

# REVIEW OF SIGNIFICANT NATURAL AREAS IN THE WAIMAKARIRI DISTRICT

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## **Contract Report No. 4714**

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### **Project Team:**

Melissa Hutchison - Field survey, mapping, report author.

Melanie Lapointe - Field survey, mapping, report author.

Steve Rate - Field survey, mapping, report author.

Erin Gallagher - Field survey.

Tom Pyatt - GIS/mapping.

Des Smith - Contract manager, peer review.

### **Prepared for:**

Waimakariri District Council

215 High Street

Rangiora 7400



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**Reviewed and approved for release by:**



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Des Smith  
Principal Ecologist, Christchurch Manager  
Wildland Consultants Ltd

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## 1. INTRODUCTION

Waimakariri District Council (WDC) is undertaking a 10 yearly review of its operative District Plan as required under the Resource Management Act 1991 (RMA). As part of this process, the Council is required to recognise and provide for the following matters of national importance under the RMA:

- *the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

The Council is also required to control any actual or potential effects of the use, development, or protection of land to maintain indigenous biological diversity (RMA s31). Statutory duties in relation to significant indigenous vegetation and significant habitats of indigenous fauna have been defined in the Canterbury Regional Policy Statement. These must be given effect to in district plans.

During the review, the Council will identify and map areas of significant indigenous vegetation and significant habitats of indigenous fauna (Significant Natural Areas, SNAs), and confirm the presence and significance of previously identified sites. Once mapped, the Council is required to develop appropriate controls on activities within the SNAs to ensure their protection.

Appendix 25.1 of the operative Waimakariri District Plan contains 112 Significant Natural Areas (referred to as ‘Vegetation and Habitat Sites’ or ‘V sites’). The Council has reviewed the listed sites and determined that many of these remain unchanged, but that other sites have changed since being listed. As a first step, WDC has commissioned Wildland Consultants Ltd (Wildlands) to carry out a review of 62 sites that are listed in the current District Plan (i.e. Deliverable 1). The aim is to review these sites to determine whether they meet the criteria for listing as Significant Natural Areas (in terms of their features and values), whether indigenous biodiversity is being maintained, and to map the boundaries of each site. Subsequently, Wildland Consultants will also identify and map any new Significant Natural Areas that should be included in the District Plan (i.e. Deliverable 2).

## 2. ECOLOGICAL CONTEXT

Waimakariri District contains five Ecological Districts (EDs): Low Plains, High Plains, Oxford, Torlesse, and Ashley (McEwen 1987). The Low Plains and High Plains EDs are located within the Canterbury Plains Ecological Region, Oxford and Ashley EDs are in the Foothills Ecological Region, and Torlesse ED is in the Puketeraki Ecological Region (Table 1).

Table 1: Area of each Ecological District within the Waimakariri District.

<b>Ecological District</b>	<b>Area (ha) within Waimakariri District</b>
Low Plains Ecological District	88,367
High Plains Ecological District	38,593
Oxford Ecological District	55,058
Torlesse Ecological District	35,918
Ashley Ecological District	3,775
<b>Total</b>	<b>221,713</b>

The 62 sites to be reviewed for Deliverable 1 are located in the Low Plains, High Plains, and Oxford Ecological Districts. Brief descriptions of these Ecological Districts are provided below.

## 2.1 Low Plains Ecological District

Within the Waimakariri District, the Low Plains Ecological District (ED) is bordered to the east by the coast and to the west by the High Plains Ecological District. It extends from sea level to approximately 300 metres above sea level (McEwen 1987, Harding 2009). The Ecological District is drained by the Ashley and Waimakariri Rivers, as well as other smaller rivers. The geology mostly comprises Pleistocene glacial outwash gravels and Holocene alluvial deposits, with substantial areas of Holocene coastal swamp deposits and beach gravels. Low dunes, dune lakes and lagoons are present along the coast. In the rest of the Ecological District, soils range from shallow stony sands on terraces to deep clayey soils and loess on older flat plains (McEwen 1987, Harding 2009). The Low Plains ED is characterised by low rainfall of c.600-800 mm per year, with warm summers, hot foehn northwesterlies giving temperatures above 32°C, cool winters with frequent frosts, and occasional light snowfalls (McEwen 1987).

The natural vegetation of the Low Plains ED has been severely modified and reduced in extent as a result of agricultural and urban development. These natural 'dryland' ecosystems would have originally supported an open and diminutive vegetation mosaic of short grasses, cushion plants, mat plants, mosses, lichens on stones and on the ground, and some bare ground. Common plant species would likely have been *Raoulia australis* and *Scleranthus uniflorus*, short tussock grasses such as silver tussock (*Poa cita*) and danthonia (*Rytidosperma clavatum*), and mats of low woody species such as pātōtara (*Leucopogon fraseri*) and creeping pōhuehue (*Muehlenbeckia axillaris*).

Indigenous plant species that are now uncommon in the Ecological District (e.g. *Raoulia monroi*, *Muehlenbeckia ephedroides*, *Colobanthus brevisepalus*, *Carmichaelia corrugata*, and *Carex breviculmis*) would probably have been widespread in these grasslands previously (Meurk 2008). Kānuka (*Kunzea robusta* and *K. serotina*) forest, kōwhai (*Sophora microphylla*)-tī kōuka (*Cordyline australis*) treeland, matagouri (*Discaria toumatou*) shrubland and silver tussock grassland would have been widespread on stable gravels (Stevens and Meurk 1996, Meurk 2008).

Now only small remnants of indigenous vegetation remain in the Low Plains ED. Scattered kānuka forest remnants are found in the Eyrewell area, indigenous shrubland-grassland vegetation is present along the banks of the lower Waimakariri River, and areas of coastal wetland vegetation are still present along the coast of the Waimakariri District (Meurk 2008, Harding 2009). Approximately 1% of the Low Plains Ecological District is protected (Harding 2009).

## 2.2 High Plains Ecological District

The High Plains Ecological District is located to the west of the Low Plains ED and to the south of the Okuku River in the Waimakariri District. Its western boundary follows the base of the foothills. The High Plains ED lies between 250 and 500 metres above sea level (Harding 2009). The geology is mainly Pleistocene glacial outwash gravels and Holocene alluvial deposits, with minor volcanic outcrops, some forming small hills (McEwen 1987). The range of soils includes stony sands to deep silt loams on river flats as well as



deep clayey or silty soils from loess (McEwen 1987). The climate of the High Plains ED is similar to the Low Plains ED except for a higher rainfall of c.800-1,000 mm per year (McEwen 1987).

Like the Low Plains ED, the natural vegetation of the High Plains ED has been severely modified by agricultural development and fires. The eastern part of the Ecological District would have had similar 'dryland' ecosystems dominated by short grasses and low-lying shrubs. Near the foothills, extensive areas of beech or beech-podocarp forest would have been found (Meurk 2008, Harding 2009). Kānuka forest, kōwhai-tī kōuka treeland, matagouri shrubland, silver tussock grassland, and freshwater wetland would also have been present throughout the Ecological District (Stevens and Meurk 1996, Meurk 2008).

Only small remnants of indigenous vegetation are still present in the Waimakariri part of the High Plains ED. The largest area of indigenous vegetation consists of kānuka and grassland remnants in the Eyrewell area along the boundary with the Low Plains ED, and small beech or beech podocarp remnants at the base of the foothills (Meurk et al. 1995, Harding 2009, Meurk 2008). Approximately 1.5% of the High Plains Ecological District is protected (Harding 2009).

### 2.3 Oxford Ecological District

Oxford Ecological District occupies the foothills of the Waimakariri District between the Waimakariri River and Mt Grey/Maukatere (Harding 2009). It adjoins the High Plains ED and is bordered to the north by the Puketeraki Range (Torlesse Ecological District). Oxford Ecological District covers a region of glaciated higher hill country with summits reaching between 900 and 1,350 metres above sea level (Harding 2009). The Ashley River, Eyre River, Okuku River and their smaller tributaries drain most of the Ecological District. Greywacke and argillite of the Torlesse Group rock are present in the Ecological District, with glacial outwash gravels and more recent river deposits in Lees Valley (McEwen 1987, Harding 2009). The Oxford Ecological District is characterized by moderate rainfall of c.1,000-1,200 mm per year, with warm summers, occasional hot foehn northwesterlies giving temperatures above 32°C, cool winters with frequent frosts, and occasional light snowfalls (McEwen 1987).

Beech forests would have been the most extensive original vegetation type on slopes and in the hill country, while mixed podocarp forests were present at lower altitudes (McEwen 1987, Harding 2009). Mānuka (*Leptospermum scoparium*)-kānuka scrub, patches of hardwood, and tussock grassland would also have been present. The Lees Valley probably supported different types of tussock grassland, wetland, and gravelfield (Harding 2009).

Indigenous vegetation cover at lower altitudes has been greatly reduced in extent and modified by agricultural practices and fire (Harding 2009). At higher altitudes, extensive beech forest remains, although the original vegetation has been modified by pest animals and grazing stock (Harding 2009). Approximately 23% of Oxford Ecological District is protected (Harding 2009).

## 2.4 Threatened Environment Classification

The Threatened Environment Classification (TEC) combines data from three national databases: Land Environments of New Zealand (LENZ), the Land Cover Database (LCDB), and the national protected areas network (Cieraad *et al.* 2015, Walker *et al.* 2015). The TEC is designed as a regional-national scale tool for assessing the threat status of land environments based on the loss of original natural vegetation cover, and the extent to which the remaining indigenous vegetation is protected. The classification shows that most of the Low Plains and High Plains Ecological Districts, as well as the lower altitude parts of Oxford Ecological District, are located on land environments with less than 10% or 10-20% indigenous vegetation cover remaining (Table 2 and Figure 1). The higher altitude regions of Oxford Ecological District occur mainly on land environments with more than 30% indigenous cover remaining and more than 20% protected.

