undermine the aspirations of that department. Somewhat rattled, I responded that there was nothing in our contract to dictate the outcome, that our results had been endorsed by a committee of senior government scientists and, moreover, universities cherished their freedom of expression.

When the controversy became a major issue in the 1972 general election, the Labour Party had a policy of not proceeding with lake raising (there was a similar issue with Lake Wanaka), whereas the National Government were generally equivocal. Following a landslide win for Labour (aided by many southern electorates), the new Labour (Kirk) Government soon confirmed their policy on the Fiordland and Wanaka lakes, and later, more courageously, announced a Guardians group to oversee the sustainable management of the Fiordland lakes (and a Lake Wanaka Preservation Act, which is still in force). I was appointed chair of the Manapouri-Te Anau Lake Guardians which comprised the 'cream of the rebels' (Fig. 29). We were given broad terms of reference to manage the system and I was chair for the first 26 years,

during which we developed lake management guidelines based on our earlier ecological studies which maximised the power production within the constraints of retaining natural lakeshores.



**Fig. 29** The initial Lake Guardians with two associates: (left to right) Hec Jones (NZED), Ron McLean (Kennington, farmer), Wilson Campbell (Te Anau, motelier), Alan Mark, Les Hutchins (Manapouri, company manager), John Moore (Te Anau, local doctor), Jim McFarlane (Invercargill, civil engineer); front, John Gardner (Fiordland park ranger).

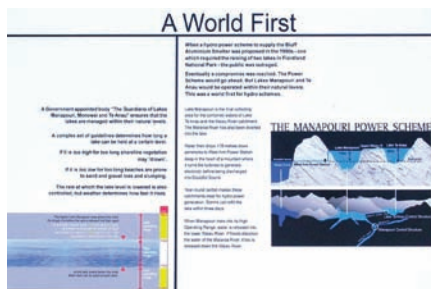
The Guardians celebrated their 21st year in 1994, with a weekend gathering of many earlier campaigners and launching their 'Manapouri Saved' book at the West Arm Hostel. They were formally recognised in 1990 when Lake Monowai was added to their brief and the guidelines were verified over time (Fig. 30) and in 1981 formalised with gazettal and legislative amendments by the National Government, returned in 1975. The overall achievement has been recognised as a 'World First' (Fig. 31), with the supporting book to mark the 21st celebration (Peat, 1994), a joint publication in an American lake-management journal (Mark et al., 2001), and, in 1998, a 'Commemoration Rock' was unveiled at Manapouri Township overlooking the lake (Fig. 32).

So, despite many disputes and debates over more than a decade, there is now general agreement that the compromise reached has been a most satisfactory outcome with a 'World First' of integrating nature conservation with the hydro-electric development, the use of science-based guidelines for sustainable management of the national park lakes (now a world heritage area), and a forerunner for the Official Information Act 1982 (the Fiordland Lakes debate was shrouded in unnecessary secrecy), the Resource Management Act 1991, and the requirement of an Assessment of Environmental Effects (AEE) for all major developments.





**Fig. 30** Dying trees on a Te Anau lakeshore delta, April 1975, as a result of prolonged high lake levels, which exceeded the management guidelines.



**Fig. 31** An interpretation panel, one of three in the Manapouri-Te Anau area, explaining the power scheme and crediting it as a 'World First' in integrating nature conservation with a major hydro-electric development.



**Fig. 32** The unveiling of a commemorative plaque in October 1998, in Manapouri by the Conservation Minister Nick Smith, accompanied by Roger Sutton (conservation board), myself and Lou Sanson (Southland Conservator).

### The Aramoana Smelter proposal

Although nearer home than the Fiordland lakes and the Tiwai Point smelter, I decided to play only a minor role with the Aramoana issue for two reasons: likelihood of being branded a perpetual stirrer and thus losing some credibility and also probably weakening the case; and I knew there were other competent players. Aramoana, pathway to the sea, at the entrance to Otago Harbour was vested 'industrial' by the Otago Harbour Board when Otago Metals, a small New Zealand company, proposed an aluminium smelter there in the late 1970s, but failed to secure an adequate power supply. Soon after, a much larger

and more serious proposal by a consortium of New Zealand-based Fletcher-Challenge, Australia's CSR Ltd and Swiss-based Alusuisse, plus the Harbour Board in a minor role, received national-development status, to be fuelled from the Clyde High Dam, and an impressive AEE was produced. This proposal split the opinions within the City, the University and even its Economics Department, such was the contention. I was involved with others in highlighting the ecological importance of the extensive salt marsh which had been ranked of 'national significance' in a Lands and Survey coastal survey. We had managed to convince the smelter planners and principals, particularly Hugh Fletcher, of the intrinsic value of the salt marsh to the extent that it was designated a 'wildlife refuge' in the AEE, to be protected from seepage by a bund wall.

