

## SUPPLEMENTARY MATERIALS

### Appendix S1. Selected examples of discretionary consents that have resulted in the loss of ecological values

Here we summarise some examples of discretionary consents (granted under the CPLA 1998) that have resulted in the loss of ecological values. The list is intended to be illustrative and not comprehensive. We have limited our examples to those that:

- (1) had well documented ecological values
- (2) were the highest priorities for protection in accordance with the National Priorities for the Protection of Indigenous Biodiversity on Private Land (MfE & DOC 2007; Cieraad et al. 2015; Williams et al. 2007)<sup>1</sup> and
- (3) at least one of us is personally familiar with.

#### S1A. Background

The granting of discretionary consents resulting in the loss of ecological values has been commonplace over the last 2 decades. These consents are likely one of the foremost mechanisms facilitating ongoing losses of indigenous biodiversity in the South Island of New Zealand. In our experience, this is because:

- (1) DOC's role in providing advice to LINZ on the ecological values present is often inadequate, because
  - (a) inspections are typically undertaken by local staff who are neither trained ecologists nor have the requisite experience to undertake assessments,
  - (b) assessments of landscape values are almost never obtained and effects ignored,
  - (c) local DOC office managers have delegated authority (decision makers) over the advice provided to LINZ, and

often have personal relationships with local farmers that they wish to maintain; and these office managers can and do edit the technical advice.

- (2) On occasions when DOC provides proper expert ecological advice on values present and affected by CPLA discretionary consents, LINZ prefers the advice of LINZ service providers. Service providers are typically farm development advisors and are not qualified to provide ecological advice.

#### S1B. Examples

1) Otamatapaio Station (Fig. 1; Table 1): CPLA discretionary consent granted by LINZ to clear native shrublands and cultivate. Values lost included native shrublands in a threatened land environment, originally rare and threatened saline ecosystems and ephemeral wetlands (both ranked 1; critically endangered; threat rankings are in accordance with Holdaway et al. (2019)), several threatened plant species including *Myosotis brevis* (nationally endangered), *Ceratocephala pungens* (nationally critical), *Myosurus minimus* subsp *novae-zealandiae* (nationally vulnerable). Local DOC staff advised LINZ that there were no inherent values present.

2) Simons Pass (Fig. 2; Table 1): CPLA discretionary consents granted that resulted in the loss of nationally significant ecological values associated with intact sequences of originally rare dry moraine and glacial outwash ecosystems (both ranked 1; critically endangered) that were considered to be the best remaining examples of their type in New Zealand. Ephemeral wetlands (also originally rare ecosystems ranked 1; critically endangered) embedded within the moraine were National Priority 2. DOC's advice to LINZ was to decline based on high values present and being conscious of the concurrent

**Table 1.** National priorities for protecting rare and threatened biodiversity on private land that have been affected by the land-use changes enacted at 14 example locations in the High Country.

National Priorities affected	Otamatapaio Station	Simons Pass	Omahau Hill	Sawdon Station	Arrowsmith Station	Mt Oakden	Mt Algidus	Glenthorne Station	Mt White	Inverary Station	Balmoral Station	Lake Taylor Station and Lakes Station	Glynn Wye Station	Glenrock Station
National Priority 1	X			X		X	X		X	X	X			
National Priority 2	X	X	X	X	X		X		X				X	X
National Priority 3	X	X	X	X	X	X		X	X		X		X	X
National Priority 4	X	X	X	X	X	X	X	X	X	X	X	X	X	X

<sup>1</sup> Protecting our places: Introducing the national priorities for protecting rare and threatened biodiversity on private land. Available at <https://www.biodiversity.govt.nz/land/guidance/>

The four national priorities are:

#### National Priority 1

To protect indigenous vegetation associated with land environments, (defined by Land Environments of New Zealand at Level IV), that have 20 percent or less remaining in indigenous cover.

#### National Priority 2

To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.

#### National Priority 3

To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2

#### National Priority 4

To protect habitats of acutely and chronically threatened indigenous species.



**Figure 1.** Otamatapaio Station: clearance of native shrublands on a National Priority 1 threatened land environment (Category 1 – < 10% indigenous cover remaining; Cieraad et al. 2015), with originally rare and threatened saline ecosystems and ephemeral wetlands (National Priorities 2, 3), and several threatened plant species (National Priority 4).



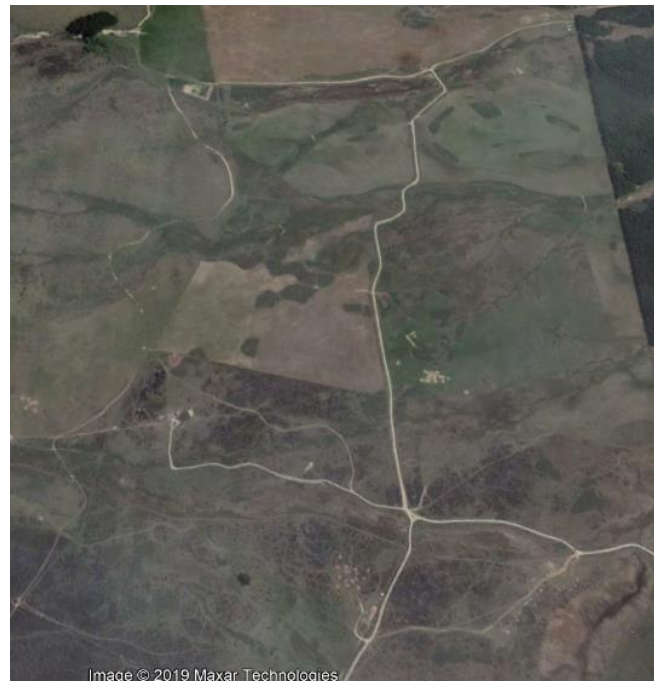
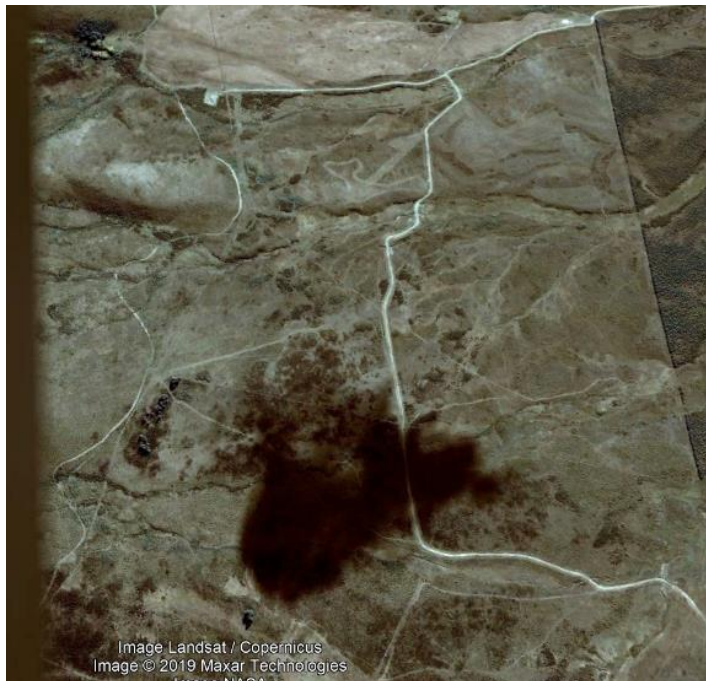
**Figure 2.** Simons Pass: extensive loss of a unique complete sequence of National Priority 3 glacial moraines (with embedded ephemeral wetlands; National Priority 2), and outwash ecosystems of different geological ages that are all ‘originally rare’ terrestrial ecosystem types which are), along with populations of several nationally threatened species of plants, invertebrates, and nationally important breeding habitat for nationally vulnerable banded dotterels (National Priority 4).