Table 2: Area of each Threatened Environment Classification (TEC) category within the Waimakariri District.

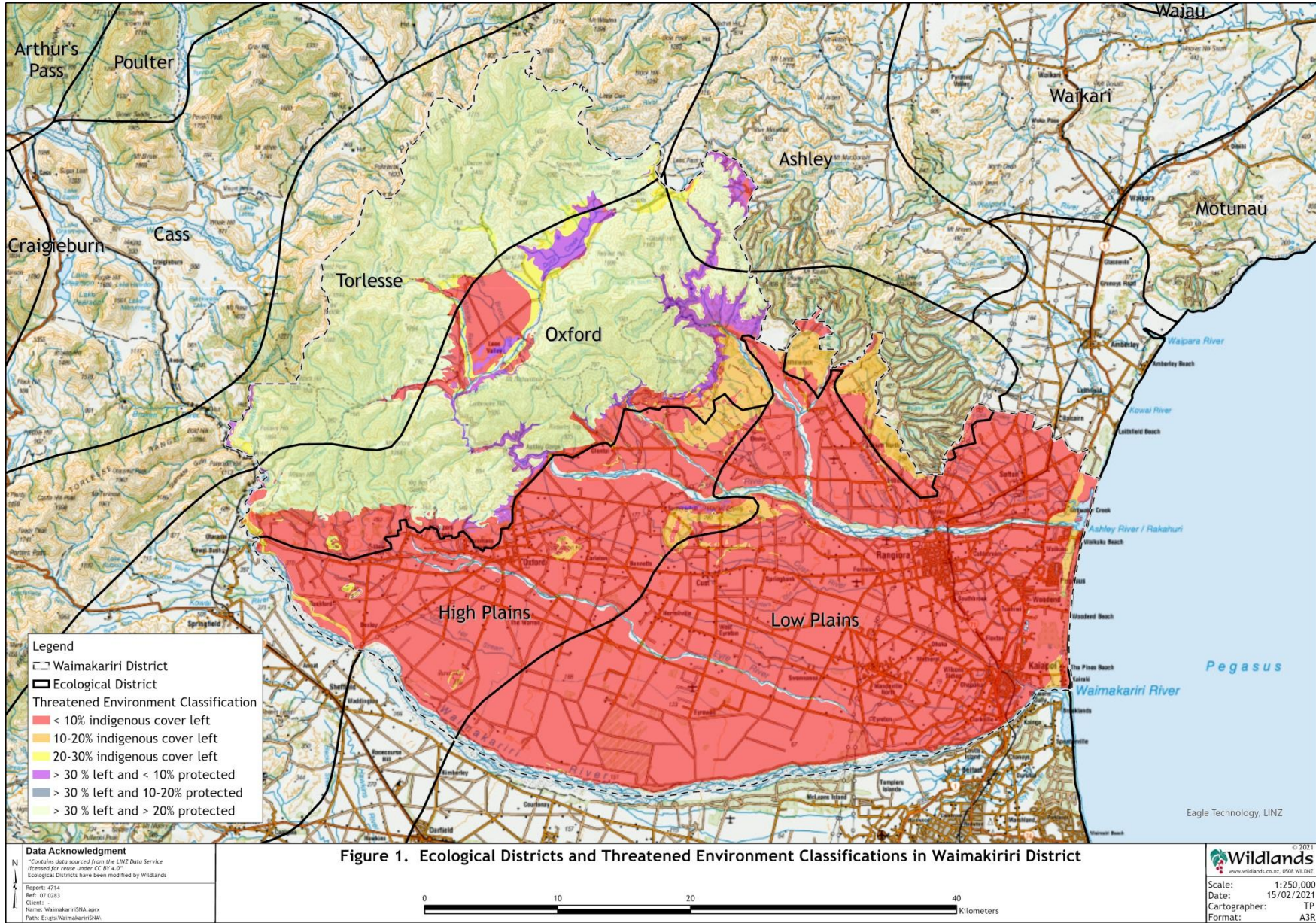
TEC Category	Area (ha)
<10% indigenous cover left	126,992
10-20% indigenous cover left	8,429
20-30% indigenous cover left	3,094
>30% left and <10% protected	5,856
>30% left and 10-20% protected	0
>30% left and >20% protected	68,880

## 2.5 Public Conservation Land and other protected land (covenants)

The Waimakariri District contains substantial areas of public conservation land administered by the Department of Conservation – these are located mainly in the foothills in the Oxford and Torlesse Ecological Districts (e.g. Oxford Forest, 13,320 hectares; Mt Thomas Forest, 10,642 hectares; Ashley Riverbed/Rakahuri, 1,102 hectares; View Hill Scenic Reserve, 44 hectares).

The Waimakariri District also contains a number of areas of private land that have been legally protected through covenants with the QEII National Trust (at least 14 covenants are registered in the District).

Very little indigenous vegetation on the Canterbury Plains is legally protected (<2% of the Low Plains and High Plains Ecological Districts are legally protected, Harding 2009). Two of the largest protected areas of indigenous dryland vegetation (kānuka forest) on the plains are Motukānuka Scientific Reserve (13.0 hectares, purchased by DOC in 2019) and Eyrewell Scientific Reserve (2.3 hectares).





## 2.6 Naturally uncommon (historically rare) ecosystems

In total, 72 naturally uncommon (historically rare) ecosystem types have been identified in New Zealand (Williams *et al.* 2007). At least eight naturally uncommon ecosystem types are present in the Waimakariri District, and all of them are classified as threatened at a national scale (Holdaway *et al.* 2012) (Table 3).

Table 3: Naturally uncommon ecosystem types (Williams *et al.* 2007) in the Waimakariri District and their threat status (Holdaway *et al.* 2012).

Ecosystem Type (Williams <i>et al.</i> 2007)	Threat Status (Holdaway <i>et al.</i> 2012)	Description (Manaaki Whenua-Landcare Research)	Example/s
Ephemeral wetlands	Critically Endangered	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/ephemeral-wetlands/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/ephemeral-wetlands/</a>	Lees Valley
Active sand dunes	Endangered	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/coastal/active-sand-dunes/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/coastal/active-sand-dunes/</a>	Waikuku Beach
Braided riverbeds	Endangered	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/braided-riverbeds/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/braided-riverbeds/</a>	Waimakariri River, Ashley River
Coastal lagoons	Endangered	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/lagoons/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/lagoons/</a>	Tūtaepatu Lagoon
Dune slacks	Endangered	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/dune-slacks/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/dune-slacks/</a>	Pines Beach
Basic cliffs, scarps, and tors	Vulnerable	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/basic-cliffs-scarps-and-tors/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/basic-cliffs-scarps-and-tors/</a>	Burnt Hill, View Hill
Calcareous cliffs, scarps, and tors	Vulnerable	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/calcareous-cliffs-scarps-and-tors/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/inland-and-alpine/calcareous-cliffs-scarps-and-tors/</a>	Limestone scarps north of Okuku
Estuaries	Vulnerable	<a href="https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/lagoons/">https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/lagoons/</a>	Ashley Estuary, Waikuku Estuary

## 2.7 Fauna

Large braided rivers such as the Waimakariri and Ashley Rivers provide important habitat for indigenous birds, such as the black-fronted tern/tarapirohe (*Chlidonias albobriatus*; classified as Threatened-Nationally Endangered by Robertson *et al.* 2017) and banded dotterel/tūturiwhatu (*Charadrius bicinctus bicinctus*; Threatened-Nationally Vulnerable) (McEwen 1987). Black shag/kawau (*Phalacrocorax carbo novae-hollandiae*; At Risk-Naturally Uncommon) was noted in the upper Ashley River (Boffa Miskell 2009, Boffa Miskell 2012).

New Zealand falcon/karearea (*Falco novaeseelandiae novaeseelandiae*; At Risk-Recovering) are known to nest in areas of indigenous vegetation in Oxford Ecological District (McEwen 1987, Boffa Miskell 2009, Boffa Miskell 2012). Grasslands and tussocklands in the Lees Valley provide good quality habitat for New Zealand pipit/pīhoihoi (*Anthus novaeseelandiae novaeseelandiae*; At Risk-Declining) (Boffa Miskell 2010, Boffa Miskell 2012).

Beech and kānuka forests provide habitat for many indigenous bird species, including bellbird/korimako (*Anthornis melanura melanura*), tūī (*Prothemadera novaeseelandiae novaeseelandiae*), and South Island fantail/pīwakawaka (*Rhipidura fuliginosa fuliginosa*).

Kea (*Nestor notabilis*; Threatened-Nationally Endangered) and South Island rifleman/titipounamu (*Acanthisitta chloris chloris*) have also been observed in the Canterbury Foothills (Department of Conservation 1996, Boffa Miskell 2009).

A number of indigenous lizard (gecko and skink) species occur in the Waimakariri District, for example these species were noted at Eyrewell (McEwen 1987, Meurk 2017) and the Lees Valley (Department of Conservation 1996, Boffa Miskell 2010):

- Jewelled gecko (*Naultinus gemmeus*; At Risk-Declining, Hitchmough *et al.* 2016),
- Waitaha gecko (*Woodworthia cf. brunnea*; At Risk-Declining)
- Canterbury grass skink (*Oligosoma aff. polychroma* Clade 4; At Risk-Declining)
- Southern Alps gecko (*Woodworthia* "Southern Alps"; Not Threatened).