The proposal eventually failed, mainly on economic values of the time, and the return of the land to the Harbour Board was contested in the court which, impressed by its proposed wildlife status, decided it should remain protected. Soon thereafter, following a government decree regarding protected coastal lands of conservation value, most of the flat land, including the non-tidal portion which was considered important in supplying fresh water to the marsh, was transferred to the Department of Conservation. I recommended Ecological Area status because of its joint floral and faunal values and Conservation Minister, Denis Marshall, formally opened the 359 ha Aramoana Ecological Area in 1992 (Fig. 33A–C). Subsequently, I initiated construction of a boardwalk out on to the vulnerable salt marsh which Mayor Sukhi Turner opened in the late 1980s.

### Forest and Bird Protection Society

Frustrated by the failure of nine scientists to succeed with our Nardoo proposal (as previously mentioned), I joined Forest and Bird in the early 1980s since I felt such a large organisation committed to nature conservation appeared to have more political clout than a small group of scientists. With the support of others we widened the Society's campaigns



**Fig. 33 A–C**, Aramoana, the site and its values.

into non-forest systems, particularly wetlands, shrublands and tussock grasslands, and their first council meeting in the South Island high country (Fig. 34) and several journal articles soon followed<sup>2</sup>. The Society's efforts in the South Island high country have been very rewarding, particularly through the tenure review process.



**Fig. 34** My early involvement with the Forest and Bird Protection Society: launching into tussock grassland conservation (Kevin O'Connor of Lincoln College giving 'The Sermon on the Mount' to the first Council foray into South Island high country, at Porters Pass, in November 1984).

The future of the South Island West Coast forests was being debated at this time. Some of our earlier ecological studies were relevant, including two studies of perching plant (epiphytic) communities which revealed world-record diversity for temperate forests (Fig. 35) and we launched a major campaign for the Southwest New Zealand World Heritage Area, spearheaded with the first book the

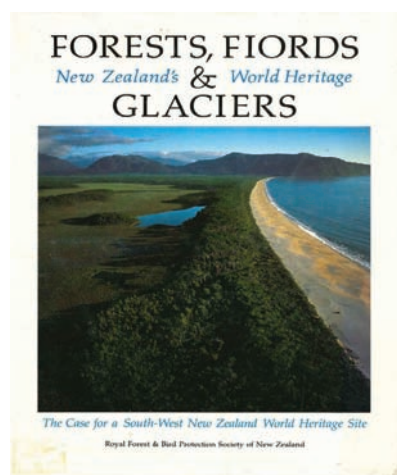
<sup>2</sup> Two of my South Westland ecological studies were relevant to justifying World Heritage status of these areas: the dune swales at Okuru (Dickinson and Mark, 1994) and Lake Moeraki epiphytic communities (Hofstede et al., 2001).



Society had published for a major campaign (Hutchings and Potton, 1987; Fig. 36). This succeeded against the odds when results of a major resource assessment for South Westland by a government-appointed representative 11-member panel supported 9:2 some further logging in the region, to try and achieve sustainable forest management on the vulnerable soils of the coastal plain.



**Fig. 35** Epiphytes at Cole Creek, Lake Moeraki, with 49 higher plant species and 52 lower plant species epiphytic on the one tree – a temperate forest record.



**Fig. 36** Forest and Bird's major publication for promotion of South West New Zealand for World Heritage status; which succeeded.

Government's decision to proceed with World Heritage status for the southwest, consistent with our campaign, was applauded by the Society but received some initial criticism from South Westlanders. This criticism has since abated with the acceptance locally of a more sustainable future based on ecotourism, conservation and recreation, in contrast to southward continuation of resource exploitation as in the past.