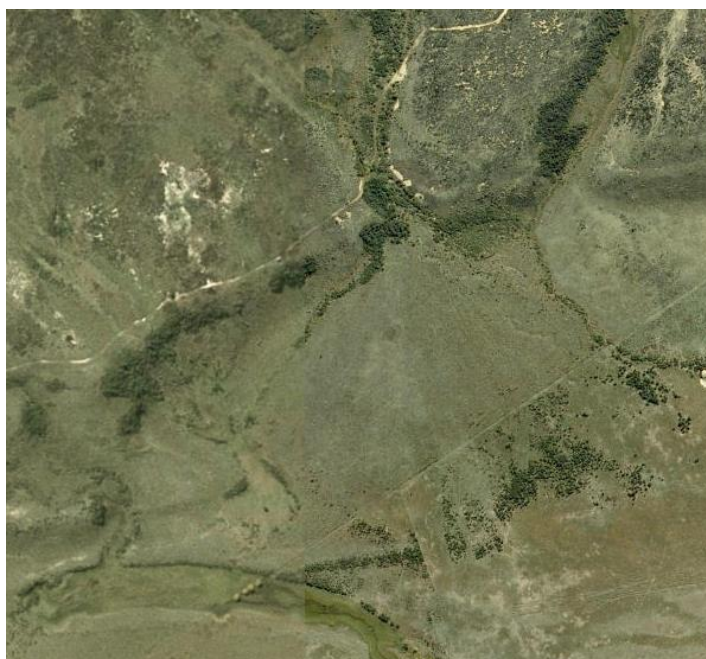
Tenure Review process underway. LINZ initially supported DOC advice but the lessee appealed to the Commissioner of Crown Lands (CCL) and in a closed hearing the decision to decline was overturned by the CCL.

3) Omahau Hill (Figs 3, 4; Table 1): CPLA discretionary consents approved to cultivate and clear native vegetation on areas identified through Tenure Review survey as highest priority for protection. Described as comprising excellent examples of diverse indigenous vegetation, originally rare

dry moraine and glacial outwash ecosystems (both ranked 1; critically endangered) and wetland complexes (also 1; critically endangered) that occur across intact sequences. These sequences supported numerous threatened species, including possibly the national stronghold for the plant *Chaerophyllum colensoi* var *delicatula* (ranked 1; nationally critical). Part of the area approved for development was also a Recommended Area for Protection (RAP) identified from the Mackenzie protected natural areas programme Espie et al. (1984).



**Figure 3.** Omahau Hill: continuing clearance of diverse indigenous vegetation on National Priority 2 and 3 moraine and wetland complexes that supported many threatened species (National Priority 4). There has also been herbicide spraying of indigenous shrublands on adjacent hillslopes.



**Figure 4.** Omahau Hill: development of fluvio-glacial outwash terraces and alluvial fans (originally rare National Priority 3) that supported many threatened species (National Priority 4).





**Figure 5.** Sawdon Station: development of critically endangered dry moraine (National Priority 3) and ephemeral kettlehole wetlands (National Priority 2) that supported many threatened species (National Priority 4).

4) Sawdon Station (Fig. 5; Table 1): CPLA discretionary consent granted to cultivate originally rare dry moraine and glacial outwash ecosystems (both ranked 1; critically endangered) and ephemeral wetlands in kettleholes (also 1; critically endangered) that supported numerous threatened species.

CPLA discretionary consent also granted to plant exotic lupins across large areas of dry moraine and kettlehole ecosystems, including nationally significant fluvio-glacial dunelands (an originally rare ecosystem, ranked 1; critically endangered) adjoining the braided Edwards River (the Edwards River is also an originally rare ecosystem ranked 2; endangered, and also a recommended area for protection in the PNAP survey, and a Site of Natural Significance SONS 53 in the District Plan). The Edwards River supported population strongholds for numerous threatened plants, invertebrates, and lizards including a very important population of scree skinks (nationally vulnerable) in the Edwards River margins. Despite DOC advising LINZ of the very high values present, the risk and expense lupins pose, the consent was approved subject conditions that included preventing flowering and stopping spread into the Edwards River. The proliferation of flowering lupins (*Lupinus polyphyllus*) through the Edwards River on Sawdon Station suggest these conditions were not adhered to by the lessee.

5) Arrowsmith Station (Fig. 6; Table 1): CPLA discretionary consents approved for clearance of shrublands and tall tussock grasslands on originally rare dry moraine and ephemeral wetland ecosystems (ranked 1; critically endangered), ecosystems that are directly connected to Lake Heron. This area is also an Outstanding Natural Landscape. Local DOC staff advised LINZ to approve.

6) Mt Oakden (Figs 7-10; Table 1): CPLA discretionary consent granted for clearance of old growth shrublands on

threatened and poorly protected alluvial fans and originally rare dry moraines (ranked 1; critically endangered) that have a direct hydrological connection to Lake Coleridge. The cleared land overlapped in a National Priority 1 threatened land environment; Category 1 – < 10% indigenous cover remaining; Cieraad et al. 2015). The site was part of an “Outstanding Natural Landscape” and clearance occurred in parts of a recommended area for protection (Shanks et al. 1990). The clearances breached district plan rules for clearance of indigenous vegetation. DOC’s advice to LINZ permitted clearance.

7) Mt Algidus (Figs 11–12; Table 1): CPLA discretionary consent given to clear indigenous vegetation (shrublands and diverse short tussock grasslands) on alluvial terraces of the Wilberforce and Rakaia Rivers (in a National Priority 1 threatened land environment; Category 1 – < 10% indigenous cover remaining). The alluvial fans that are directly connected to regionally significant wetland complexes (known as Hydrowaters, part of which is a reserve). DOC’s advice to LINZ permitted clearance.

8) Glenthorne Station (Fig. 13; Table 1): CPLA discretionary consent given to clear indigenous vegetation on recent floodplains of the braided Harper and Avoca rivers (ranked 2; endangered) which supported numerous threatened species. DOC’s advice to LINZ permitted clearance.

9) Mt White (Figs. 14–18; Table 1): CPLA discretionary consent granted to clear numerous areas of extremely high ecological values on alluvial and glacial landforms that support highly natural indigenous vegetation. Originally rare, threatened and poorly protected ecosystems affected include diverse tussock grasslands, shrublands and wetlands on dry moraines (ranked 1; critically endangered), glacial