Waimakariri District contains a variety of freshwater environments that provide important habitat for indigenous fauna, including many Threatened and At Risk species. For example, the Canterbury mudfish (*Neochanna burrowsius*; classified as Threatened-Nationally Critical by Dunn *et al.* 2018) is present in in springs, creeks, drains and wetlands in the Low and High Plains Ecological Districts (Taylor and McCaughan 2012, Taylor and Marshall 2017). Lamprey (*Geotria australis*; At Risk-Declining) was recorded at a few sites in the stony reaches of North Brook, in Cam River's brook and in Middle Brook (Taylor and McCaughan 2012, Taylor and Marshall 2017).

Longfin eels (*Anguilla dieffenbachii*; At Risk-Declining), shortfin eels (*A. australis*), torrentfish (*Cheimarrichthys fosteri*; At Risk-Declining), common smelt (*Retropinna retropinna*), giant bully (*Gobiomorphus gobioides*; At Risk-Naturally Uncommon), and bluegill bully (*G. hubbsi*; At Risk-Declining) and are known to inhabit streams and rivers in the District, and many inanga (*G. maculatus*; At Risk-Declining) spawning sites have been identified (Taylor and McCaughan 2012). There is also a single record of giant kōkopu (*Galaxias argenteus*; At Risk-Declining) in the District (Taylor and McCaughan 2012). Freshwater crayfish, kōura (*Paranephrops zealandicus*; At Risk-Declining in Grainger *et al.* 2018) are present in the Cam River catchment, and freshwater mussels (*Echyridella menziesii*; At Risk-Declining) have also been observed in the District (Taylor and McCaughan 2012). The introduced brown trout (*Salmo trutta*) and Chinook salmon (*Oncorhynchus tshawytscha*) also occur in the District (Taylor and McCaughan 2012).

Many indigenous invertebrate species have been recorded in the Waimakariri District. For example, the Eyrewell forest ground beetle (*Holcaspis brevicula*), which is classified as Threatened-Nationally Critical (Leschen *et al.* 2012), is only known from exotic plantation forests at Eyrewell (Brockhoff *et al.* 2005). The red katipo spider (*Latrodectus katipo*, At Risk-Declining) is known to be present in sand dunes at Waikuku (Vink *et al.* 2008). The moth *Eurythecta robusta* (At Risk-Naturally Uncommon in Hoare *et al.* 2017), the Canterbury Plains boulder copper butterfly (*Lycaena* new species, see Patrick and Patrick 2012), and *Tingena griseata* were recorded in indigenous herbfield at Dagnum Reserve (Wildland Consultants 2016). The thin-veined copper butterfly (*Lycaena rauparaha*) was described from specimens collected at Kaiapoi, but may no longer occur in the Waimakariri District (Patrick and Patrick 2012).

### 3. METHODS

#### 3.1 Existing Vegetation and Habitat Sites (Deliverable 1)

Waimakariri District Council selected 62 of the Vegetation and Habitat Sites (or V sites) listed in the current District Plan (112 sites in total) for the initial phase of this review (referred to as ‘Deliverable 1’, see Table 4). The remainder of the V sites were assessed by the Council and were not reviewed by Wildland Consultants.

Each V site was assigned a new number according to the Ecological District it was located in (e.g. LP = Low Plains, HP = High Plains, OX = Oxford). The Ecological Districts GIS layer was used as a guide to determine which Ecological District each site was located in, however in some places the Ecological District boundaries were not accurate and the boundaries had to be adjusted (redrawn) according to the information in previous site reports (e.g. Stevens and Meurk 1996, WDC reports by David Given and David Rossiter), the topography, landform, and/or field observations. For example, the boundaries were redrawn so that flat land on the plains was in the High Plains or Low Plains Ecological Districts rather than Oxford Ecological District. Some of the previous site names were updated to include the main vegetation type present at the site, and some site names were changed if the site has been commonly known by another name.

Waimakariri District Council contacted the landowners of the 62 sites by telephone to inform them of the District Plan Review process and ask for the permission for a site visit to be carried out. Some landowners raised concerns about the process and denied access for field surveys. In those cases, a desktop assessment only was undertaken.

Table 4: Summary information for 62 Vegetation and Habitat Sites (V Sites) selected by Waimakariri District Council for this review (Deliverable 1).

Wildlands Site Number	V Site Number/s	Site Name	Ecological District	Field Visit
LP001	V129	Monopoli's Pond	Low Plains	No
LP002	V128	Canterbury Regional Council Lease Kānuka Site	Low Plains	No
LP003	V126	Main Race Road Kānuka	Low Plains	Yes
LP004	V120	Pesters Road Kānuka House	Low Plains	Yes
LP005	V124	Western Kānuka Block	Low Plains	No
LP006	V115	Native Broom Trig Site	Low Plains	Yes
LP007	V158	Fenceline Kānuka	Low Plains	No
LP008	V106	Kānuka Northern Strip	Low Plains	No
LP009	V105	Kānuka Pond Site	Low Plains	No
LP010	V108	Dagnum Dryland	Low Plains	No
LP011	V146, V150	Saltwater Creek	Low Plains	Yes
LP014	V054	Douds Road Wetland	Low Plains	Yes
LP016	V157	Barkers Road Wetland	Low Plains	No
LP017	V148	Yaxleys Road Wetland	Low Plains	Yes
LP026	V149	Yaxleys Flax Swamp	Low Plains	No
HP001	V101, V102	Burnt Hill	High Plains	Yes
HP003	V141	Raineys Road Treeland	High Plains	Yes
HP004	V145	Springvale Flaxland	High Plains	Yes
HP005	V023	Browns Road	High Plains	No
HP006	V075	Mountain Road Treeland	High Plains	No
HP007	V084	Hayland Road Wetland	High Plains	No
HP008	V024	Garry River	High Plains	No
HP009	V033	Maori Reserve Road Wetland	High Plains	Yes
HP010	V035	Bald Hills Road Wetland	High Plains	Yes

Wildlands Site Number	V Site Number/s	Site Name	Ecological District	Field Visit
HP017	V131	Rockford Road Tussock	High Plains	No
HP018	V133	Rockford Flax Swamp	High Plains	No
HP019	V138	Roackford Bottom Flax Swamp	High Plains	No
HP020	V136	Waimakariri Gorge Kōwhai and Kānuka Treeland	High Plains	No
HP021	V135	Waimakariri Gorge Terrace Shrubland	High Plains	No
HP022	V151, V152	View Hill	High Plains	Yes
HP023	V142	Manor Park Bush	High Plains	Yes
HP024	V011	Hayland Wooded Gully	High Plains	No
OX001	V006	Loburn Kowai Road Wetland	Oxford	Yes
OX002	V085	Loburn Kowai Road Kānuka	Oxford	No
OX003	V001	Grey Faces	Oxford	Yes
OX004	V003	Hills Bush	Oxford	Yes
OX005	V081	Upper Karetu River Wetland	Oxford	Not assessed
OX006	V074	Whiterock	Oxford	No
OX007	V071	Okuku River Kānuka Forest	Oxford	Yes
OX008	V072	Okuku River Terrace	Oxford	Not assessed
OX009	V067	Okuku River Beech-Kānuka Forest	Oxford	Yes
OX010	V066	No. 2 Road Shrub	Oxford	Yes
OX012	V030, V078	Blowhard Track Beech Forest	Oxford	Yes, No
OX014	V083	Bald Hills Beech	Oxford	No
OX015	V029	Bald Hills	Oxford	No
OX016	V079	Bald Hills Forest	Oxford	No
OX017	V036	Bald Hills Creek	Oxford	Yes
OX018	V041	Ashley Gorge Beech	Oxford	Yes
OX019	V045	Ashley Gorge Road Forest	Oxford	No
OX020	V063	Westering Downs	Oxford	No
OX022	V057	Tawai Bush	Oxford	No
OX023	V059	Island Road Beech	Oxford	Yes
OX024	V061	Miro Downs Trig	Oxford	Yes
OX032	V167	Middle Bridge Flax Wetland	Oxford	Yes
OX033	V166	Ashley River Gorge	Oxford	Not assessed
OX034	V165	Top Gorge	Oxford	Not assessed
OX049	V007	Boundary Road Shrub	Oxford	Yes
OX051	V050	Woodburn Kānuka Forest	Oxford	Yes

### 3.1.1 Desktop assessment

A literature review was undertaken to gather all relevant information on the Waimakariri District, the three Ecological Districts and the selected sites. When available, WDC provided existing information for each of the selected sites, including:

- GIS layers available in WDC Webmap.
- Previous field visits and survey reports:
  - Sites of Indigenous Vegetation Remnants of the Plains of Waimakariri District (David Given and David Rossiter 1994-1997)
  - Sites of Indigenous Vegetation Remnants of the Foothills of Waimakariri District (David Given and David Rossiter 1994-1997)
  - Biodiversity Monitoring Field Report (David Rossiter 2006)
  - Indigenous Vegetation Sites Resurvey (David Rossiter 2010-2011)

The following sources of information were also consulted:

- Previous information and reports.
- Recent and historical aerial imagery.