As one of three recently appointed Society Ambassadors I was invited to be involved in North Canterbury's Lake Sumner debate, based on my experience with the Fiordland lakes. A farming group in the lower Hurunui catchment, looking for an irrigation source had planned a 2 m-high dam on the outlet of 14 km<sup>2</sup> Lake Sumner (as well as an 83 m-high dam in the adjoining South Hurunui River), the only unmodified natural lake left in Canterbury. Their consultants had assessed the environmental effects as 'minor or less than minor' (implying it would satisfy RMA criteria) but local 'boatie/crib-owner' and Christchurch resident, Edward Snowden, assessed it otherwise. I was invited through Christchurch Forest and Bird staffer, Chris Todd, to assess the situation and did so with Edward's assistance in April 2010, when we circumnavigated the lake, established a baseline from a survey point near the outlet and in relation to the lake level at the time. I selected representative sites along its northern mostly forested shoreline (within Sumner Conservation Park) to profile the forest using a surveyor's level and staff. With a natural variation of 3.2 m and the lake only 0.619 m above its historic minimum at the time, I was very surprised to see part of the canopy of many shoreline trees dipping into the lake, particularly the several mostly large southern rātā trees which, along with at least two kāmahī (both confined to the shoreline fringe and known to be rare in North Canterbury, kāmahī especially so) and the more common mountain beech (Fig. 37A–B). With these and other shoreline trees rooted within 1.5 m of the lake they would clearly be inundated for periods exceeding their known tolerance (from our Fiordland studies) if the proposed lake raising proceeded. Apparently the consultants had used an incorrect baseline and did not even front up at a later Environment Canterbury (ECan) Committee hearing. ECan later rejected the lake raising (and the South Hurunui) proposal and an alternative scheme on a lower tributary, the Waitohi, is now under consideration.

I was also asked to assist the Society with its opposition to the proposed



**Fig. 37** Shoreline trees of Lake Sumner, North Canterbury, which helped protect it from the threat of lake raising for irrigation water storage in 2011–2012. **A**, kōwhai trees on the forest margin. **B**, rātā – kāmahī fringe at lake level.

open-cast coal mining on public conservation land on the Denniston Plateau in North Westland, proposed by the Australian (more recently New Zealand) mining company, Bathurst Resources. Aware that court proceedings would be inevitable, I also joined a weekend BioBlitz<sup>3</sup> exercise ahead of these formalities, organised by Forest and Bird staff and members in March 2012, when 150 volunteers assisted in obtaining much relevant information from the plateau. I was asked to present the 'international significance' of the Plateau's intrinsic values to the Environment Court and also the preceding 'ecological caucus hearing' where specific aspects of the case are presented to a Court commissioner. Here I rejected the term 'pakihi' (a common Westland wetland type) being used by the applicant's consultants and suggested 'Plateau tussock wetland' to emphasise its many significant and unique features. I invoked criteria of both the World Heritage Convention and the Ramsar Wetlands Convention to rank Denniston against, since New Zealand is a signatory to both, and I had agreement from all the caucus members that the values of Denniston satisfied certain aspects of both: the Denniston wetland ecosystem on its own would be too small to satisfy World Heritage criteria but it would complement Kahurangi National Park if and when it was proposed; and the proportion of the endangered land snail, *Powelliphanta patrickensis*, on the proposed mine

<sup>3</sup> A BioBlitz is a brief (1–2 day) event where teams of volunteer scientists and community members work together to find and identify as many species and conservation values as possible.



site (c. 20%) would certainly satisfy one of the important criteria of the Ramsar Convention. My conclusion was that the “many special biotic, ecological and biogeographic features of the Denniston Plateau, which are relevant to the distinctiveness criterion and rank it nationally and, in my considered assessment, also internationally significant and unique. The Plateau is the centre of dispersal and abundance for a regionally endemic tall tussock species, *Chionochloa juncea*, which dominates widely on the Plateau (Fig. 38) and gives it much of its character. A range of other, mostly woody, ecosystems add to the ecological and biological diversity of the Denniston Plateau. The indigenous faunal assemblage is even more distinctive (Fig. 39), considered to be unique, with several charismatic invertebrate and lizard species, including several formally classified as Threatened, Rare or Uncommon. ... In my professional assessment, the Denniston Plateau is much too precious, scientifically and in heritage terms, to permit open-cast mining ...”