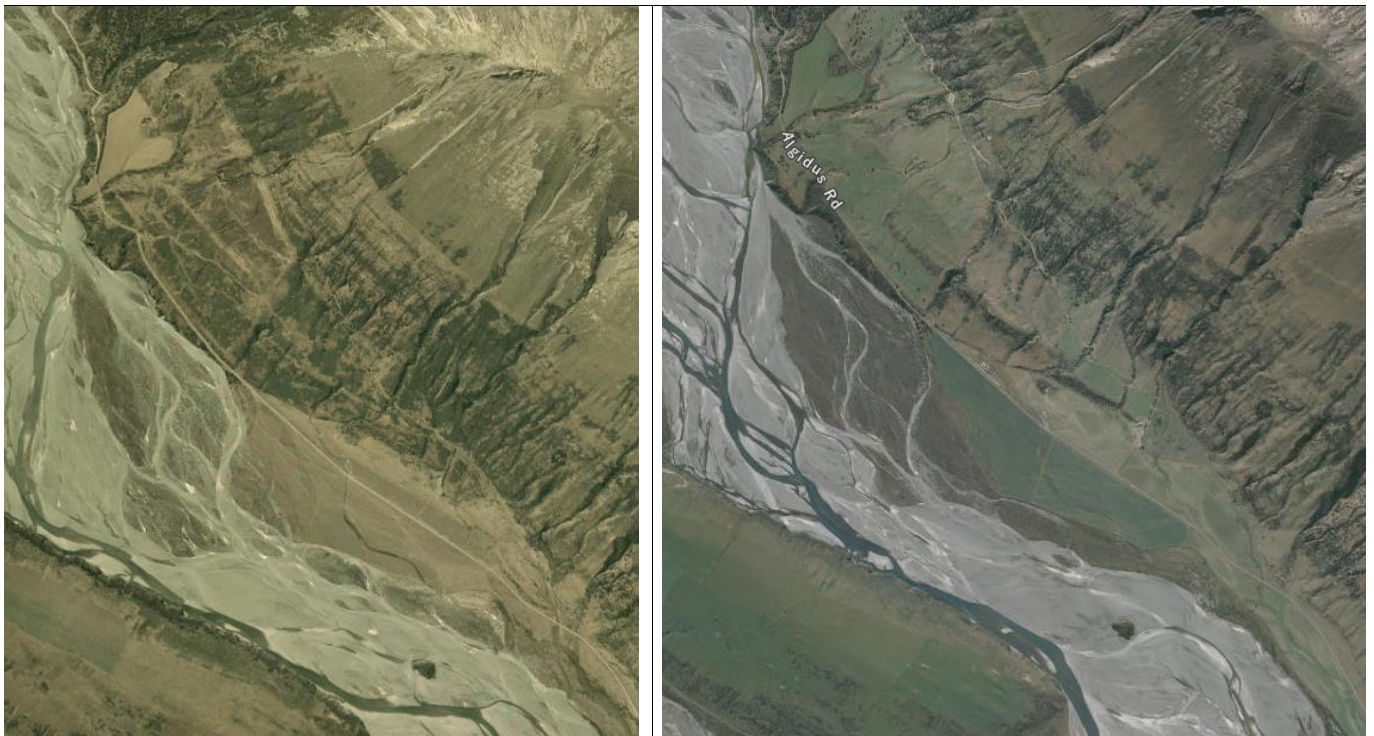


**Figure 6.** Arrowsmith Station: cultivation of dry moraine and wetland complexes (National Priorities 2, 3), part of an “Outstanding Natural Landscape”, with numerous threatened species (National Priority 4).

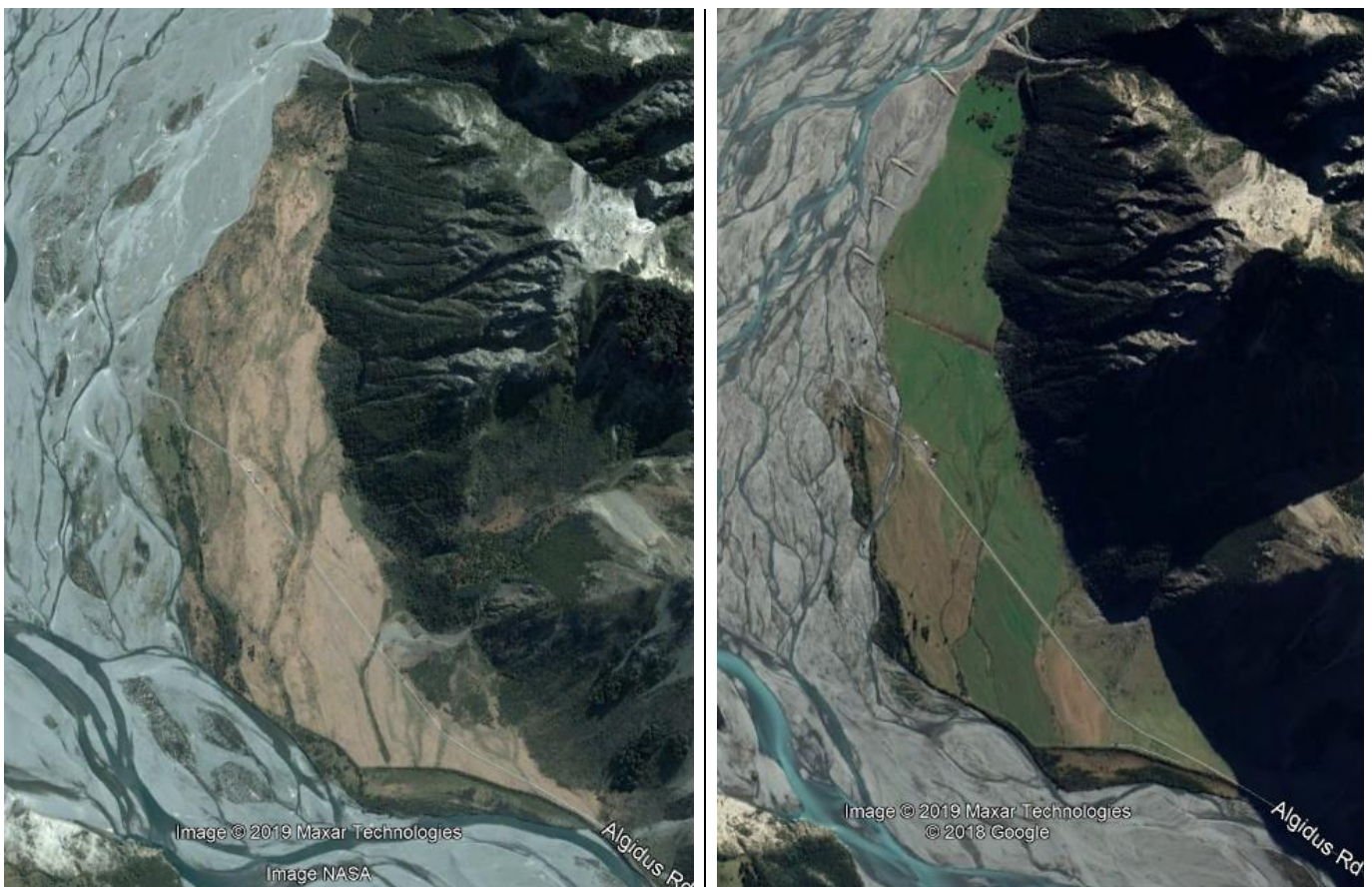


**Figure 7.** Mt Oakden: widespread clearance of mature shrublands and tussock grasslands on alluvial fans that form an important part of a sensitive lake catchment, in an Outstanding Natural Landscape.





**Figure 8.** Mt Oakden: widespread clearance of mature shrublands and tussock grasslands on alluvial fans, terraces, dry moraines (an originally rare ecosystem ranked 1. Critically endangered) and hillslopes, in an “Outstanding Natural Landscape”.



