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NEW ZEALAND LTD

BOTANICAL INSPECTION OF
BIRCH HILL FLATS,
MOUNT COOK NATIONAL PARK

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SUMMARY

The greater part of the Birch Hill Flats is subject to a grazing lease. No native plants occur in the grazed area that do not occur elsewhere within or close to Mount Cook National Park. Continued grazing should cause little further change in the already depleted and modified vegetation in the foreseeable future, although the situation should be periodically reassessed.

Subtle vegetation changes are occurring in an adjoining area that has not been grazed by sheep for 60 years. It is not yet clear where these changes are leading, or even if the end result will be desirable in conservation terms. The fencing of the flats into grazed and ungrazed areas has provided a *de facto* experiment, continuation of which should yield information important for the management of this and similar areas of valley grassland.

The southern end of the lease includes a valuable wetland. Sheep appear to use only the drier portions, creating a species-rich turf that would probably be smothered by adventive grasses in the absence of grazing.

INTRODUCTION

The Birch Hill Flats are a stony delta, consisting mainly of former channels of the Hooker River. On the north-east they are bounded by the Hooker River, on the west by the lower slopes of the Ben Ohau Range, and on the south-east by the Tasman River. Their present vegetation grades between grey moss field of *Racomitrium lanuginosum*, and grassland dominated by adventive species. There are also scattered shrubs and patches of matagouri (*Discaria toumatou*), mostly low-growing. A damp, sedge-dominated area covers about 20 ha at the southern end.

The flats have been grazed for at least 120 years, but the area subject to grazing has been progressively reduced. The current grazing lease extends from the fence line between

Unwin Hut and Hooker Corner in the north to Birch Hill Stream in the south. In the east it is bounded by the Tasman River, and in the west it extends some distance up the mountain slopes. The history of the lease and the current leasehold conditions are summarised in a document entitled Proposed Grazing Amendment - Birch Hill Flats. This is undated, but its status is as a proposed amendment to the Mount Cook National Park Management Plan (1988). The document also summarises a botanical report by Joy Comrie, issued under Keith Lewis's name on 30 March 1990.

The proposed amendment recommends continuation of licensed grazing by sheep on the Birch Hill Flats, subject to certain conditions including fencing out of some higher hill slopes in the south-east. The document called for public submissions by 2 December 1991, but a decision has not yet been reached. To help its deliberations, the Department of Conservation approached Landcare Research to carry out a further botanical inspection, and to "comment on the indigenous botanical values of the area concerned and the prospects for vegetation recovery in the absence of grazing, and in its presence".

I carried out this inspection on 4 March 1994, returning on the following day to check some further points. The time of the visit had been chosen to allow species to be identified readily in the field, especially grasses which have mature seed heads at this time. The task was fortuitously made easier by severe floods in early January that damaged fences and thereby made it impractical to return stock to the area. Two months freedom from grazing has been long enough to allow species to reveal themselves, without being so long as to change the botanical composition of the vegetation on the lease.

METHODS

The Unwin-Hooker Corner fence provides the opportunity to compare adjacent areas; the south-eastern, down-valley side is within the sheep grazing lease, whereas on the other side, authorised grazing was terminated through the construction of the fence in 1933 (Joy Comrie, Department of Conservation, pers.comm.). First inspection indicated real but subtle differences across the fence line, and it was necessary to employ a method of comparison that had to be both sensitive and rapid.

Eight pairs of temporary plots were selected to represent identical topography, one on either side of the fence, but far enough from it to avoid possible "fence effects". For each plot, species were listed and the main components of ground cover were estimated over an area of 1 m². Further species and vegetation characteristics were also noted over a wider surrounding area within the same topographic unit.

In recognition of the fact that the vicinity of the fence represented only a narrow band across the very steep gradient of decreasing precipitation down the Hooker and Tasman valleys and, moreover, did not include the youngest surfaces formed by the rivers, a further eight plots were described on other parts of the lease.

Vegetation of the wetland near the southern end of the lease was briefly described, and species were listed. Only passing attention was paid to the vegetation on the mountain slopes to the west, as this part of the lease was considered to be outside the Landcare Research brief.

Species identification is based on the field guide Wild Plants of Mt Cook National Park (H.D. Wilson 1978), with nomenclature updated where necessary. Comrie's report, her species list, and the six plots that she described provide further information about the botany of the Birch Hill Flats.

TOPOGRAPHY AND PLANT COMMUNITIES OF THE BIRCH HILL FLATS

The Birch Hill Flats consist of present and former flood plains of the Hooker River, together with channels from Black Birch Stream and other western tributaries. This seemingly monotonous surface provides at least seven intergrading habitats, as follows.