Although warned by the Society's Counsel that I may be challenged by the Applicant's Counsel or even the Court, as to my assumed 'expert witness' status, based on my previous 'advocacy' for protection of the Plateau in public statements and two opinion pieces (with Rod Morris, well-known natural historian and photographer) in several print media, this challenge didn't happen. With many other presentations by experts for the appellant, I was confident of success with our case but, alas, the Court, although recognising the very high natural values of the plateau, found in favour of the Applicant, swayed apparently by three aspects of the case: the offset package offered, the significant employment it would provide, and the important economic returns to a somewhat depressed region. It was noted the Plateau had remained as a 'Stewardship Area', the lowest status of protection, since acquired by DoC more than 20 years ago, and therefore could be considered dispensable. The Society considered an appeal but, instead, an agreement was reached for better protection of another part of the Plateau. Conservation Minister Dr Nick Smith later approved access to Bathurst for mining, and this began



**Fig. 38** View north across the Denniston Plateau, an important public conservation area in North Westland, dominated here by an open stand of the locally endemic tussock grass *Chionochloa juncea*, with associated wetland species: a unique 'Plateau Tussock Wetland' association of very high heritage value.



**Fig. 39** A unique diversity of indigenous flora (bryophyte stalactites and vascular plants) and fauna (invertebrates, lizards and birds) from the Denniston Plateau, many restricted in range and in a Threatened category, but generally thriving here because of low numbers of exotic pests associated with its relatively severe environment. Photos: Rod Morris.



**Fig. 40** Despite its acknowledged heritage values and conservation land status, approval was given for open-cast mining and, despite the collapse of the coal market, mining commenced near the centre of the Plateau early in 2015. Photo: P. Lusk.

early in 2015 (Fig. 40) despite coal prices being highly depressed at this time.

Before the Denniston case developed, I concerned myself with Solid Energy's proposal for a similar open-cast mine, the Cypress Mine in the upper Waimangaroa Valley at Happy Valley, down-slope from their existing Stockton Mine in North Westland. I became concerned when I heard the conditions with their consent involved

restoration of at least half of the 25 ha mine site with 'direct transfer' of the tall tussock wetland ecosystem. A letter that I organised to CEO Don Elder from 12 concerned New Zealand ecologists led to a meeting with Elder and their Environmental Manager Mark Pizey at their Head Office with Drs Dave Kelly, Bob McDowell, Peter Wardle and me, where we discussed our concerns and doubts about fulfilling the restoration requirements. We were told there were still procedures to work through before a final decision was made, so I requested Dave and I be allowed to participate here. This was agreed, subject to us observing confidence, and we were helicoptered to the site in July 2009 with a staff member and two consultants. We again expressed concern with the proposal and requested copies of the annual independent peer-review reports required as a condition of the Regional Council's consents, which were duly supplied up to March, 2013. They also revealed some concerns, mainly associated with the threats of acid leaching.

Further communication became difficult until it was revealed mining had commenced, even though it was known that the Company was in financial difficulties, CEO Don Elder resigned, the government gave \$300 million to bail it out financially, and it laid off about 200 workers from Stockton which has seriously unsettled Westport; Solid Energy is currently again in financial strife. Nevertheless it went ahead with developing the Cypress mine in 2013 and now (from September 2014) has a massive pit exposed (Fig. 41). The future remains uncertain.



**Fig. 41** The Stockton open-cast coal mine was extended downhill to Cypress in adjacent Happy Valley, by Solid Energy in 2014 after a prolonged dispute with conservationists, and the company being in dire financial straits at the time, with a substantial bond to ensure restoration to a near-natural state. Photo: P. Lusk.