**Figure 9.** Mt Oakden: clearance of mature shrublands and tussock grasslands on alluvial terraces.

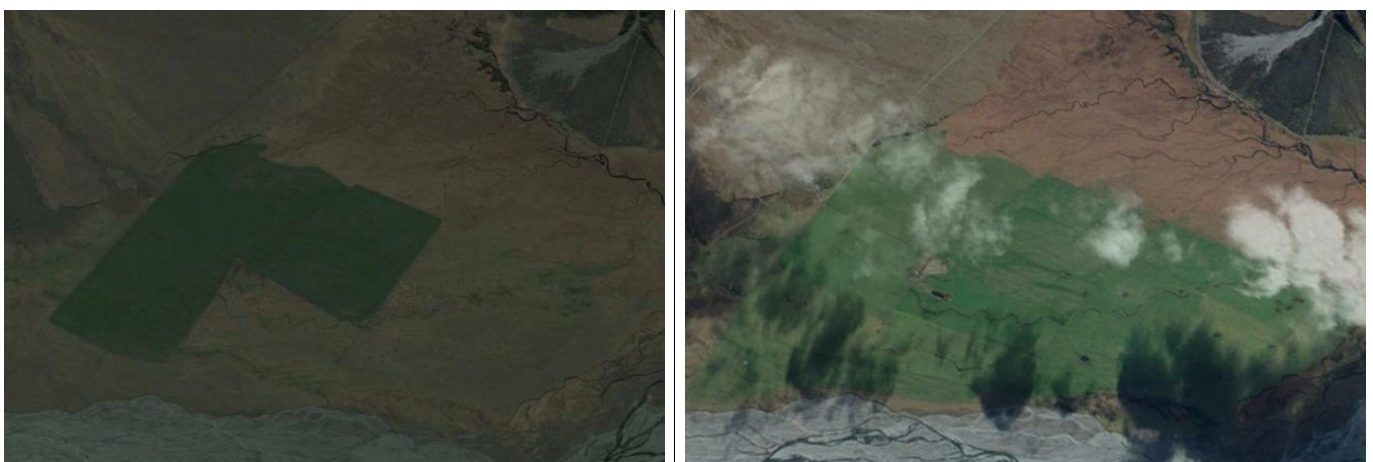




**Figure 10.** Mt Oakden: cleared mature shrublands and bush on an originally rare dry moraine ecosystems (National Priority 3, ranked 1. Critically endangered), in the outstanding natural landscape.

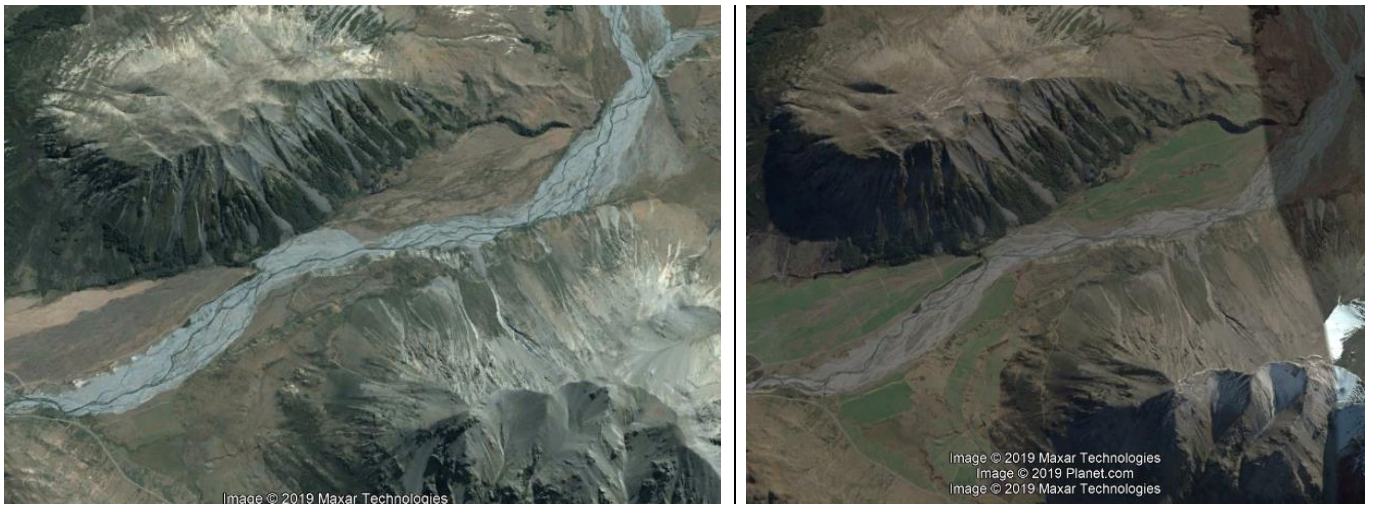


**Figure 11.** Mt Algidus: cultivated alluvial terraces of the Wilberforce and Rakaia Rivers on a National Priority 1 threatened land environment (Category 1 – < 10% indigenous cover remaining; Cieraad et al. 2015).



**Figure 12.** Mt Algidus: development of floodplains directly connected to regionally significant wetland complexes (Hydrowaters).





**Figure 13.** Glenthorne Station: development of indigenous vegetation on recent alluvial terraces of the Harper and Avoca Rakaia Rivers.



**Figure 14.** Mt White: Some of Mt White's nationally significant ecological values and Outstanding Natural Landscape, including alluvial terraces and dry moraines (National Priority 3, ranked 1. Critically endangered) that support numerous threatened species, for which CPLA consent for clearance was granted.