- 1 Recent surfaces still being colonised by plants; mostly very stony, but with areas of sand and fine gravel. The brownish-green moss *Racomitrium crispulum* provides most of the cover, which also includes pioneers such as the grasses *Poa lindsayi*, *P. maniototo* and *Lachnagrostis filiformis*, and the scabweeds *Raoulia hookeri* and *R.*

haastii. Species typical of more developed vegetation are also present.

- 2 Undulating stony flats are by far the most extensive topographic unit. Although they convey an impression of rawness, it is probably many decades, perhaps even centuries, since they have been significantly disturbed by floods. The larger stones are coated by small lichens, but sheets of *Racomitrium lanuginosum* are the dominant feature of the vegetation. Typically only about a quarter of the cover is formed by vascular plants, the major species being browntop (*Agrostis capillaris*), sweet vernal (*Anthoxanthum odoratum*), Chewings fescue (*Festuca rubra*), and a native danthonia (*Rytidosperma buchananii*). Small native dicots such as *Cyathodes fraseri*, the harebell *Wahlenbergia albomarginata*, *Helichrysum filicaule*, pipiriri (*Acaena inermis*), *Muehlenbeckia axillaris* and *Pimelea prostrata* grow among the grasses. Catsear (*Hypochoeris radicata*) is usually present.

Fescue tussock (intermediate between *Festuca novae-zelandiae* and *F. matthewsii*) occurs as widely scattered plants and sparse groups. Most of the tussocks contain much dead material, and seem small and degenerate. Native bluegrass (*Elymus rectisetus*) is sparsely scattered throughout, but blue tussock (*Poa colensoi*) is generally exceedingly rare except in the ungrazed area.

Mouse-ear hawkweed (*Hieracium pilosella*) is dispersed widely, as well as forming dense patches that exclude most other plants or, as in the case of browntop, sweet vernal and *Rytidosperma buchananii*, reduce them to a sparse, stunted condition. Small, woody native plants such as *Muehlenbeckia axillaris* and *Cyathodes fraseri*, on the other hand, seem unaffected by this competition. Interestingly, many of the *Hieracium* mats consisted mainly of dead and dying rosettes. King devil (*H. praealtum*) is much less apparent except in the ungrazed area. The grey, hummocky scabweed *Raoulia australis* is locally important, chiefly as degenerate mats that are perhaps survivors from a phase of severe vegetation depletion, when they occupied bare ground that today would be preempted by mouse-ear hawkweed.

- 3 Flat surfaces where all but the largest stones are buried beneath a layer of silt, derived as wind-blown loess on the higher surfaces, and water-deposited silt in

depressions. Over most of the Birch Hill Flats these constitute only limited areas, but seem to increase westwards, presumably because of silt originating in the tributary streams. On these surfaces, vascular plants provide up to 90% of the cover, with a corresponding reduction in moss cover. The vegetation is dominated by the usual three adventive grasses, browntop, sweet vernal and Chewings fescue, but there is a comparatively high representation of other plants.

Eighteen to twenty vascular species were recorded in each of the samples, most of them native. Additions to those found in Habitat 2 include *Gentiana corymbifera*, *Raoulia subsericea*, *Oreomyrrhis rigida*, *Gonocarpus aggregatus* and *Craspedia minor*.

- 4 Steep, bouldery banks marking the edge of former stream channels. The vegetation on these depends on aspect. Those facing north carry essentially the same vegetation as the stony flats, but the boulders provide protection for some of the more palatable species, such as white clover (*Trifolium repens*), sorrel (*Rumex acetosella*) and native bluegrass.

South-facing banks are moister and more sheltered, and adventive grasses form a dense cover. However, single individuals of species not recorded elsewhere on the flats were also noted, namely silver tussock (*Poa cita*), porcupine bush (*Melicytus alpinus*) and prickly shield fern (*Polystichum vestitum*). All are on the ungrazed side of the fence, but only the last is likely to owe its presence to protection from grazing.

- 5 Matagouri (*Discaria toumatou*) is conspicuous on the Birch Hill Flats, varying in density from widely scattered shrubs less than 50 cm tall on stony areas to thickets up to 1.5 m tall where the soil is deeper. Nearly all the bushes seem young, with branches extending to ground level, thereby protecting the vegetation beneath from grazing. The main species to benefit are browntop and the native herb *Gonocarpus aggregatus*, both of which develop spindly growth among the thorny matagouri twigs.