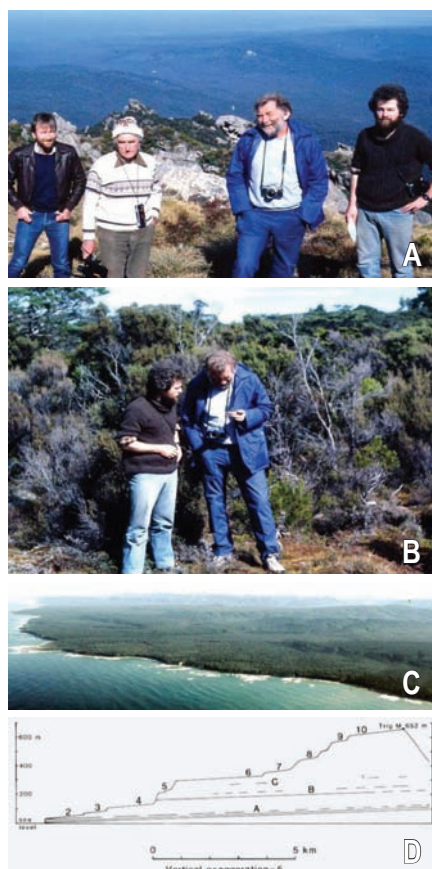


## Waitutu marine terraces 'ecological staircase' studied and saved

The Waitutu terrace sequence in western Southland, adjacent to Fiordland National Park, was known to be unusual but became more prominent when road access for possible logging of both the Māori-owned and Forest Service sections was discussed in the late 1970s. As a result the National Parks and Reserves Authority, of which I was a member, became interested and investigated the area in 1982 which prompted my concern for the limited information on its ecological values. Authority member Les Hutchins of Manapouri sponsored a brief but informative visit by geologist Chris Ward, myself and visitor David Bellamy by helicopter, which was most instructive, revealing the distinctive sequence of ten terraces from a high point of 652 m, overlooking Lake Poteriteri, down the 11.5 km terrace sequence, southwards to the coast (Fig. 42A–D).

Chris and I later organised a team of seven scientists for a comprehensive ecological and biological study over ten days in May 1985. The results were published in a special 90-page 'Collected papers' in the Royal Society's *Journal*<sup>4</sup>. We described a remarkable chrono-(time) sequence of vegetation and soils spanning c. 640,000 years and ranging from open bog on the oldest (upper) terrace, through mānuka-dominated shrubland, mixed mountain beech-podocarp-mānuka woodland to tall mixed silver beech-podocarp-broadleaved forest on the lower terraces, apart from coastal scrub and turf on the youngest terrace estimated to be about 3000 years old. The soil sequence matched the vegetation pattern, and it appeared that, despite the area not having been glaciated, the surfaces were probably bared and deflated during the glacial period.

Our findings prompted the government to seek adequate protection of this unique 'ecological staircase'. The cutting rights on the Māori land were later purchased by the government (an alternative area was made available in Rowallan Forest) and transferred to the Department of Conservation, as was the Forestry



**Fig. 42** A comprehensive ecological study of the Waitutu marine terrace sequence in western Southland in May 1985, confirmed its unique scientific values which justified its formal protection and management as an extension to Fiordland National Park.

**A.** (left to right) Tony Hughes, Les Hutchins, David Bellamy and Chris Ward on Hump Ridge en route by helicopter to assess the terraces (showing in the background).

**B.** David and Chris on one of the middle terraces among open mixed mānuka – mountain beech woodland. **C.** aerial view to the west. **D.** diagram of the ecological staircase: a sequence of ten marine terraces 0 to 650 m altitude created over 0 to c. 640,000 years.



**Fig. 43** Pomona Island, the largest in Lake Manapouri (262 ha), now restored by a local Trust (after a baseline study in 2005 which I led), by removing and now maintaining it essentially free of exotic animals (a few mice still persist), allowing several threatened bird species, including the Haast tokoeka (kiwi), as well as South Island robin and mōhua (yellowhead) to be introduced, with more planned.

land, and all to be managed as part of Fiordland National Park. This was a most rewarding and satisfactory outcome.

## Ecosanctuaries: the way of the future?

At this time, ecosanctuaries, areas adequately protected from exotic animals so that a full range of local native fauna can thrive in a natural setting, offer the best option for retaining a near-natural ecosystem. Protection can be achieved with either surrounding open water or a secure predator-proof perimeter fence. I have been involved with both types. I am Patron and organised the original baseline study of Pomona Island of 262 ha, the largest island in Lake Manapouri (and New Zealand's largest inland island) (Fig. 43), and Orokonui Ecosanctuary of 307 ha, with an 8.7 km predator-proof fence, on the outskirts of Dunedin which I had the pleasure of officially opening in October 2009. Faunal introductions are continuing in this most successful but expensive venture (Fig. 44).



