Memo

Date	21 September 2016
To	Matt Dodson
cc	
From	Philip Grove, Land Resources Scientist Ecology

Subject: Current State biodiversity assessment for the Waimakariri Canterbury Water Management Strategy Zone

Modelling biodiversity outcomes for the Waimakariri Canterbury Water Management Strategy Zone under various land use change scenarios

1 Introduction

The Waimakariri Water Zone Committee Community Outcome 5 is that "Indigenous biodiversity in the zone is protected and improved". The accompanying Narrative 5 is:

"Protect and improve the indigenous biodiversity, habitat or ecosystems. Plant and animal pest species are managed or eliminated"

The purpose of this study is to evaluate whether or to what extent a range of land use change scenarios modelled for the Zone will allow this and other identified CWMS objectives to be met. The first stage was to develop a baseline or 'current state' assessment for biodiversity, set at 2015-16.

At a catchment scale, mapping is the simplest way to quantify the current state (distribution and extent) of the Zone's habitats or ecosystems, and their constituent indigenous biodiversity. The current state map can then be used to evaluate the impact of modelled land use changes on biodiversity.

2 The Current State

2.1 Methods

The Zone was mapped to show current distribution and extent of habitats of 'high', 'moderate' and 'low' value for indigenous biodiversity. The mapping was done as a desk-top Geographic Information Systems (GIS) exercise. It drew on and collated existing information from national and regional GIS datasets as well as other existing biodiversity information, such as Conservation Resources Reports produced as part of the Crown Pastoral Lease tenure review process. The existing information was cross-checked against recent aerial imagery and corrected/updated where necessary. Finally, the map was reviewed by Department of Conservation staff and other ecologists who are familiar with the Zone.

Note that the habitats map is a catchment scale overview and is not attempting to identify 'Sites of Ecological Significance' following the Regional Policy Statement criteria - to do so would require more detailed on-the-ground ecological assessment. However, the standard assessment criteria of representativeness, rarity or distinctive features, diversity and pattern, and ecological context were considered. Regional and national priorities for biodiversity protection identified in the Canterbury Biodiversity Strategy (Biodiversity Strategy Advisory Group 2008) and 'Protecting our Places' (MfE and DOC 2007) were also considered.

2.1.1 Information sources

- Land Cover Database (LCDB) version 4.1
- Threatened Environments Classification (TEC)

- Department of Conservation reserves (public conservation land)
- QEII National Trust covenant areas
- Threatened plant records (DOC GIS layer)
- Sites of National Significance (ECan GIS layer)
- Regional Wetlands (ECan GIS layer)
- Native bird habitat (ECan GIS layer)
- Mudfish Habitat (Ecan GIS layer)
- Canterbury Biodiversity Strategy priority sites (Ecan GIS layer)
- Current irrigated area (ECan GIS layer)
- 'Significant Inherent Values' (SIVs) identified during tenure review
- Naturally Uncommon Ecosystems (Williams *et al.,* 2007)
- Aerial photos of Waimakariri District
- Vegetation Habitat Points (Waimakariri District Council)

2.1.2 Habitat Ranking (assessed at 2015-16 baseline)

Low biodiversity value habitats – developed pasture, crops; exotic conifer plantation forest (except where known to support significant ecological values); urban areas.

Moderate biodiversity value habitats – generally corresponds to 'semi-improved tussock grassland', that is scattered native shrubs and tussock amongst OSTD pasture. Also includes mixed native-exotic scrub and shrubland vegetation, gorse and/or broom, and deciduous hardwoods, as these can still provide habitat for native fauna.

High biodiversity value habitats – includes one or more of the following: intact native vegetation; threatened environments supporting indigenous vegetation and/or habitat for indigenous species; naturally rare ecosystems; habitats for threatened species; wetland and riparian habitats; protected natural areas; areas identified as having high ecological values from previous surveys (e.g. as part of pastoral lease tenure reviews).

It is important to note that 'indigenous cover' or 'native vegetation' refers to indigenous cover generally, and is not restricted to original 'pre-human' vegetation. Remaining areas of importance for biodiversity are often induced or secondary indigenous vegetation (e.g. shrublands, short tussock grasslands) or areas of mixed indigenous and exotic vegetation.

2.2 Results

For mapping purposes, habitats were separated into those above and below 1000 m, as areas above 1000 m are unlikely to be affected by land use change.