There are a few groves and isolated bushes of matagouri that are much larger and older, and are probably survivors from fires that removed the original shrub

cover. These veterans have thick trunks, and canopies well above the ground that shade a dense, green sward dominated by browntop and white clover. The lushness of this sward could be attributed either to nitrogen fixing by matagouri or to manuring by sheltering animals.

Few other shrubs were recorded. Very small plants of native broom (*Carmichaelia rivularis*) grow among rocks, but are heavily browsed by hares. At one point where the grass sward is relatively dense I noted colonies of small-leaved, summer-green tutu species (*Coriaria plumosa* and *C. angustissima*) and a single, browsed young inaka (*Dracophyllum longifolium*) plant.

- 6 The main streams flowing from the Ben Ohau Range form large fans of coarse gravel where they reach the Birch Hill Flats. Because of their steepness and proneness to massive floods, these fans are largely bare or at early stages of plant succession, especially at the present time following the January floods. However, there is more subsurface water available to plants than on the flats proper, and as a result areas that escape disturbance develop dense, tall matagouri scrub. In the shelter of the scrub, and especially in open glades among it, there are thick grass swards of Chewings fescue, browntop, sweet vernal and some native bluegrass, as well as scattered fescue tussocks. The most common dicot plants are white clover, catsear, and the native plants pennywort (*Hydrocotyle novae-zeelandiae* var. *montana*), *Acaena inermis*, and *Gonocarpus aggregatus*.

- 7 The sedge-dominated area near the southern end of the lease lies on a thick silty deposit, across which Lagoon Stream has incised a meandering course. Three main plant communities are tentatively distinguished. Wet but relatively freely draining areas, mostly near stream channels, support vigorous growth of cutty grass (*Carex coriacea*). Poorly drained areas are characterised by *Carex sinclairii*, *C. diandra* and sedge tussock (*Schoenus pauciflorus*). The introduced jointed rush *Juncus articulatus* is abundant in both these wet communities.

There are also drier areas in which sedges are sparser and introduced grasses, especially browntop, are important. These support the richest plant community, which includes native species such as *Gentiana grisebachii*, *Pratia angulata*, *Pernettya*

nana, *Gonocarpus montanus*, *Lagenifera petiolata* and *Ranunculus multiscapus*, which were not otherwise recorded on the Birch Hill Flats. Altogether 42 species were listed from the wetland, 20 of them native.

COMPARISONS ACROSS THE UNWIN-HOOKER CORNER FENCE LINE

As already noted, differences between the grazed and ungrazed sides of the fence are subtle. The most noticeable is that the seed heads of the adventive grasses are somewhat shorter on the grazed side - in the sample plots by some 5 to 20 cm. However, this could well be the legacy of the most recent grazing.

King devil is clearly far more abundant and vigorous in the ungrazed areas. Blue tussock is all but confined to the ungrazed vegetation, though even here only as widely scattered plants except on some stony rises where it is more prominent. In the adjacent grazed area, blue tussocks were seen only within a few metres of the fence, and possibly result from seed blown from the ungrazed side. They have a leaf height of about 10 cm, compared with 30 cm across the fence.

Rare blue tussocks were found on grazed land up to 200 m from the fence surrounding the Mount Cook airport, and with increasing frequency towards and inside this fence. It seems likely that airport traffic has discouraged grazing to some extent. Although the fence forms an effective enclosure, it has been in place for only a year (Alan Watson, pers. comm.), not long enough to give rise to a vegetation difference on either side.

I gained an impression, which is only weakly supported by my data, that there are more hard tussocks on the ungrazed side of the fence, and that these tussocks are more vigorous and include a greater proportion of small plants. It is unclear whether the latter have originated as seedlings or from fragmentation of old tussocks.

In the denser grass communities the golden-green moss *Hypnum cupressiforme* is more abundant in ungrazed areas where, at times, it forms loose mats up to 8 cm deep. The only

vascular species noted as being consistently more abundant on the grazed side are mouse-ear hawkweed, *Acaena inermis* and the native grasses *Rytidosperma buchananii* and *R. thomsonii*.

In summary, the clearest differences between the grazed and ungrazed sides of the fence lie in the stronger association of king devil and blue tussock with the latter; Comrie drew the same conclusion from her survey undertaken about four years ago.

THE PAST AND THE FUTURE

The time available for this study did not permit a search for information on the vegetation of the Birch Hill Flats before it was modified by grazing - if indeed such information exists. It is useful to attempt a historical reconstruction, however, as this may influence the aims of future management.