**Fig. 44** Orokonui Ecosanctuary, a 307 ha, predator-proofed area of podocarp-broadleaved forest and regenerating kānuka woodland, with an 8.7 km fence, on the outskirts of Dunedin, where an ambitious restoration programme is well underway.

Such ecosanctuaries, which are established at several locations around New Zealand, will remain the most common method of adequately securing our many vulnerable native animals (and some plants) until pest-proofing on a large scale becomes a viable method for excluding a

<sup>4</sup> The geology, flora and fauna of the Waitutu marine terraces. *Journal of the Royal Society of New Zealand*, Vol. 18, No. 1, pp. 1–90.



wide range of introduced animal pests. Methods of pest control are steadily improving and a 'Pest-free New Zealand' organisation is now established to advance this most desirable outcome. The dilemma remains, however, with a range of introduced herbivores which are also cherished by a large group of recreational hunters.



**Fig. 45** One of two recent proposals to shorten and hasten the passage between Queenstown and Milford Sound, both declined by the government on environmental and financial grounds. The proposed 43.8 km monorail, depicted here, was seen by many as highly intrusive and disturbing in old-growth mixed beech-podocarp forest, copper tussock grassland and wetland ecosystems, within a conservation area but also part of the SW New Zealand World Heritage Area.

### 'Save Fiordland' and the threat of continuing development

The few areas of remote and wilderness regions remaining in New Zealand, a limited and finite resource, will continue to be threatened by a range of development proposals. Most recently, a proposal for an 11 km-long tunnel from Glenorchy through the Main Divide to the lower Hollyford Valley, aimed at reducing the road travel between the tourist mecca of Queenstown and Milford Sound, New Zealand's most iconic tourist destination, failed to get government approval, as did a 'Fiordland Link Experience' between Queenstown and Milford Sound. This involved a 20 km boat trip across Lake Wakatipu, a 45 km all-terrain vehicle ride, followed by a 43.8 km monorail ride (Fig. 45) and then a 90 km bus ride to the Sound. The most contentious section was the monorail and a parallel access/service road (and offered as a mountain bike route) to be constructed through old-growth, virgin, mixed beech-podocarp forest in the Snowdon Forest section of the SW New Zealand World Heritage Area and an important native bat and bird habitat. As Patron of the

'Save Fiordland' group, established to oppose both of these proposals, I shared their delight with the rejection of both proposals. In declining this latter proposal, Conservation Minister Nick Smith said: "The strategic issue of facilitating better transport options between Queenstown and Milford remains. The door is still open but proposals will need to be both environmentally sustainable and economically viable." This response obviously didn't include a Haast – Hollyford highway, an off-and-on proposal which is again being promoted in certain quarters. Many of the same issues relate to this proposal, as the debate continues.

### The Wise Response Society: its origins and mission

This society arose in Otago when a group of concerned citizens discussed their concerns with Contact Energy's release, in 2012, of four options for further hydro-electric development on the Clutha River. A meeting in Alexandra proposed Option 5; no more dams. A later meeting in Dunedin discussed broader environmental concerns which led to the formation of a 'wise response' concept and its launch in Dunedin in March 2013, with 10 speakers from throughout the country and support from representatives of three political parties. We also received support from more than 100 prominent New Zealanders for our proposed Appeal to Parliament for a risk assessment in five major but interconnected fields: Economic Security, Energy and Climatic Security, Business Continuity, Ecological/Environmental Security and Genuine Well-being (Fig. 46). We formally petitioned Parliament in April 2014 and our concerns are currently with the Finance and Expenditure Select Committee.