- Topographic maps.
- Remote sensing datasets (including LENZ, Land Cover Database, Threatened Environment Classification, Land Research Information Systems (LRIS), and the Natural Vegetation Survey Databank (NVS)).
- Information held by the Department of Conservation, Environment Canterbury, Canterbury Botanical Society, and QEII National Trust.
- Flora and fauna databases.
- Professional ecological knowledge.

For each site, previous reports and current aerial imagery were used to identify the main vegetation and habitat types present, and whether the site contained any nationally Threatened or At Risk species, or species that are uncommon in the relevant Ecological District or Canterbury Region. The desktop assessment was also used to identify sites that had insufficient information for an ecological significance assessment to be completed – these sites were considered to be a high priority for field visits.

### 3.1.2 Field surveys

Field surveys of 30 sites (existing Vegetation and Habitat sites, Deliverable 1) were carried out by Wildlands staff between December 2018 and August 2019. These included sites that were identified as a high priority for field survey at the desktop assessment stage, as well as a subset of sites representing the different vegetation and habitat types found in the Waimakariri District. Unfortunately, some high priority sites could not be visited because we were not able to make contact with the landowner to arrange a site visit. Two of the site visits were prompted by requests from landowners. Most of the property owners who were contacted were aware of the importance of SNAs and were interested to receive up-to-date ecological information for their site/s. Many of the landowners were met in person at the time of the field visit and a few accompanied the ecologist/s during the field survey.

Once permission for access was granted, the whole property was assessed for potential SNAs. For small sites, the entire SNA was traversed on foot using existing tracks or off trail. For larger sites, or sites where access was difficult, the SNA boundaries were followed and existing tracks or natural openings were used to survey the core of the SNA when possible. During the site visit, all vascular plant species observed were recorded, and, if time allowed, the abundance of each species was estimated using the DAFOR system (a semi-quantitative method using five abundance categories: Dominant, Abundant, Frequent, Occasional, and Rare). Specimens were taken of any species not able to be identified in the field. Non-vascular plants, lichens and fungi were also recorded when they were able to be identified (to genus level at least). Locations of Threatened and At Risk species, uncommon species, and selected weed species were recorded using a GPS unit. Incidental observations of fauna species (birds, lizards, and invertebrates) were recorded during the site visit.

Vegetation and habitat types at each site were identified based on the Atkinson (1985) method. Current and potential threats to ecological values were also identified.



### 3.1.3 GIS mapping

Site boundaries were confirmed or modified using the Waimakariri ArcGIS Web Application and the most recent aerial imagery available. For sites that were not visited, site boundaries were based on the extent of indigenous vegetation visible in aerial imagery for each site. The area covered by each site was calculated from the polygon/s drawn in the GIS.

### 3.1.4 Ecological significance assessment

Information gathered during the desktop assessments and the site visits was used to assess the ecological significance of each site. The sites were assessed using the 10 criteria specified in Appendix 3 of the Canterbury Regional Policy Statement (Environment Canterbury 2013a). These criteria take into account the National Priorities for protection of indigenous biodiversity on private land (MfE and DOC 2007) and goals and vision of the Canterbury Biodiversity Strategy (see below).

#### **National Priorities**

Four National Priorities have been identified for protection of rare and threatened indigenous biodiversity on private land (MfE and DOC 2007):

- National Priority 1 - protection of indigenous vegetation on Acutely Threatened and Chronically Threatened land environments (Walker *et al.* 2007).
- National Priority 2 - protection of ecosystems that have become rare, such as wetlands.
- National Priority 3 - protection of naturally rare ecosystems (Williams *et al.* 2007).
- National Priority 4 - protection of habitats of ‘Acutely Threatened’ and ‘Chronically Threatened’ species.<sup>1</sup>

#### **Canterbury Biodiversity Strategy**

The Canterbury Biodiversity Strategy was adopted in February 2008 by 19 different organisations, including Environment Canterbury, local District Councils, land managers, Ngāi Tahu, and conservation groups (Environment Canterbury 2008). The Strategy promotes a set of targets and actions to achieve the overall goal and vision of the Strategy, which is to value and care for the region’s biodiversity, and to sustain and enhance it both now and into the future. Essentially, the goal is to have a full range of healthy ecosystems from the mountains to the sea, reflecting the natural character of Canterbury, and supporting a sustainable economy that includes sustainable harvest.

#### **Canterbury Regional Policy Statement**

Appendix 3 of the Canterbury RPS sets out 10 criteria to be used to determine ecological significance under Section 6(c) of the RMA (1991). Interpretation of the criteria is provided by the guidelines in Wildland Consultants (2013). According to the guidelines, a site is considered to be significant if it meets one (or more) of the criteria.

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<sup>1</sup> The categories in the New Zealand Threat Classification System have changed since the priorities were developed; these now refer to ‘Threatened’ and ‘At Risk’ species (see Townsend *et al.* 2008).

### 3.1.5 Site reports

Data gathered during the desktop and field assessments is presented in a site report that includes a map of the SNA, summary of previous ecological information, description of vegetation and habitats, and fauna, ecological significance assessment. Management issues and recommendations are also identified. Information on threatened species that may be targets for illegal collecting (e.g. lizards) was omitted from site reports.

Each SNA was described and assessed separately, but SNAs on the same property were grouped in one document.

## 3.2 Identification of new Significant Natural Areas (Deliverable 2)

The second phase of the project was to identify new SNAs in Waimakariri District. The following sources of information were used to identify new sites:

- Field survey data (for new sites on properties visited for Deliverable 1)
- Desktop and field identification of wetlands by Environment Canterbury (2017)
- GoogleEarth layer - Eyrewell Kānuka remnants (Jason Butt 2016)
- Protected Natural Areas Programme Survey Report and data for the Low and High Plains Ecological Districts (Steven and Meurk 1996)
- GIS layer - Areas of Natural Significance (DOC, unknown date)
- GIS layer - DOC's Review of Significant Natural Areas in the Waimakariri District (Mark Davis 2019)
- GIS layer - QEII National Trust Covenants.

During the field surveys for Deliverable 1, potential SNAs on the same properties were also visited (12 new sites were visited, see Section 3.1.2 for survey methods). Sites that were not visited were assessed using existing information (see above). QEII National Trust Covenants were added to the list of new SNAs in the District, but their ecological significance was not assessed and the legal boundaries of the covenant were used as the SNA boundaries (unless other information was available). Other potential SNAs are known to be present in the District (e.g. beech forest in the foothills, Canterbury mudfish habitat), but were not able to be assessed or mapped due to time and budget constraints.

## 4. SIGNIFICANT NATURAL AREAS

### 4.1 Overview of existing Vegetation and Habitat sites (Deliverable 1)

Of the 62 Vegetation and Habitat Sites that were reviewed for Deliverable 1, 52 sites have been assessed as ecologically significant using the Canterbury RPS criteria (Table 5). Sites that were adjacent to one another and had similar vegetation types were combined and assessed as a single site (so the total number of SNAs is actually 49). Four of the 62 sites were not assessed:

- Ashley River Gorge (OX033, V166) and Okuku River Terrace (OX008, V072) are located in riverbeds on public conservation land;
- Top Gorge (OX034, V165) had already been assessed (Boffa Miskell 2009);
- Upper Karetu Wetland (OX005, V081) requires a site visit in order to be assessed.

Table 5: Significant Natural Areas in Waimakariri District identified for Deliverable 1 (review of selected Vegetation and Habitat sites (V sites) in the current Waimakariri District Plan).

Wildlands Site Number	V Site Number	Site Name	Vegetation / Habitat Type	Area (ha)
LP001	V129	Monopoli's Pond	Wetland	1.35
LP002	V128	Canterbury Regional Council Lease Kānuka Site	Kānuka forest	4.52
LP003	V126	Main Race Road Kānuka	Kānuka forest	4.61
LP004	V120	Pesters Road Kānuka House	Kānuka forest	2.63
LP005	V124	Western Kānuka Block	Kānuka forest	0.54
LP006	V115	Native Broom Trig Site	Shrubland-grassland	0.40
LP007	V158	Fenceline Kānuka	Kānuka forest	1.61
LP008	V106	Kānuka Northern Strip	Kānuka forest	1.30
LP009	V105	Kānuka Pond Site	Kānuka forest	1.22
LP010	V108	Dagnum Dryland	Shrubland-grassland	22.72
LP011	V146, V150	Saltwater Creek	Wetland	14.60
LP014	V054	Douds Road Wetland	Wetland	0.47
LP016	V157	Barkers Road Wetland	Wetland	0.35
LP017	V148	Yaxleys Road Wetland	Wetland	3.21
LP026	V149	Yaxleys Flax Swamp	Wetland	0.76
<b>HP001</b>				
HP001	V101, V102	Burnt Hill	Shrubland-grassland	57.74
HP003	V141	Raineys Road Treeland	Treeland	0.83
HP004	V145	Springvale Flaxland	Wetland	12.30
HP006	V075	Mountain Road Treeland	Treeland	0.33
HP007	V084	Hayland Road Wetland	Wetland	5.36
HP009	V033	Maori Reserve Road Wetland	Wetland	0.55
HP010	V035	Bald Hills Road Wetland	Wetland	1.01
HP017	V131	Rockford Road Tussock	Grassland	2.00
HP018	V133	Rockford Flax Swamp	Wetland	1.45
HP019	V138	Rockford Bottom Flax Swamp	Wetland	2.01
HP020	V136	Waimakariri Gorge Kōwhai and Kānuka Treeland	Treeland	1.32
HP021	V135	Waimakariri Gorge Terrace Shrubland	Shrubland-grassland	1.80
HP022	V151, V152	View Hill	Shrubland-grassland	37.66
HP023	V142	Manor Park Bush	Beech forest	5.04
HP024	V011	Hayland Wooded Gully	Beech forest	18.11
<b>OX002</b>				
OX002	V085	Loburn Kowai Road Kānuka	Kānuka forest	0.29
OX003	V001	Grey Faces	Mixed forest	13.91
OX004	V003	Hills Bush	Beech forest	118.48
OX006	V074	Whiterock	Shrubland-grassland	10.82
OX007	V071	Okuku River Kānuka Forest	Kānuka forest	63.42
OX009	V067	Okuku River Beech-Kānuka Forest	Beech-kānuka forest	64.23
OX012	V030, V078	Blowhard Track Beech Forest	Beech forest	53.68
OX014	V083	Bald Hills Beech	Beech forest	12.90
OX015	V029	Bald Hills	Beech forest	13.07
OX016	V079	Bald Hills Forest	Beech forest	25.26
OX018	V041	Ashley Gorge Beech	Mixed forest	0.76
OX019	V045	Ashley Gorge Road Forest	Beech forest	7.23
OX020	V063	Westering Downs	Beech forest	8.03
OX022	V057	Tawai Bush <sup>1</sup>	Beech-podocarp forest	19.92
OX023	V059	Island Road Beech	Beech forest	10.81
OX024	V061	Miro Downs Trig	Shrubland-grassland	37.44
OX032	V167	Middle Bridge Flax Wetland	Wetland	2.31
OX049	V007	Boundary Road Scrub	Scrub	2.04
OX051	V050	Woodburn Kānuka Forest	Kānuka forest	2.64
<b>TOTAL</b>				<b>675.04</b>