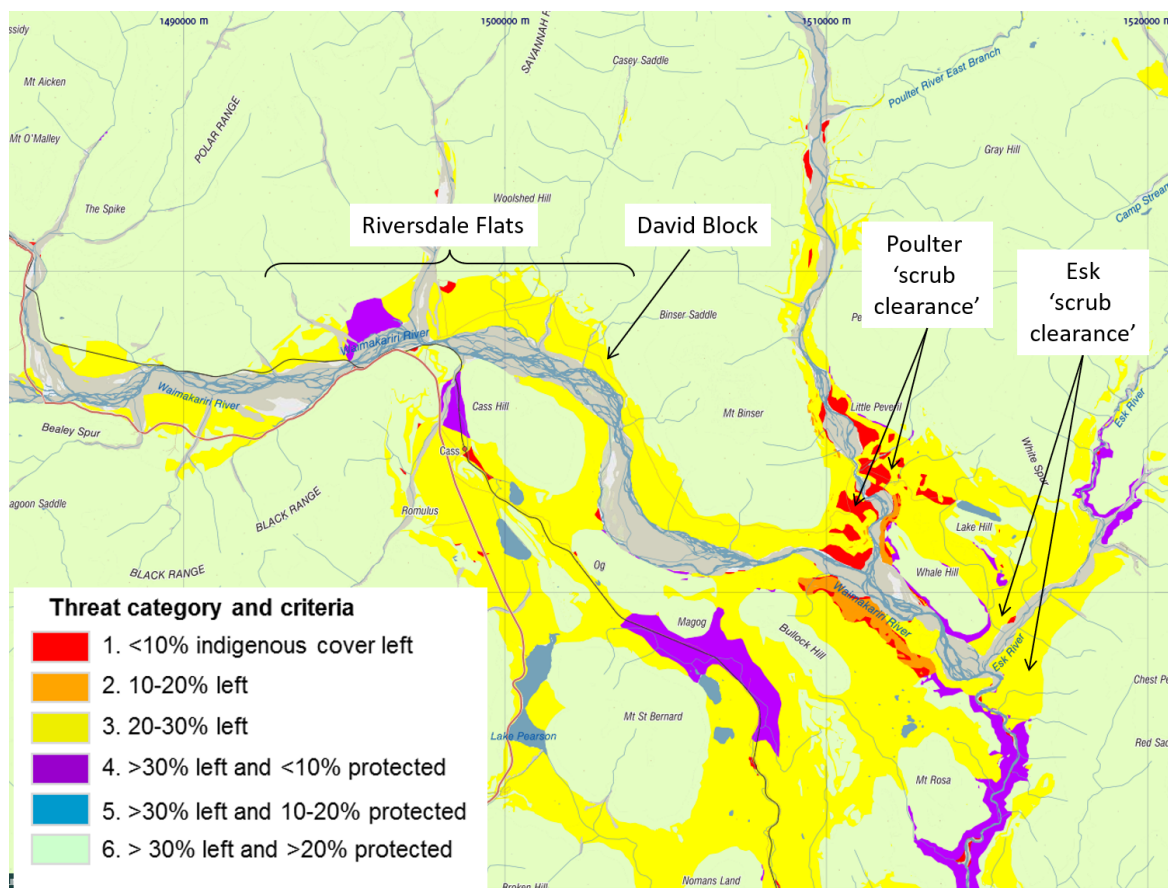


Figure 15. Maps showing (a) the threatened environment classification for Mt White.

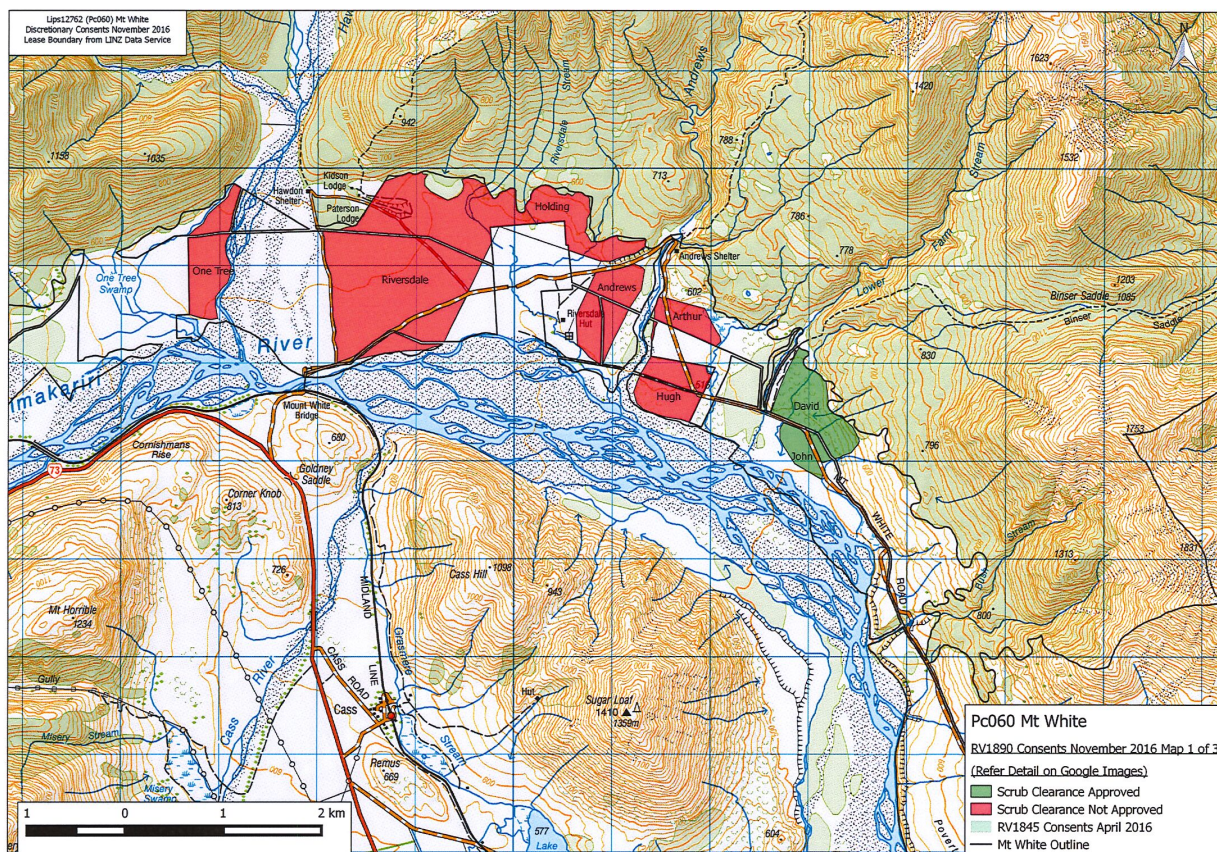


Figure 16. Some of the CPLA discretionary consents that were issued to develop nationally significant ecological values.



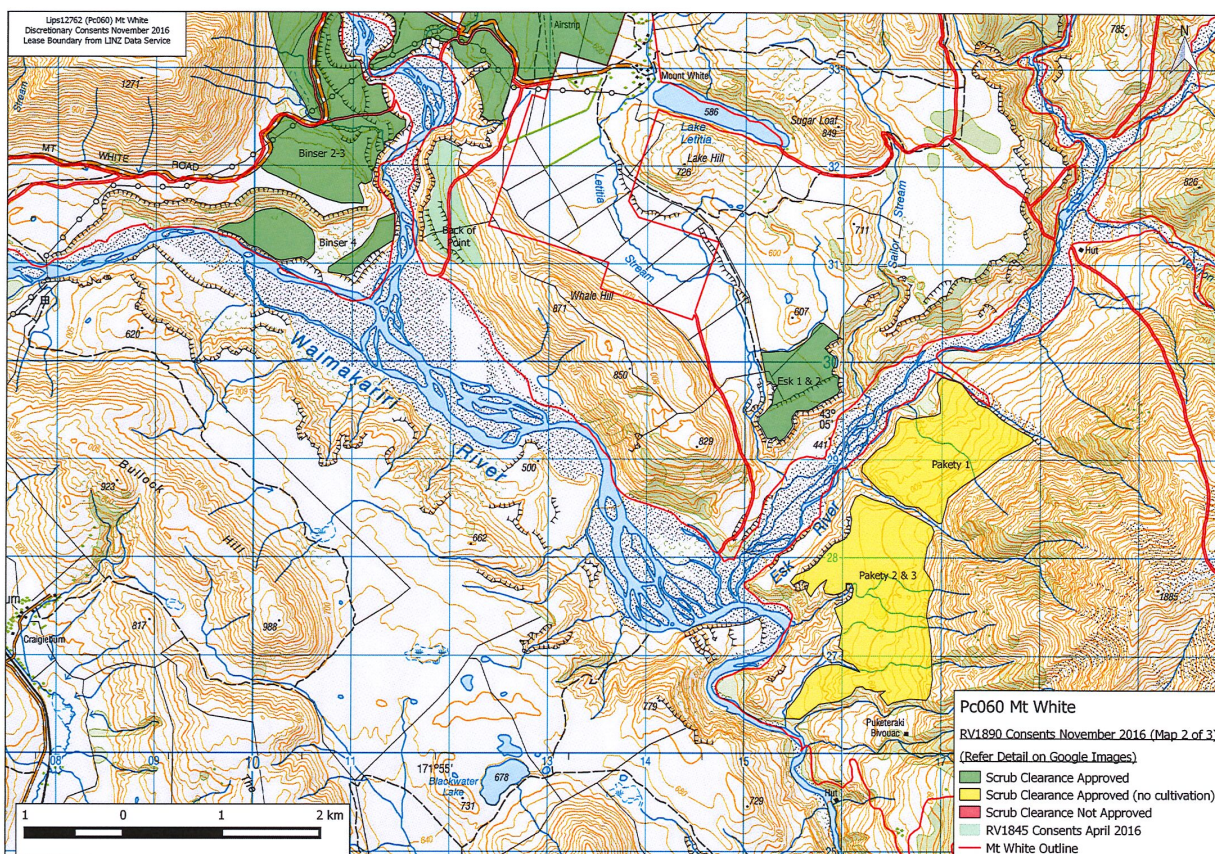


Figure 17. Other CPLA discretionary consents that were issued to develop nationally significant ecological values on Mt White.