**Fig. 46** Promotional features of the Wise Response Society, which depicts its main platform.

### Dilemmas with advocating nature conservation

As a long-term advocate or campaigner for nature conservation in numerous contentious environmental issues, I have become very aware of a range of dilemmas, some would call them trade-offs, that one inevitably must face. Being a professional field ecologist with sound qualifications, and in academic employment, I have a choice of research endeavours in both basic and applied ecology, and I have indulged in both. With the South Island high country, my fellowship with the Hellaby Indigenous Grasslands Research Trust required me to research the basic ecology of the grassland dominants and apply that knowledge to achieve the sustainable management of this important ecosystem. As explained earlier, my research revealed serious degradation problems associated with heavy grazing of snow tussocks in the early post-burn period, so that my recommendation for pastoral farming was, if infrequently (at least 15–20-yr intervals) burning upland snow tussock grassland, ensure the whole block is burnt and allow for one and preferably two years of spelling before resuming grazing.

Some runholders disputed this recommendation and its basis, as well as that which came from our findings on the water yield studies. They even commissioned a desk-top review of our water yield findings by professional hydrologists and then misrepresented aspects of their report to the media in a clear attempt to undermine my scientific credibility. The role of fog in contributing to water yield from the upland snow tussock grasslands is still disputed but there is at least general agreement that these grasslands maximise water yield compared with any alternative land use (and even bare soil).

The Manapouri-Te Anau issue inevitably generated debate, this time with senior government engineers and politicians, but I stood my ground on the basis of endorsement of our ecological studies by senior government scientists and that we had been invited to undertake these studies by a government department, essentially without prejudice. However, the debate has now subsided, with general endorsement of the outcome



as expressed in a joint paper with the CEO of Meridian Energy (and ex ECNZ) and a Department of Conservation scientist in 2001.

Having been prominent in the debate on these two major issues, I was aware of the danger of too frequent public exposure when the Aramoana debate began in the late 1970s. To be labelled a 'perpetual stirrer' not only risks one's professional credibility but it may also affect the case at hand, and so lessen the chances of success. I was well aware that a credible case did not inevitably ensure a successful outcome, as with the Nardoo exercise. For this reason, I intentionally kept a low profile on the Aramoana issue.

When an issue progresses to an Environment Court hearing, the ability to appear as an expert witness may depend on whether one has been an advocate for the issue before it is contested in a court hearing. This situation arose when I appeared for Forest and Bird in their Environment Court appeal against the Bathurst coal mining application on the Denniston Plateau, as already outlined. I have since consulted various authorities on this issue and, as one expert legal authority has responded: "There is a lot of difficulty about expert witnesses in the Environment Court. ... The main thing is that you can demonstrate your integrity on the issues in front of the court and have reached your position on the basis of proper research on the science and not on the basis of predetermined positions of the organisation that has called you."

Another professional environmental lawyer stated: "An expert witness in the Environment Court is one who is independent and can meet the practice note for expert witnesses<sup>5</sup>. If you are perceived to be a public campaigner for a particular organisation and not objective, the court may not place much weight on your evidence. However, I do not believe you should refrain from speaking out on a significant law and policy matter because of the possibility that you might be challenged as an expert in the Environment Court."

And another response from an environmental lawyer was: "I believe it could impact the weight of your evidence as an expert witness if you have made statements in the past advocating a personal position." A fourth opinion from an environmental consultant who frequently faces the court, was: "The most likely effect is that the Court places less weight on your evidence – especially if you do not declare that, for example, you once gave a public talk on a relevant topic."

So clearly, one should keep public statements on contentious issues to objective aspects within one's acknowledged area of expertise.

Prominent involvement in several contentious environmental issues inevitably also involves employer/employee relations, in my case an academic institution where one is privileged to be protected by the 'Critic and Conscience of Society' conditions in the relevant legislation (unlike a government scientist who is constrained by the conditions of employment). Nevertheless, messages of concern are likely to be received by an outspoken academic's employer, and in my case there were several, often with distorted information, and a few even recommending my dismissal. These always resulted in explanatory meetings with senior administrators and I am pleased to record that the University of Otago always defended my role. Moreover, they even presented me with an Honorary DSc in retirement. My scientific peers in the Royal Society also confirmed their support with a Fellowship (1978), as well as its Hutton Medal for my botanical research (1997) and its Fleming Environmental Award (2010). The New Zealand and American Ecological Societies, as well as the Forest and Bird Protection Society all conferred life membership, which was further reassurance.

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<sup>5</sup> This includes: "An expert witness is not, and must not behave as an advocate for the party who engages the witness."