2.2.1 Current state summary (2015-16)

High biodiversity value habitats > 1000 m	15,585 ha
High biodiversity value habitats < 1000 m	48,756 ha
Moderate biodiversity value habitats > 1000m	1,502 ha
Moderate biodiversity value habitats < 1000 m	26,025 ha
Low biodiversity value habitats	135,784 ha
Total	226,652 ha

N.B. These figures relate only to the Waimakariri Zone boundary as mapped. This boundary line excludes the bed and north bank margins of the Waimakariri River.

3 Discussion – An overview of Waimakariri Zone biodiversity

Special features of Waimakariri Zone are the numerous remnants of dry plains kanuka woodland, and the network of lowland-coastal wetlands along Pegasus Bay. The braided Waimakariri and Ashley Rivers are both internationally significant habitats; they form an ecological link between mountains and sea and support breeding populations of a range of characteristic but threatened birds – wrybill, banded dotterel, black-fronted tern and black-billed gulls. Lees Valley inland basin contains regionally-significant wetlands supporting red tussock and sedge-rush vegetation, and dry shrubland-grassland communities on a naturally rare and threatened inland alluvial fan ecosystem (Holdaway et al. 2012). Extensive mountain beech forests remain on the frontal ranges and in the headwaters of the Ashley and Townshend Rivers further inland.

Nationally- and regionally- important terrestrial and wetland biodiversity 'highlights' within or on the boundary of Waimakariri WMZ identified at time of CWMS development included:

1. Bed and undeveloped riparian margin of the Waimakariri River.
2. Bed and margin of Ashley/Rakahuri River from the mouth to the gorge.
3. The Ashley/Rakahuri River gorge between the plains and Lees Valley
4. Wetland, riparian and terrestrial dry shrubland and alluvial fanvegetation/habitats in Lees Valley intermontane basin
5. Native forests of the Oxford Forest, Mt Thomas Forest, Ashley Forest area and associated wetlands
6. Podocarp forest remnants at foothills-plains interface e.g. Coopers Creek/View Hill area, and associated wetlands, including Tawera mudfish population.
7. Dry plains native vegetation remnants particularly along the margins of the Waimakariri River and adjacent to or in the vicinity of Eyrewell Forest.
8. Native plant and animal habitats associated with Eyrewell Forest
9. Ashley/Rakahuri - Saltwater Creek Estuary
10. Waimakariri River mouth and tidal reaches including lower Kaiapoi River
11. Network of low plains wetlands and coastal dunes between the Ashley/Rakahuri and Waimakariri Rivers (e.g. Tutaepatu Lagoon)
12. Coastal dunes and associated wetlands north of Ashley/Rakahuri-Saltwater Creek estuary (e.g. Ashworths Beach ponds).
13. Notable threatened plants in the Waimakariri Zone include *Cardamine curbata* and national stronghold populations of *Cardamine pinnata* and *Sonchus novae-zelandiae*.

In terms of its land use history and biodiversity current state, Waimakariri is similar to its neighbouring Canterbury Plains zones - Selwyn-Waihora and Ashburton. That is, a landscape transition across the Zone from highly developed/modified plains environments to 'less developed' but still modified foothills and inland basins, to the relatively unmodified subalpine-alpine areas.

As for the rest of Canterbury, there has been substantial loss of indigenous biodiversity from Waimakariri Zone since human settlement. This has primarily occurred through the loss and modification of habitat by deforestation, burning, drainage, cultivation and other development, and new species introductions. Continuing habitat loss and modification, and the impacts of animal and plant pests remain the principal threats to indigenous biodiversity today.

The greatest rate of loss of indigenous habitat and biodiversity have occurred in lowland and coastal environments (<400m) where development has been most intensive. Over most of these areas, >90% of original cover has gone. Lowland forests, shrublands and indigenous grasslands have been reduced to small, scattered fragments, and these remnants are still threatened by changing land use, browsing pressure, edge effects, weeds and pests. Freshwater and coastal wetlands have been drained and reclaimed; remaining wetlands are under threat from catchment land use intensification, grazing, recreational impacts and coastal erosion. These coastal-lowland elevation environments, where there has been the greatest loss of indigenous vegetation and habitat, also represent the parts of the region where remaining indigenous biodiversity is at the greatest risk of further loss.