Even though the flats are undeniably a harsh environment, it is likely that they once supported taller, denser and richer vegetation than they do today. Hard and blue tussock would have been widely dominant, the latter mainly on shallower, stonier soils than the former. Snow tussocks (*Chionochoa*) were probably also prominent. Tufted and creeping native grasses would have covered much of the ground between tussocks; i.e., native blue grass, and other species that have completely disappeared from the locality. As well, there would have been large dicot herbs, including speargrasses (*Aciphylla*), aniseed (*Gingidia montana*), and species of *Anisotome* and *Celmisia*. Matagouri would have been as abundant as it is today, and generally much bigger, though decreasing in size towards the younger, stonier surfaces. Other shrubs would also have been present, including native broom and *Hebe*.

The early years of grazing would have reduced the more palatable species, and fires and trampling would have destroyed the litter and the fertility and water-holding capacity of the topsoil. The arrival of rabbits would have exacerbated the degradation. It seems likely that during the first half of this century the flats would have supported remnant patches

of hard tussock among short, browse-resistant plants. Scabweeds would have been prominent among the latter.

With the reduction of rabbit numbers in the 1950s, with the cessation of fire, and perhaps with more controlled levels of grazing, the vegetation cover would have improved. Most of the response, however, was by adventive grasses, which achieved a prominence which is now unassailable. The most recent chapter in this reconstruction has been the explosive increase of hawkweeds.

Under the present grazing regime the Birch Hill Flats seem to have reached a level of stability. The decrease of hard tussock, which surely results as much from competition with adventive grasses as from competition with hawkweeds, may well continue. However, any major future changes are most likely to result from invasion by species that have not yet established on the flats.

Some 60 years of freedom from grazing by domestic animals have not resulted in spectacular changes, and the end point of the changes that are occurring, or seem to be occurring, is unknown. However, the following questions arise.

- Does the increase in *Hypnum* moss in the denser ungrazed grass communities presage the redevelopment of a ground cover that is more retentive of nutrients and water?
- Is there a real increase of hard tussock in the ungrazed areas, and do the blue tussocks represent a recovery of this species, or merely more prolonged survival of a species on its way out?
- Even if there is a real increase of hard and blue tussocks in the ungrazed area at present, is this likely to continue in the face of competition from a concomitant increase in vigour of adventive grasses and hawkweeds?
- What do the patches of dead mouse-ear hawkweed indicate? Is the species about to decline, or is it merely fluctuating at a high level?

CONCLUSIONS

I shall now attempt to answer the questions posed in the brief; firstly, the botanical values. Nearly all the native plant species listed from the grazing lease on the Birch Hill Flats were also found on the adjoining ungrazed area. The few exceptions, other than those confined to the wetland in the south, were probably simply overlooked on the ungrazed area (e.g. the small orchid *Microtis oligantha* and the grass *Rytidosperma thomsonii*) or, like the two species of tutu, are abundant elsewhere in Mt Cook National Park.

Twelve of the native plants of the wetland were not seen on other parts of the Birch Hill Flats but, likewise, they occur elsewhere in the Park or, in the case of *Pernettya nana*, in its immediate vicinity.

Secondly, the implications of continued grazing. No recovery towards the original vegetation can be expected, and little change is likely in the foreseeable future, other than possible demise of the remaining hard tussocks. However, I believe that this conclusion should be revisited each time the grazing licence comes up for renewal.