<sup>1</sup> QEII National Trust covenant.

In the **Low Plains ED**, 15 SNAs were identified, covering 60.29 hectares in total (Table 6). The SNAs comprise small areas of kānuka forest/treeland, indigenous shrubland-grassland, and freshwater wetlands.

In the **High Plains ED**, 15 SNAs were identified, covering 147.51 hectares (Table 6). The SNAs of the High Plains ED contain a greater range of vegetation types than the Low Plains ED, with shrubland-grassland and shrubland sites representing almost two-thirds of the total area. Wetlands, beech forest, treeland, and grassland sites have also been identified as SNAs.

In **Oxford ED**, 19 SNAs were identified, covering 467.24 hectares (Table 6). The SNAs in Oxford ED tend to be larger and mostly consist of indigenous forest and scrub (almost half the sites comprise beech forest). Beech-podocarp forest, mixed forest, kānuka forest, scrub, shrubland-grassland, and wetlands are also present.

In total, 529.33 hectares of Deliverable 1 SNAs (78.4% of the total area of 675.04 hectares) are located on threatened land environments with less than 20% indigenous cover remaining (Table 7).

Five sites were assessed as not significant following the site visits (see **Section 4.5**).

Table 6: Vegetation/Habitat types of Significant Natural Areas (SNAs) in each Ecological District identified for Deliverable 1 (i.e. Vegetation and Habitat sites (V sites) in the current District Plan that were reviewed by Wildlands).

Ecological District	Vegetation / Habitat Type	Number of SNAs	Area (ha)
Low Plains	Kānuka forest	7	16.43
	Shrubland-grassland	2	23.12
	Wetland	6	20.74
	<b>TOTAL</b>	<b>15</b>	<b>60.29</b>
High Plains	Beech forest	2	23.15
	Grassland	1	2.00
	Shrubland-grassland	3	97.20
	Treeland	3	2.48
	Wetland	6	22.68
	<b>TOTAL</b>	<b>15</b>	<b>147.51</b>
Oxford	Beech forest	8	249.46
	Beech-kānuka forest	1	64.23
	Beech-podocarp forest	1	19.92
	Kānuka forest	3	66.35
	Mixed forest	2	14.67
	Scrub	1	2.04
	Shrubland-grassland	2	48.26
	Wetland	1	2.31
	<b>TOTAL</b>	<b>19</b>	<b>467.24</b>
	<b>GRAND TOTAL</b>	<b>49</b>	<b>675.04</b>

Table 7: Total area of Significant Natural Areas in each Threatened Environment Classification (TEC) category in the Waimakariri District (Deliverable 1).

TEC Category	Area (ha)
<10% indigenous cover left	228.37
10-20% indigenous cover left	300.96
20-30% indigenous cover left	19.81
>30% left and <10% protected	54.54
>30% left and 10-20% protected	0.0
>30% left and >20% protected	67.62
Unclassified	3.74
<b>TOTAL</b>	<b>675.04</b>

#### 4.2 Overview of new Significant Natural Areas identified (Deliverable 2)

In total, 66 potential new SNAs were identified for Deliverable 2, covering 1,251.31 hectares. This comprises 54 new sites (782.96 hectares) and 12 QEII National Trust covenants (468.35 hectares). Thirteen of the new SNAs were assessed following a field visit (see Table 8), while the rest were assessed through a desktop review (these sites are not listed in Table 8). Other potential SNAs were noted in the District, but these were not able to be assessed or mapped due to time and budget constraints for this review.

Excluding the QEII Trust covenants (for which the vegetation and habitat types were generally not known), potential new SNAs identified in the **Low Plains ED** mostly comprise small pockets of kānuka forest (29.40 hectares, 24 out of 32 sites) and coastal wetlands (581.56 hectares, 7 sites) (Table 9). In the **High Plains ED**, potential new SNAs are mostly wetlands (7.01 hectares, 5 out of 11 sites) and shrubland (24.01 hectares, 4 sites). Most of the potential new SNAs in **Oxford ED** are beech forests (118.60 hectares, 6 out of 11 sites) and wetlands (6.20 hectares, 4 sites).

In total, 573.04 hectares of the potential new SNAs (45.8% of the total area of 1,251.31 hectares) are located on land environments with less than 20% indigenous cover remaining (Table 10).

Table 8: New Significant Natural Areas in Waimakariri District identified for Deliverable 2. NB. Only sites that had field visits and QEII National Trust covenants are listed in the table.

Wildlands Site Number	Field Visit	Site Name	Vegetation / Habitat Type	Area (ha)
LP025	Yes	Carleton Road Kānuka	Kānuka forest	0.31
HP013	Yes	Burnt Hill Southern Outcrop Shrubland	Shrubland-grassland	0.34
HP014	Yes	Birch Hill Wetland Covenant	Wetland	3.82
HP015	Yes	Reserve Road wetland	Wetland	1.05
HP016	Yes	Garry River shrubland	Shrubland	3.03
HP032	Yes	Budges Hill Shrubland	Shrubland	16.42
OX039a-i	Yes	Ashley Gorge Road Beech Forest Remnants	Beech forest	55.42
OX041	Yes	Ashley Gorge Road Wetland	Wetland	0.18
OX043	Yes	Okuku Shrub and Flax Wetland	Wetland	3.53
OX044	Yes	Okuku Hardwood Scrub	Beech forest	1.39
OX045	Yes	Okuku Mānuka Gully	Beech forest	0.64
OX046	Yes	Okuku Flaxland	Wetland	0.42
OX052a-j	Yes	Woodburn Kānuka Patches	Kānuka forest	9.23

QEII NATIONAL TRUST COVENANTS				
QEII Site Number	Field Visit	Site Name	Vegetation / Habitat Type	Area (ha)
5-11-022A	No	QEII National Trust Open Space Covenant	Unknown	103.95
5-11-022B	No	QEII National Trust Open Space Covenant	Unknown	217.66
5-11-073	No	QEII National Trust Open Space Covenant	Unknown	5.99
5-11-165	No	QEII National Trust Open Space Covenant	Unknown	1.80
5-11-170	No	QEII National Trust Open Space Covenant	Unknown	2.84
5-11-203	No	QEII National Trust Open Space Covenant	Unknown	121.71
5-11-219	No	QEII National Trust Open Space Covenant	Unknown	1.55
5-11-292	No	QEII National Trust Open Space Covenant	Unknown	3.33
5-11-293	No	QEII National Trust Open Space Covenant	Unknown	1.46
5-11-294	No	QEII National Trust Open Space Covenant	Unknown	2.55
5-11-324	No	QEII National Trust Open Space Covenant	Unknown	4.86
5-11-325	No	QEII National Trust Open Space Covenant	Unknown	0.65
<b>TOTAL - QEII Trust Covenants</b>				<b>468.35</b>

Table 9: Vegetation/Habitat types of new Significant Natural Areas (SNAs) in each Ecological District identified for Deliverable 2. NB. The table does not include the 12 QEII National Trust covenants listed in Table 8.

Ecological District	Vegetation / Habitat Type	Number of SNAs	Area (ha)
Low Plains	Kānuka forest	24	29.40
	Shrubland	1	3.05
	Wetland	7	581.56
	<b>TOTAL</b>	<b>32</b>	<b>614.01</b>
High Plains	Grassland	1	3.56
	Shrubland	4	24.01
	Shrubland-grassland	1	0.34
	Wetland	5	7.01
	<b>TOTAL</b>	<b>11</b>	<b>34.92</b>
Oxford	Beech forest	6	118.60
	Kānuka forest	1	9.23
	Wetland	4	6.20
	<b>TOTAL</b>	<b>11</b>	<b>134.03</b>
<b>GRAND TOTAL</b>		<b>54</b>	<b>782.96</b>

Table 10: Total area of new Significant Natural Areas in each Threatened Environment Classification (TEC) category in the Waimakariri District – Deliverable 2, including the QEII National Trust covenants listed in Table 8.