In heavily modified low plains, environments where little intact native vegetation cover remains, 'semi-natural' mixed native-exotic and even largely exotic vegetation cover, such as riparian willow forest, now provide the best and most extensive remaining habitats for native flora and fauna. A very

substantial example of this was the Eyrewell Forest pine plantation which supported large populations of native shrub and groundcover plants, native birds, lizards and invertebrates including the threatened endemic Canterbury Plains ground beetle (*Holcaspis brevicula*) (Brockerhoff *et al*. 2008). Most of the former Eyrewell Forest has now been converted to irrigated dairy and dairy support farm land. It remains to be seen to what extent preservation of a remaining pine forest area together with ecological restoration projects underway or planned will compensate for effects of this recent land use change on dryland plains biodiversity.

In montane environments (400-800 m), the loss of indigenous cover has not been as extensive as in the lowland and coastal areas, and extensive areas of native forest, native shrublands, tussock grasslands and some important ecological corridors persist. However, some parts of the frontal hill country, and especially the Lees Valley inland basin, are currently experiencing rapid rates of land use change and intensification, further reducing remaining area of habitats such as red tussock wetlands and dry shrubland. As a result of several factors including pastoral lease tenure review and the extension of developed/cultivated farmland to increasingly higher altitudes, Lees Valley has recently undergone some of the most rapid change in land use within the Zone. The Mt Pember alluvial fan in Lees Valley is regionally significant as the last undeveloped alluvial fan of its type. It supports populations of several threatened plants - including *Brachyscome pinatta, Sonchus novae-zelandiae* and *Carmichaelia monroi* (de Lange et al. 2013) – but is being degraded by cattle grazing.

In general, high country and alpine environments (>800m) remain dominated by indigenous beech forest and tussock grassland vegetation, although even here grazing by introduced animals is having an impact. Pests such as possums, pigs, deer and goats pose a threat to both old-growth forest remnants and regenerating forest across the Zone; while mammalian predators decimate native wildlife.

Wetland changes – past and present

Comparison of Freshwater Ecosystems of New Zealand (FENZ) historic and current freshwater wetland layer for Waimakariri Zone show and 95% reduction in wetland extent, from 22,164 ha *c.* 1840 to 1,026 ha in 2000. While there are some accuracy limitations with the FENZ current wetland layer and it does underestimate remaining wetland extent, proportion of freshwater wetland habitat loss across the Zone as a whole since European settlement is still likely to exceed 90%.

The rate of wetland loss in Waimakariri Zone, and elsewhere in the region, has slowed compared to the massive reduction of the late 19th-early 20th century, but continues. While most of the past wetland loss was from the low plains, more recent (post 1990) wetland reduction has occurred in the foothills and Lees Valley associated with land use intensification in these parts of the Zone (Pompei and Grove 2010). The conversion, in 2008, of a large nationally-significant wetland area at Mounseys Rd west of Oxford into dairy farm was disastrous in particular for what had been one of the largest known populations of endangered Canterbury mudfish. Over the last few years though, there has also been some examples of increased extent of lowland-coastal wetland habitats, associated with Pegasus Town development and post-earthquake shifts in bed levels and hydrology along the lower Waimakariri River.

Recent trends in Land Use/Land Cover and implications for indigenous biodiversity

A comparison of area of Land Cover Database (LCDB) classes across the Zone classes over the period 1996-2012 shows net reduction in extent of a number of ' high biodiversity value' habitats: Indigenous forest (reduced by 78 ha); Broadleaved Indigenous hardwood scrub (reduced by 115 ha); kanuka (reduced by 87 ha); herbaceous freshwater wetland vegetation (reduced by 32 ha). There was also substantial reduction in extent of 'moderate biodiversity value' habitats especially gorse and/or broom (down by 836 ha) and 'low producing grassland' (down by 2077 ha). The 1996-2012 LCDB showed a corresponding increase in 'low biodiversity value' habitats': high producing exotic grassland (up 1762 ha); orchard, vineyard, crop (up 300 ha); built-up area (389 ha).

4 Conclusion

Terrestrial biodiversity values will be adversely impacted under all land use change scenarios that result in further reduction in extent of high and/or moderate value habitats within the zone, and a corresponding increase in lower value habitats.

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