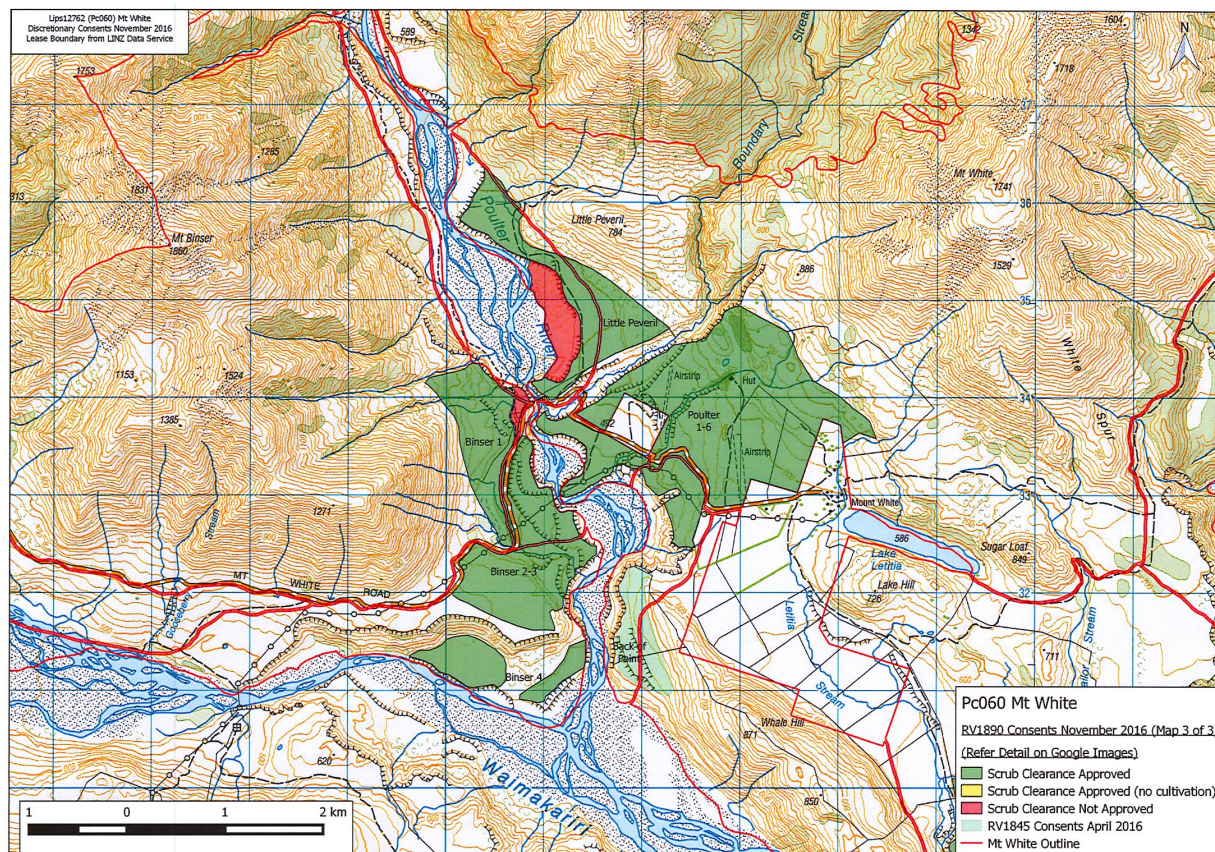
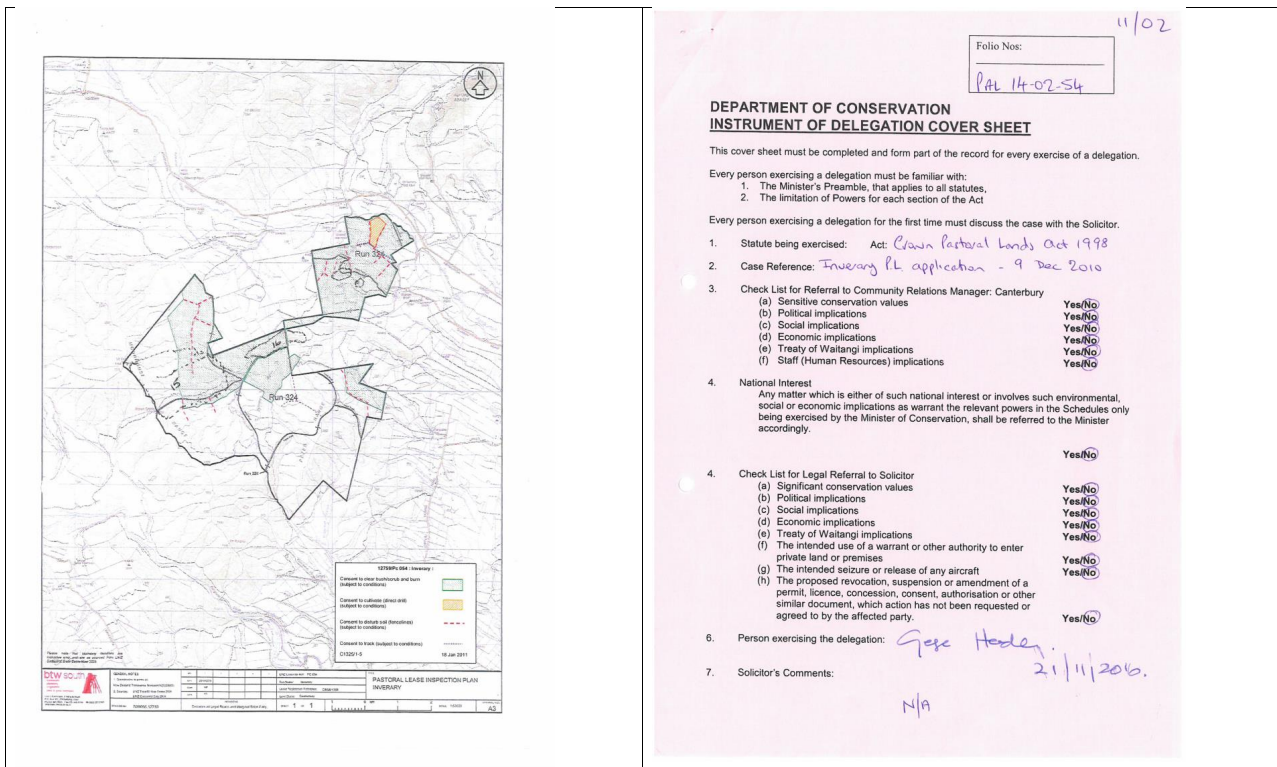


Figure 18. Further CPLA discretionary consents that were issued to develop nationally significant ecological values on Mt White.