TEC Category	Area (ha)
<10% indigenous cover left	271.63
10-20% indigenous cover left	301.41
20-30% indigenous cover left	16.68
>30% left and <10% protected	94.38
>30% left and 10-20% protected	0.00
>30% left and >20% protected	382.71
Unclassified (water)	184.50
<b>TOTAL</b>	<b>1,251.31</b>

## 4.3 Ecological values of Significant Natural Areas (Deliverables 1 and 2)

### 4.3.1 Vegetation and habitats

The SNAs comprise 11 broad vegetation and habitat types: beech forest, beech-podocarp forest, beech-kānuka forest, mixed forest, kānuka forest, treeland, shrubland, shrubland-grassland, grassland, and wetland (Table 11). In the Low Plains and High Plains EDs, most SNAs are quite modified, weeds are relatively common, and they tend to be isolated and surrounded by pastoral farmland. Nevertheless, these sites constitute the last remaining examples of indigenous vegetation on the plains of the Waimakariri District, and are located on land environments with less than 10% or 10-20% indigenous cover left.

In the Oxford Ecological District, the SNAs are larger and mostly comprise secondary growth indigenous forest located on steep slopes or in gullies. They occur mostly at lower elevations along the base of the foothills in a matrix of cultivated land, plantation forestry, and public conservation land.

Table 11: Vegetation/Habitat types of all Significant Natural Areas (SNAs) in the Waimakariri District identified in this review (i.e. Deliverables 1 and 2).

Vegetation / Habitat Type	Number of SNAs	Area (ha)
Beech forest	16	391.21
Beech-kānuka forest	1	64.23
Beech-podocarp forest	1	19.92
Grassland	2	5.56
Kānuka forest	35	121.41
Mixed forest	1	14.67
Scrub	1	2.04
Shrubland	5	27.06
Shrubland-grassland	8	168.92
Treeland	3	2.48
Wetland	29	640.50
<b>TOTAL</b>	<b>103</b>	<b>1,458.00</b>
Unknown (QEII covenants)	12	468.35
<b>GRAND TOTAL</b>	<b>115</b>	<b>1,926.35</b>

Many of the SNAs identified act as buffers for streams and rivers or public conservation land or private covenants. They protect these ecosystems from activities occurring on adjacent land and buffer them from edge effects. They also help maintain connectivity for indigenous plant and animal species moving between patches of indigenous vegetation and habitats.

### 4.3.2 Flora

Previous ecological reports (e.g. Meurk *et al.* 1995, Steven and Meurk 1996, Meurk 1997, Rossiter 1997, Given 1999, McCombs 2003, Meurk 2008, Boffa Miskell 2009, 2010, 2012, Rossiter 2011, Giller 2014, Harding 2016), iNaturalist observations ([www.inaturalist.nz](http://www.inaturalist.nz)), and recent ecological surveys by Wildland Consultants Ltd (Wildland Consultants 2020) were used to compile a list of indigenous vascular plant species that have been recorded (or are likely to be present) in the Waimakariri District.

This is a preliminary list only, however, as comprehensive botanical surveys have not been carried out in parts of the District (e.g. Torlesse and Ashley Ecological Districts).

### **Threatened, At Risk, and Data Deficient species**

According to the latest conservation status assessment for vascular plants (de Lange *et al.* 2018a), 66 indigenous vascular plant species in the Waimakariri District are classified as Threatened, At Risk, or Data Deficient nationally (see Table 12). This includes seven ‘Threatened-Nationally Critical’ species, 15 ‘Threatened-Nationally Vulnerable’ species, 33 ‘At Risk-Declining’ species, and seven ‘At Risk-Naturally Uncommon’ species.

More than 160 indigenous vascular plant species were recorded during the site visits by Wildlands, including 15 Threatened or At Risk species (Table 12).

Table 12: Threatened, At Risk, and Data Deficient vascular plant species (as per de Lange *et al.* 2018a) that have been recorded (or are potentially present) in the Waimakariri District. Yes = species recorded by Wildland Consultants during site visits in 2018-2019. (NB. this list is not exhaustive and other Threatened, At Risk, and Data Deficient species are likely to be present in the District).

Scientific Name	Common Name	Conservation Status (de Lange <i>et al.</i> 2018a)	Recorded by Wildlands
<i>Brachyscome pinnata</i>		Threatened-Nationally Critical	
<i>Carmichaelia torulosa</i>	Canterbury pink broom	Threatened-Nationally Critical	
<i>Gentianella calcis</i> subsp. <i>waipara</i>	Native gentian	Threatened-Nationally Critical	
<i>Korthalsella salicornioides</i>	Dwarf mistletoe	Threatened-Nationally Critical	
<i>Lophomyrtus obcordata</i>	Röhutu, NZ myrtle	Threatened-Nationally Critical <sup>1</sup>	Yes
<i>Neomyrtus pedunculata</i>	Röhutu, myrtle	Threatened-Nationally Critical <sup>1</sup>	
<i>Sebaea ovata</i>	Sebaea	Threatened-Nationally Critical	
<i>Heliohebe maccaskillii</i> <sup>2</sup>	Weka Pass sun hebe	Threatened-Nationally Endangered	
<i>Carex inopinata</i>	Grassy mat sedge, unexpected sedge	Threatened-Nationally Vulnerable	Yes
<i>Carmichaelia corrugata</i>	Dwarf broom	Threatened-Nationally Vulnerable	
<i>Carmichaelia kirkii</i>	Climbing broom	Threatened-Nationally Vulnerable	
<i>Coprosma obconica</i>		Threatened-Nationally Vulnerable	
<i>Geranium retrorsum</i>	Turnip-rooted geranium	Threatened-Nationally Vulnerable	
<i>Kunzea robusta</i>	Kānuka, rawirinui	Threatened-Nationally Vulnerable	Yes
<i>Kunzea serotina</i>	Kānuka, makahikatoa	Threatened-Nationally Vulnerable <sup>1</sup>	Yes
<i>Melicytus flexuosus</i>		Threatened-Nationally Vulnerable	
<i>Metrosideros diffusa</i>	Climbing rātā	Threatened-Nationally Vulnerable <sup>1</sup>	Yes
<i>Muehlenbeckia ephedroides</i>	Leafless pōhuehue	Threatened-Nationally Vulnerable	
<i>Olearia fimbriata</i>		Threatened-Nationally Vulnerable	
<i>Ranunculus ternatifolius</i>		Threatened-Nationally Vulnerable	
<i>Raoulia monroi</i>	Fan-leaved mat daisy	Threatened-Nationally Vulnerable	
<i>Solanum aviculare</i> subsp. <i>aviculare</i>	Poroporo	Threatened-Nationally Vulnerable	
<i>Sonchus novae-zelandiae</i>	Kirkianella	Threatened-Nationally Vulnerable	
<i>Acaena buchananii</i>	Bidibidi, pipiriri	At Risk-Declining	
<i>Aciphylla subflabellata</i>	Grassland speargrass, grassland spaniard, kurikuri	At Risk-Declining	Yes
<i>Alepis flavida</i>	Yellow mistletoe, pirita	At Risk-Declining	
<i>Carex buchananii</i>	Cutty grass, matirewa	At Risk-Declining	
<i>Carex litorosa</i>	Salt sedge	At Risk-Declining	
<i>Carex tenuiculmis</i>		At Risk-Declining	
<i>Carmichaelia monroi</i>	Stout dwarf broom	At Risk-Declining	
<i>Coprosma brunnea</i> <sup>3</sup>		At Risk-Declining	



Scientific Name	Common Name	Conservation Status (de Lange <i>et al.</i> 2018a)	Recorded by Wildlands
<i>Coprosma intertexta</i>		At Risk-Declining	Yes
<i>Coprosma pedicellata</i>		At Risk-Declining	
<i>Coprosma virescens</i>	Mikimiki	At Risk-Declining	
<i>Coprosma wallii</i>	Bloodwood	At Risk-Declining	
<i>Daucus glochidiatus</i>	Dwarf carrot	At Risk-Declining	
<i>Discaria toumatou</i>	Matagouri, tūmatakuru	At Risk-Declining	Yes
<i>Eleocharis neozelandica</i>	Sand spike sedge	At Risk-Declining	
<i>Ficinia spiralis</i>	Pīngao, pīkao, golden sand sedge	At Risk-Declining	
<i>Geranium solanderi</i>	Native geranium	At Risk-Declining	
<i>Hypericum involutum</i>	Grassland hypericum	At Risk-Declining	Yes
<i>Juncus caespiticius</i>		At Risk-Declining	
<i>Korthalsella clavata</i>	Dwarf mistletoe	At Risk-Declining	
<i>Leptinella serrulata</i>	Dryland button daisy	At Risk-Declining	
<i>Leptospermum scoparium</i>	Mānuka, tea tree	At Risk-Declining <sup>1</sup>	Yes
<i>Leucopogon nanum</i>		At Risk-Declining	
<i>Linum monogynum</i>	NZ linen flax	At Risk-Declining	
<i>Mentha cunninghamii</i>	NZ mint	At Risk-Declining	
<i>Olearia lineata</i>	Narrow-leaved tree daisy	At Risk-Declining	
<i>Poa billardierei</i>	Sand tussock, hinarepe	At Risk-Declining	
<i>Raoulia australis</i>	Common mat daisy	At Risk-Declining	Yes
<i>Rytidosperma exiguum</i>	Danthonia, bristle grass	At Risk-Declining	
<i>Rytidosperma merum</i>	Danthonia, bristle grass	At Risk-Declining	
<i>Tupeia antarctica</i>	White mistletoe, pirita, tupia	At Risk-Declining	
<i>Urtica perconfusa</i>	Swamp nettle	At Risk-Declining	
<i>Zoysia minima</i>	Native twitch	At Risk-Declining	
<i>Centipeda aotearoana</i>	New Zealand sneezewort	At Risk-Naturally Uncommon	
<i>Chenopodium allanii</i>		At Risk-Naturally Uncommon	Yes
<i>Hymenophyllum cupressiforme</i>	Filmy fern	At Risk-Naturally Uncommon	
<i>Juncus distegus</i>	Wīwī	At Risk-Naturally Uncommon	Yes
<i>Pimelea pseudolyallii</i>	Pimelea	At Risk-Naturally Uncommon	
<i>Pseudopanax ferox</i>	Fierce lancewood	At Risk-Naturally Uncommon	
<i>Thyridia repens</i>	Native musk	At Risk-Naturally Uncommon	Yes
<i>Cardamine cubita</i>	Native bittercress	Data Deficient	
<i>Ranunculus macropus</i>	Native buttercup	Data Deficient	Yes
<i>Rytidosperma maculatum</i>	Danthonia	Data Deficient	