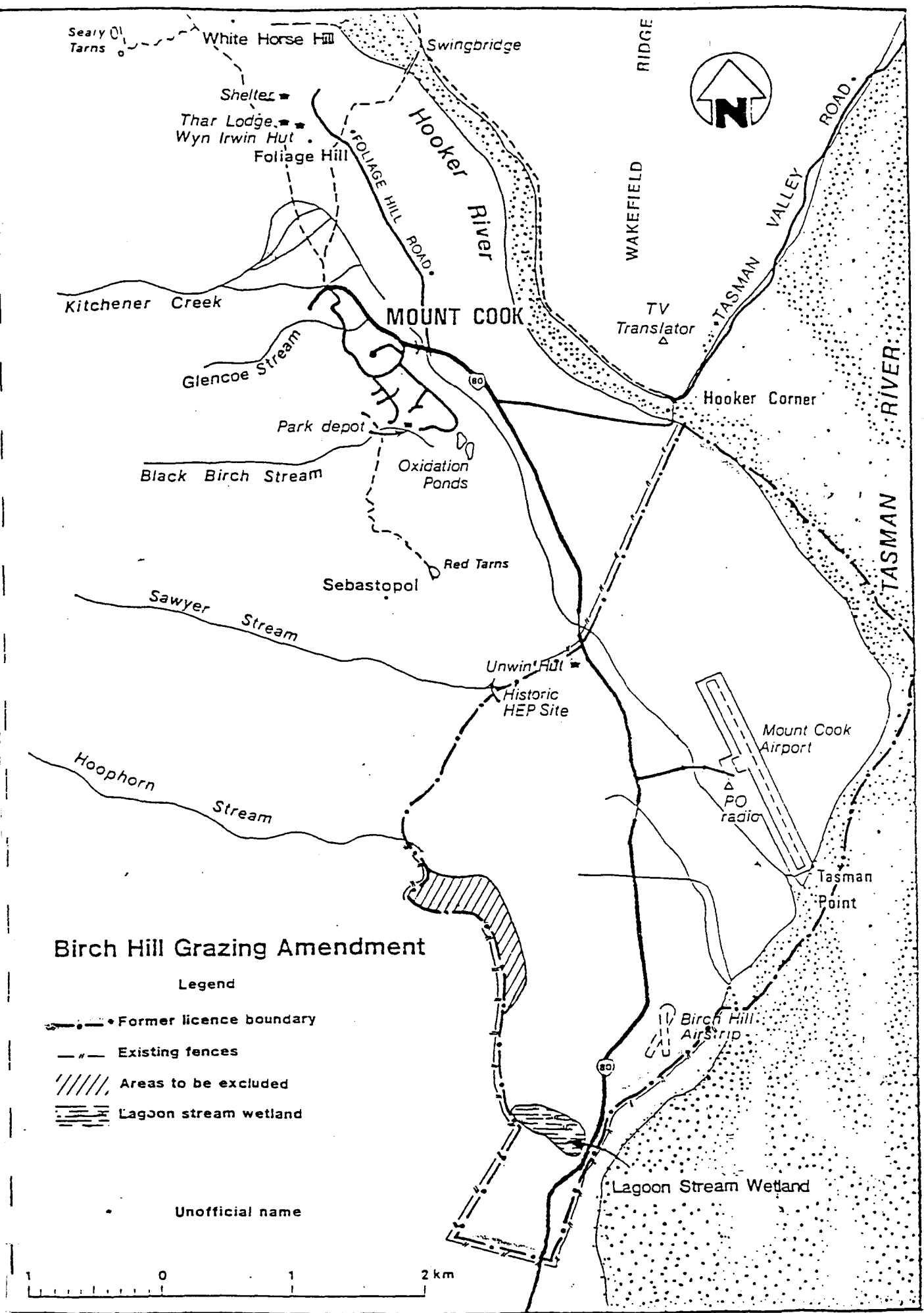
Thirdly, the prospects for vegetation recovery in the absence of grazing. Change in the area retired from grazing is occurring but is very slow, and its long-term direction is unclear. The only results of cessation of grazing that can be confidently claimed on present evidence are, on one hand, meeting the National Parks Authority's policy of eliminating grazing in national parks, and on the other hand an increased fire risk in late summer from dry grass.

The brief to Landcare Research does not call for recommendations. Nevertheless it seems important to say that the division of the Birch Hill Flats into grazed leasehold and ungrazed land has set up a *de facto* long-term experiment that is providing and will continue to provide ecological information of great significance for the management of undeveloped valley grasslands, be this management for economic production or nature conservation. It would seem premature to terminate this experiment before benefits from excluding grazing are clearly demonstrated.

The Unwin-Hooker Corner fence is strategically placed to monitor vegetation changes at the northern end of the flats. In time, the fence enclosing the Mount Cook airport will provide information for the central area, which probably receives less precipitation, but in this context it is a pity that the fence excludes the minimal area; a larger area could have been excluded with the same length of fence.

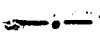



The Lagoon Stream wetland is a valuable area for conservation, as it represents a habitat that is poorly represented in the reserve system. Although sheep appear to make little or no use of the wetter parts, they definitely influence the drier, grass-dominated parts. Very likely, the turf that results from grazing is richer in plant species than it would be if it were not grazed. An enclosure to test this point would not be amiss.

Alan Watson of Mount Cook National Park drew my attention to kowhai (*Sophora microphylla*) trees among the bluffs south of Sawyer Stream. The proposal to fence out a portion of the lower mountain slopes, in the event of grazing being continued on the flats, does not include this area. The question therefore arises as to whether grazing is preventing kowhai regeneration. I was not able to check this, but did note that totara (*Podocarpus hallii* and *P. nivalis*), matagouri, *Coprosma* and manuka (*Leptospermum scoparium*) appear to be increasing in the grassland on the slope below. This suggests that in the absence of fires, this slope may become unattractive to sheep.



Birch Hill Grazing Amendment

Legend

-  Former licence boundary
-  Existing fences
-  Areas to be excluded
-  Lagoon stream wetland

• Unofficial name