**Figure 19.** Inverary Station: CPLA consent application map on the left with identified significant values shown within shaded areas. Right: DOC response to LINZ stating that no sensitive conservation values are present.

outwash terraces (ranked 1; critically endangered), and alluvial terraces (in a National Priority 1 threatened land environment; Category 1 – < 10% indigenous cover remaining). Numerous threatened species present include *Helichrysum dimorphum* (nationally endangered), *Olearia lineata* (nationally vulnerable), *Carmichaelia kirkii* (nationally vulnerable), *Carmichaelia uniflora* (nationally vulnerable), among many others. The site was within an “Outstanding Natural Landscape”. Local DOC staff advised LINZ to approve clearance. Subsequent tenure review survey identified multiple values and recommended all the areas for protection.

10) Inverary Station (Fig. 19; Table 1): CPLA discretionary consent granted to clear scrub across much of the property, including on National Priority 1 threatened land environments, including an RAP that supported a population of the highly threatened endemic Canterbury pink broom (*Carmichaelia torulosa*) (nationally critical). Although the lessee identified many of the values present in the application provided to DOC and LINZ, DOC incorrectly advised LINZ there were no values present.

11) Balmoral Station (Tekapo) (Figs 20–21; Table 1): CPLA discretionary consents granted to intensively develop (cultivate and irrigate) and plant conifer plantations on some of the best examples of highly natural originally rare moraine and glacial outwash ecosystems (ranked 1; critically endangered) in the Mackenzie Ecological Region that also supported numerous ephemeral wetlands (also ranked 1; critically endangered) and several threatened plant species.

12) Lake Taylor Station and Lakes Station (Figs 22–23; Table 1): CPLA discretionary consent given to clear large areas of

shrublands and second growth forest on steep unstable slopes into sub-alpine altitudes. Local DOC staff advised LINZ to approve.

13) Glynn Wye Station (Table 1): CPLA discretionary consent granted for clearance of old growth shrublands on poorly protected alluvial fans and originally rare dry moraines (ranked 1; critically endangered). DOC’s advice to LINZ identified numerous values present and recommended declining for those areas. LINZ ignored DOC’s advice, preferring that of the Service Provider, and gave approval to clear extensive areas of significant indigenous vegetation that was in breach of District Plan rules.

14) Glenrock Station (Fig. 24; Table 1): LICPLA discretionary consent granted for clearance of diverse tussock grasslands on poorly protected alluvial fans, originally rare fluvio-glacial outwash (critically endangered) and ephemeral wetlands (critically endangered) that comprised RAP 16 – Redcliffe Saddle identified in the Mathias and Mt Hutt Ecological Districts Protected Natural Areas Programme Survey (Arand et al. 1990). The area was also recommended for protection from tenure review survey. Supported threatened dwarf broom *Carmichaelia vexillata* and regionally rare red tussock *Chionochloa rubra* and bog pine *Halocarpus bidwillii* plant communities. DOC’s advice to LINZ recommended declining for those areas. LINZ initially supported DOC advice but the lessee appealed to the Commissioner of Crown Lands (CCL) and in a closed hearing the decision to decline was overturned by the CCL.



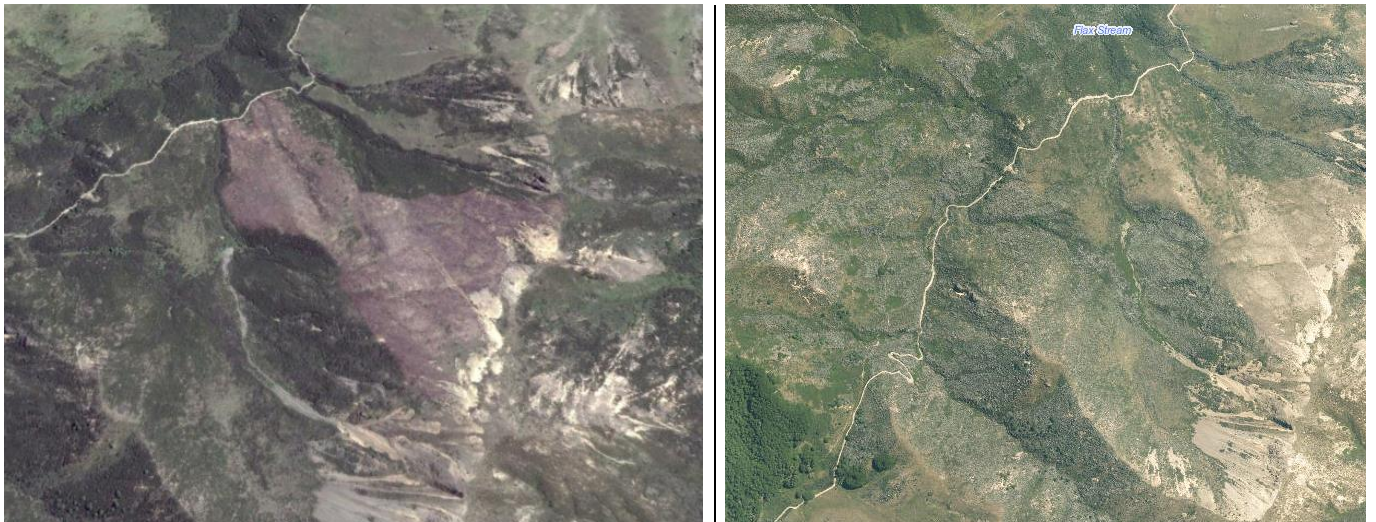


**Figure 20:** Balmoral Station (Tekapo), development and pine plantations on glacial outwash terraces and dry moraines (National Priority 3, ranked 1. Critically endangered) that supported numerous threatened species.



**Figure 21.** Balmoral Station: pine plantations on dry glacial moraines (National Priority 3, ranked 1. Critically endangered) that supported numerous threatened species.





**Figure 22.** Lake Taylor Station: extensive clearance second growth hardwood forest and shrublands on steep unstable slopes in sensitive lake catchments (grey colour in image on the right is standing dead native woody cover).



**Figure 23.** Lakes Station: extensive clearance second growth hardwood forest and shrubland on steep unstable slopes in sensitive lake catchments.



**Figure 24.** Glenrock Station: RAP 16 – Redcliffe Saddle, development of alluvial fans and glacial outwash in the upper montane/subalpine altitudes that supported multiple values.



## Appendix S2. Two case studies in Crown pastoral land management that is not ecologically sustainable

### Case study 1: Balmoral Station (Tekapo)

The following is an extract from the report of Walker and Lee (2010), which compiled and summarised changes in natural heritage that were documented in a number of reports about the pastoral lease prepared since the 1970s.

“Background documents for our assessment and remote sensing databases provide evidence of considerable habitat depletion, degradation, intentional modification and (in places) complete removal of indigenous ecosystems and species on Balmoral in recent decades. For example:

The extent, stature and dominance of (tall) red and short tussock grasses have evidently declined markedly since the mid-1970s. Molloy et al. (1976) recommended reservation of the southern slopes of the Old Man Range as a “good example of humid Mackenzie tussock grassland of historical and scientific value”, and the area was subsequently identified as an RAP (Tekapo RAP 11; Espie 1984) of red tussock, fescue *Festuca novae-zelandiae*, matagouri *Discaria toumatou* and speargrass *Aciphylla* spp.. Walls (unpubl. report) commented, “Until recent years there was far more red tussock grasslands in the wetland and gentle hill country, but much of it has evidently disappeared rather rapidly...”, and “is now reduced to scattered remnants”. The short tussock grassland derived from tall (red) tussock was “depauperate” and “rather sparse” and he noted “bare ground is exposed in many places”. He suggested that recent grassland degradation on Balmoral was probably a “complex result of sheep grazing, rabbits, over-sowing, topdressing and hawkweed invasion”. The general degradation is confirmed by a DOC note filed subsequent to the Mackenzie District Plan SONS identification process in the late 1990s. The note states: “considerable management effort would be required to bring the vegetation of the entire site back to the standard for which it was probably first identified...” by Molloy et al. (1976).