<sup>1</sup> All species of Myrtaceae in New Zealand, including kānuka (*Kunzea robusta* and *K. serotina*), mānuka (*Leptospermum scoparium*), and rātā (*Metrosideros* spp.), have been classified as Threatened or At Risk nationally due to the potential threat posed by myrtle rust (*Austropuccinia psidii*). However, this fungus has not yet been recorded in the wild in Canterbury, and kānuka, mānuka and rātā are still relatively common and widespread in the Canterbury Region.

<sup>2</sup> Also referred to as *Veronica maccaskillii*.

<sup>3</sup> Also referred to as *Coprosma acerosa* (see <https://www.nzpcn.org.nz/flora/species/coprosma-brunnea/>).

## **Indigenous non-vascular plant and lichen species**

Preliminary lists of indigenous non-vascular plant species (mosses and liverworts) and lichen species recorded in the Waimakariri District have been compiled using existing literature (e.g. Meurk *et al.* 1995, Meurk 2008) and recent observations (e.g. Hutchison *et al.* 2020 and iNaturalistNZ 2020), however these contain only a small proportion of the species likely to be present in the District. At least one At Risk-Declining lichen species (as per de Lange *et al.* 2018b), *Xanthoparmelia semiviridis*, is known to occur in the Waimakariri District, but so far no Threatened or At Risk bryophyte species (as per de Lange *et al.* 2015, Rolfe *et al.* 2016) have been recorded.

## Indigenous plant species that are uncommon in the Waimakariri District

A list of indigenous vascular plant species that are uncommon in the Low and/or High Plains Ecological Districts but are not classified as Threatened, At Risk, or Data Deficient (according to de Lange *et al.* 2018a) was compiled using information from various sources (e.g. Meurk *et al.* 1995, Steven and Meurk 1996, Meurk 1997, Rossiter 1997, Meurk 2008, Rossiter 2011, Boffa Miskell 2009, 2010, 2012, Environment Canterbury 2013, Selwyn District Council 2014, Harding 2016) and from our own knowledge and discussions with other local ecologists (see Table 13). The list comprises 97 species but it should be noted that this list is not exhaustive and other indigenous plant species may also be uncommon in the Low and High Plains Ecological Districts.

This list was used to assess the sites against criterion 4 (Rarity/Distinctiveness) of the Canterbury Regional Policy Statement (Environment Canterbury 2013a), however the list is not complete and other indigenous plant species may also be uncommon in the Low and Plains Ecological Districts. It was not possible to compile a list of indigenous plant species that are uncommon in Oxford, Torlesse, or Ashley Ecological Districts, as there is insufficient information available on the distribution and abundance of plant species in these ecological districts.

Table 13: Indigenous vascular plant species that are uncommon in the Low and/or High Plains Ecological Districts (and are not classified as Threatened, At Risk, or Data Deficient by de Lange *et al.* 2018a). Note that this list is not exhaustive and other species may also be uncommon in these ecological districts.

Scientific Name	Common Name	Information Source/s
<i>Acaena novae-zelandiae</i>	Red bidibidi	Steven & Meurk 1996
<i>Anaphalioides bellidioides</i>	Everlasting daisy, hells bells	Steven & Meurk 1996
<i>Anthosachne solandri</i>	Blue wheatgrass	Steven & Meurk 1996
<i>Apodasmia similis</i>	Oioi	Meurk 2008, Parker 2012
<i>Argentina anserinoides</i>	Silverweed	Hutchison 2020
<i>Asplenium flabellifolium</i>	Necklace fern	Steven & Meurk 1996, Butt 2017, Hutchison <i>et al.</i> 2020
<i>Austroderia richardii</i>	Toetoe	Steven & Meurk 1996
<i>Blechnum discolor</i>	Crown fern, piupiu	Steven & Meurk 1996
<i>Blechnum fluviatile</i>	Kiwakiwa	Steven & Meurk 1996
<i>Blechnum minus</i>	Swamp kiokio	Steven & Meurk 1996, Meurk 2008
<i>Blechnum penna-marina</i>	Little hard fern	Steven & Meurk 1996
<i>Bolboschoenus caldwellii</i>	Purua grass, Caldwell's clubrush	Steven & Meurk 1996
<i>Brachyglottis bellidioides</i>		Hutchison <i>et al.</i> 2020
<i>Caladenia lyallii</i>		Hutchison <i>et al.</i> 2020
<i>Carex breviculmis</i>	Grassland sedge	Steven & Meurk 1996, Hutchison <i>et al.</i> 2020
<i>Carex dipsacea</i>	Teasel sedge	Butt 2017
<i>Carex dissita</i>	Forest sedge	Steven & Meurk 1996
<i>Carex goyenii</i>	Goyens sedge	Hutchison 2013
<i>Carex maorica</i>	Cutty grass, rautahi	Steven & Meurk 1996
<i>Carex pumila</i>	Sand sedge	Meurk 2008, Parker 2012
<i>Carex resectans</i>		Meurk <i>et al.</i> 1995
<i>Carex secta</i>	Pūrei, pūkio	Steven & Meurk 1996
<i>Carmichaelia australis</i>	Common native broom	Steven & Meurk 1996, Meurk 1997
<i>Celmisia gracilentia</i>	Slender mountain daisy, pekapeka	Hutchison <i>et al.</i> 2020
<i>Centella uniflora</i>	Centella	Steven & Meurk 1996, Hutchison 2020
<i>Cheilanthes sieberi</i>	Rock fern	Steven & Meurk 1996
<i>Chionochloa rubra</i>	Red tussock	Steven & Meurk 1996
<i>Clematis forsteri</i>	Clematis	Steven & Meurk 1996, Hutchison <i>et al.</i> 2020
<i>Clematis marata</i>	Clematis	Steven & Meurk 1996, Hutchison <i>et al.</i> 2020