Although depletion of indigenous grasslands is best documented on the Old Man Range, the QEII covenant proposal states that pastoral management has been similar across the whole lease. Therefore we expect ecological depletion to have occurred elsewhere on the lease too. Consistent with this expectation, the 2007 SPOT satellite image and mosaicked aerial orthophotographs from 2002 to 2007 show a pattern of widespread vegetation depletion, with several bare-soil areas, severe constriction of denser red tussock to moist gully and seep enclaves, and nutrient transfer to fenceline stock camps in the western moraine areas. These patterns contrast with more evenly distributed and dense vegetation, less bare soil and an absence of stock camps on the neighbouring military reserve and Braemar Pastoral Lease.

Indigenous vegetation communities in the north-west corner of Balmoral had been fenced to exclude stock for an unknown period before 2001. Walls (unpubl. report) noted that these communities remained ‘in better condition than elsewhere on the lease land’ when he inspected the property.

Walls (unpubl. report) described unsustainable grazing on remaining rare native brooms in this area (including dwarf broom and coral broom *Carmichaelia crassicaule* classified category 4 declining), noting “the brooms would improve considerably in health if sheep and rabbits were fewer in number”.

Previously good short tussock grassland around the boulderfield at the head of the Old Man Range wetland has

been replaced by exotic pasture (Walls, unpubl. report).

Alongside the highway south of State Highway 8, rough pasture containing fescue tussock, various native shrubs and golden speargrass appears to have recently been cultivated. This was one of the last areas of native grassland on outwash surfaces on Balmoral south of State Highway 8.

Also south of State Highway 8, the Balmoral and Mt John outwash surfaces covered in degraded short tussock grassland have been further modified by extensive conifer tree planting trials.

The Balmoral moraine in the west of the property has been partly planted in exotic conifers, replacing the former indigenous grassland communities and providing a new, ongoing source of wilding conifer invasion. The QEII covenant proposal notes an intention to use oversowing and topdressing and grazing to help control these wildings. These practices will further degrade the indigenous component of the grassland and shrubland communities, and is also unlikely to effectively suppress establishment across the entire seed shadow created by the new conifers. Remote sensing images show exotic conifers are also extensive on the Golf Course moraine south of State Highway 8, where they pose a risk of spreading elsewhere in the Basin.

In the upper Forks Stream valley, a wetland has been partly developed into a deer paddock (DOC 2002a).

In the Swan Lagoon, Walls (unpubl. report) notes that while the wetland was currently used by sheep, “at present the indigenous vegetation is degraded by stock use, particularly cattle. With protective management it is likely to improve considerably in quality”. Grazing and trampling by cattle in particular rapidly destroy the indigenous turfs that hold the biodiversity of these ephemeral wetlands (Appendix S2). This wetland has also had its outlet deepened, which would have altered the hydrology and disturbed the zonation of the indigenous turf vegetation.

The QEII covenant proposal notes that in recent decades at least one of two tarns (or ‘lagoons’) on the southern slopes of the Old Man Range has had its hydrology and hence vegetation zonation altered by the raising of its outlet by more than half a metre (Sections 16 ‘Physical description’ notes both are altered, while the ‘Wildlife’ paragraph says just one ‘lagoon’ has had its upper water level altered). The QEII covenant proposal claims this is ‘beneficial to hydrology’, perhaps because it is useful for holding more water for stock. However, resulting shoreline erosion is also noted. Our expectation is that this farming modification would have removed species-rich zoned turf shoreline vegetation typical of Mackenzie Basin ephemeral wetlands (a naturally rare ecosystem; Williams et al. 2007).”

### Case study 2: Black Forest and Stony Creek pastoral leases

The following extract is from the vegetation report (Davis 2007) for the DOC Conservation Resources report for Black Forest-Stony Creek, prepared by Markus Davis (Davis 2007). Mr Davis surveyed the property for spring annual plants on 25–28 September 2006, and the main vegetation survey was undertaken on Feb 12–18 2007.

“There are large tracts of land on this property that are severely degraded. These lands support very few SIV’s, and as a consequence they have not been promoted for conservation and retention by the Crown. While such lands are not restricted to Area 3 (Big Range and Little Range), they are widespread there and extend into the alpine bioclimatic zone. Their ground surface is typically dominated by exposed soil and/or rocks, mouse-ear hawkweed (*Pilosella officinarum*) and other



exotic plants. In such a dry environment, the likelihood of productive uses being ecologically sustainable in these areas is poor. Related issues include the loss of top soil, soil nutrient depletion, reduced water yield and the spread of broom from Stony River into the Waitaki River system. The question arises as to what should happen to areas which have little prospect of being managed in an ecologically sustainable manner? In my view, freeholding such lands is contrary to objective (a) and the purposes of the CPLA. The issue is not confined to this property, as there are other pastoral leases in the Mackenzie and elsewhere which contain similarly degraded areas.”

## References

- Arand J, Glenny D 1990. Mathias and Mt Hutt Ecological Districts. Protected Natural Areas Programme Survey Report 12. Wellington, Department of Conservation. Wellington.
- Cieraad E, Walker S, Price R, Barringer J 2015. An updated assessment of indigenous cover remaining and legal protection in New Zealand's land environments. *New Zealand Journal of Ecology* 39: 309–315.
- Davis M 2007. Black forest-stony creek vegetation report. Prepared for the Department of Conservation. Wellington, Department of Conservation
- Espie PR, Hunt JE, Butts CA, Cooper PJ, Harrington WMA 1984: Mackenzie ecological region, New Zealand. Protected natural areas programme. Wellington, Department of Lands and Survey. 60 p.
- Holdaway RJ, Wiser SK, Williams PA 2012. Status assessment of New Zealand's naturally uncommon ecosystems. *Conservation Biology* 26: 619–629.
- Ministry for the Environment (MfE) 2007. Protecting our places: information about the national priorities for protecting rare and threatened native biodiversity on private land. Wellington, Ministry for the Environment.
- Molloy B, Hodder RAC, Cowie D 1976. Joint report: Balmoral historic reserve – Mackenzie Basin. Christchurch, Botany Division DSIR, NZ Forest Service, and Department of Lands and Survey, Canterbury Land District.
- Shanks A, Glenny D, Gibson R, Rosser K, Roozen D, Phillipson S, Steven J, Arand J 1990. Coleridge, Craigieburn and Cass ecological districts. Survey report for the Protected Natural Areas Programme.
- Walker S, Lee WG 2010. Proposed protection for indigenous ecosystems on Balmoral Station under the Crown Pastoral Land Act. Landcare Research Contract Report: LC0910/105 prepared for Canterbury Conservancy, Department of Conservation.
- Williams PA, Wiser S, Clarkson B, Stanley M 2007. New Zealand's historical rare terrestrial ecosystems set in a physical and physiognomic framework. *New Zealand Journal of Ecology* 31: 119–128.