Scientific Name	Common Name	Information Source/s
<i>Coprosma atropurpurea</i>	Mat coprosma	Meurk 1997
<i>Coprosma crassifolia</i>	Thick-leaved coprosma, mikimiki	Hutchison <i>et al.</i> 2020
<i>Coprosma linariifolia</i>	Yellow-wood	Steven & Meurk 1996
<i>Coprosma petriei</i>	Turfy coprosma	Meurk 1997
<i>Coprosma propinqua</i>	Mingimingi, mikimiki	Steven & Meurk 1996
<i>Coprosma rhamnoides</i>	Mingimingi, mikimiki	Hutchison <i>et al.</i> 2020
<i>Corybas trilobus</i> agg.	Spider orchid	Wildland Consultants 2019
<i>Corokia cotoneaster</i>	Korokio	Steven & Meurk 1996
<i>Crassula sieberiana</i>	Native stonecrop	Hutchison <i>et al.</i> 2020
<i>Dacrycarpus dacrydioides</i>	Kahikatea	Steven & Meurk 1996
<i>Dacrydium cupressinum</i>	Rimu	Steven & Meurk 1996
<i>Dichelachne crinita</i>	Plume grass	Steven & Meurk 1996, Wildland Consultants 2019
<i>Dichondra brevifolia</i>	Dichondra	Meurk 1997
<i>Dicksonia squarrosa</i>	Whēkī, rough tree fern	Steven & Meurk 1996
<i>Elaeocarpus hookerianus</i>	Pōkākā	Steven & Meurk 1996
<i>Eleocharis acuta</i>	Sharp spike sedge	Steven & Meurk 1996
<i>Elymus rectisetus</i>		Steven & Meurk 1996
<i>Epilobium alsinoides</i>	Willowherb	Meurk 1997
<i>Euchiton audax</i>	Native cudweed	Steven & Meurk 1996, Hutchison <i>et al.</i> 2020
<i>Ficinia nodosa</i>	Club rush, wiwi	Parker 2012
<i>Fuchsia excorticata</i>	Tree fuchsia, kōtukutuku	Meurk 2008
<i>Fuchsia excorticata</i> × <i>F. perscandens</i>	Shrubby fuchsia	Wildland Consultants 2019
<i>Fuscopora solandri</i>	Black beech	Meurk 2008
<i>Galium propinquum</i>	Native bedstraw	Hutchison <i>et al.</i> 2020
<i>Gonocarpus aggregatus</i>		Wildland Consultants 2019
<i>Gratiola sexdentata</i>	Gratiola	Meurk 2008, Meurk 2018
<i>Helichrysum lanceolatum</i>	Niniaio	Hutchison <i>et al.</i> 2020
<i>Hypericum pusillum</i>	Native hypericum	Butt 2018, Hutchison 2020
<i>Hypolepis ambigua</i>	Pig fern	Steven & Meurk 1996
<i>Juncus australis</i>	Leafless rush, wī	Hutchison 2020
<i>Juncus kraussii</i> subsp. <i>australiensis</i>	Sea rush	Meurk 2008
<i>Juncus pallidus</i>	Giant rush, leafless rush, wī	Meurk 2008, Parker 2012
<i>Juncus planifolius</i>		Meurk 2008
<i>Lagenophora cuneata</i>		Steven & Meurk 1996
<i>Lepidosperma australe</i>	Square sedge, square-stemmed sedge	Parker 2012
<i>Leptecophylla juniperina</i> subsp. <i>juniperina</i>	Prickly mingimingi, mikimiki	Steven & Meurk 1996
<i>Leptinella dioica</i>	Button daisy	Meurk 2008
<i>Leptinella squalida</i>	Button daisy	Hutchison <i>et al.</i> 2020
<i>Leptostigma setulosum</i>	Nertera	Hutchison <i>et al.</i> 2020
<i>Leucopogon fraseri</i>	Dwarf heath, pātōtara	Hutchison <i>et al.</i> 2020
<i>Machaerina rubiginosa</i>	Baumea	Butt 2017
<i>Machaerina tenax</i>		Steven & Meurk 1996
<i>Meliccytus alpinus</i> agg.	Porcupine shrub	Steven & Meurk 1996
<i>Meliccytus ramiflorus</i>	Māhoe, whiteywood	Steven & Meurk 1996
<i>Microlaena stipoides</i>	Meadow rice grass, pātiti	Steven & Meurk 1996
<i>Muehlenbeckia axillaris</i>	Creeping pōhuehue	Steven & Meurk 1996, Butt 2017
<i>Myriophyllum propinquum</i>	Common water milfoil	Steven & Meurk 1996
<i>Olearia avicenniifolia</i>	Mountain akeake	Steven & Meurk 1996
<i>Oxalis exilis</i>	Yellow oxalis	Steven & Meurk 1996
<i>Parsonsia capsularis</i>	Native jasmine, akakaikiore	Steven & Meurk 1996
<i>Parsonsia heterophylla</i>	Native jasmine, akakaikiore	Steven & Meurk 1996
<i>Phormium tenax</i>	Harakeke, lowland flax	Steven & Meurk 1996
<i>Poa cita</i>	Silver tussock, wī	Steven & Meurk 1996, Hutchison <i>et al.</i> 2020
<i>Podocarpus totara</i>	Lowland tōtara	Steven & Meurk 1996
<i>Polystichum vestitum</i>	Prickly shield fern	Steven & Meurk 1996, Meurk 2008
<i>Pomaderris amoena</i>	Pomaderris	Meurk <i>et al.</i> 1995
<i>Potamogeton cheesemanii</i>	Pondweed	Steven & Meurk 1996

Scientific Name	Common Name	Information Source/s
<i>Prumnopitys taxifolia</i>	Mataī, black pine	Steven & Meurk 1996
<i>Pterostylis</i> spp.	Green-hood orchid	Stanley 2020
<i>Ranunculus glabrifolius</i>	A native buttercup, waioriki	Meurk 2008
<i>Rytidosperma clavatum</i>	Danthonia	Steven & Meurk 1996
<i>Schoenus pauciflorus</i>	Bog rush	Meurk 2005
<i>Sophora microphylla</i>	Small-leaved kōwhai	Steven & Meurk 1996, Meurk 1997
<i>Sophora prostrata</i>	Prostrate kōwhai	Steven & Meurk 1996, Meurk 1997
<i>Thelymitra longifolia</i>	White sun orchid	Hutchison <i>et al.</i> 2020
<i>Typha orientalis</i>	Raupō, bullrush	Steven & Meurk 1996
<i>Viola cunninghamii</i>	A native violet	Butt 2017
<i>Wahlenbergia albomarginata</i>	NZ harebell	Meurk <i>et al.</i> 1995, Wildland Consultants 2019

### 4.3.3 Fauna

The field surveys did not include specific fauna surveys, but incidental observations of bird and invertebrate species were recorded. Identification of lizards would require specialised surveys (and a permit under the Wildlife Act). The following indigenous bird species were recorded during the site visits:

- New Zealand falcon, karearea (*Falco novaeseelandiae novaeseelandiae*)
- Bellbird, korimako (*Anthornis melanura melanura*)
- Australasian harrier, kāhu (*Circus approximans*)
- Grey warbler, riroriro (*Gerygone igata*)
- New Zealand pigeon, kererū (*Hemiphaga novaeseelandiae*)
- Welcome swallow (*Hirundo neoxena neoxena*)
- Tūi (*Prothemadera novaeseelandiae*)
- South Island fantail, pīwakawaka (*Rhipidura fuliginosa fuliginosa*)
- Paradise shelduck, pūtangitangi (*Tadorna variegata*)
- Spur-winged plover (*Vanellus miles*)
- Silvereye, tauhou (*Zosterops lateralis lateralis*)

The New Zealand falcon/karearea is classified as ‘At Risk-Recovering’, but the other bird species above are all classified as ‘Not Threatened’ (Robertson *et al.* 2017).

The following indigenous invertebrate species were recorded during the site visits:

- Common bag moth (*Liothula omnivora*)
- Canterbury copper butterfly (*Lycaena* new species, Patrick & Patrick 2012)
- Magpie moth (*Nyctemera annulata*)
- Flax window maker moth (*Orthoclydon praelectata*)
- Yellow admiral butterfly (*Vanessa itea*)
- Chirping cicada (*Amphipsalta strepitans*)
- Green-veined cicada (*Rhodopsalta cruentata*)
- Beech scale insect (*Ultracoelostoma* spp.)
- Nursery web spider (*Dolomedes minor*).

None of the invertebrate species observed are classified as Threatened or At Risk (Buckley *et al.* 2012, Sirvid *et al.* 2012, Stringer *et al.* 2012, Hoare *et al.* 2017). A more thorough assessment of significant habitats of indigenous fauna should be carried out in the Waimakariri District (also see Wildland Consultants 2015).

#### 4.4 Other sites visited or mapped

A number of other sites were visited or mapped during the SNA review (Table 14). For example, Waimakariri District Council asked Wildlands to visit two additional sites following requests by landowners. During the site visits, Wildlands staff visited some other existing Vegetation and Habitat sites to determine the type of vegetation present. Furthermore, Wildlands has modified the boundaries of some existing Vegetation and Habitat sites in the 'SNA Review Areas' GIS layer.

Table 14: Other sites visited or mapped as part of the Significant Natural Areas review.

Wildlands Site Number	V Site Number	Comments
HP011	V143	Desktop mapping: The site boundary was redrawn because it did not match the actual vegetation and habitat site.
HP025	V153	Desktop mapping: The site boundary was redrawn because it did not match the actual vegetation and habitat site.
LP019A	V123	Site boundary and habitat type were confirmed during a site visit.
LP019B	V122	Site boundary and habitat type were confirmed during a site visit.
LP019C	V121	Site boundary and habitat type were confirmed during a site visit.
LP027	V156	Large flax and sedge wetland that has been disturbed. Found the location of V156 while reading the documents provided by WDC for site V157. David Rossiter (2011) report mentions the presence of flax, mānuka, <i>Carex secta</i> , and <i>Coprosma</i> . Weeds: cherry, hawthorn, willow and gorse. A large pond was excavated right beside it which is probably having an impact on the wetland hydrology. Google Earth 2009 aerial imagery shows the limit of the original wetland.  A proposed site boundary has been drawn.
OX036	V056	A small area of beech on the other side of Woodside Road was added to the site.
OX053	V025	Desktop mapping: The site boundary was redrawn because it did not match the actual vegetation and habitat site.
OX057	V060	Desktop mapping: The site boundary was redrawn because it did not match the actual vegetation and habitat site.
LP024	-	7 Golf Links Road: visited at the request of the landowner.  Small area with indigenous plant species along the Cam River. Red beech and black beech are present, along with other indigenous and exotic plant species. It is assumed that most of the indigenous species at the site have been planted (although some of the ferns and sedges at the site could be natural/wild). This site does not appear to meet any of the criteria for ecological significance.
LP056	-	4 Camside Road: visited at the request of the landowner.  The landowner believed that kānuka ( <i>Kunzea robusta</i> or <i>K. serotina</i> ) was present at the site, but no kānuka was found during the site visit. The site does not appear to meet any of the criteria for ecological significance.

## 4.5 Non-significant Vegetation and Habitat sites

Some of the existing Vegetation and Habitat Sites (V sites) reviewed for Deliverable 1 are not considered to be ecologically significant when assessed against the criteria in the Canterbury Regional Policy Statement (see Table 15).

Table 15: Existing Vegetation and Habitat Sites that are not ecologically significant according to the criteria in the Canterbury Regional Policy Statement (Appendix 3).

Wildlands Site Number	V Site Number	Site Name	Comment
HP005	V023	Browns Road	Desktop assessment only. The site contains scattered cabbage trees along the roadside. The vegetation is dominated by exotic grasses and does not constitute indigenous vegetation. The site does not meet any of the significance criteria.
HP008	V024	Garry River	A very small area with a few scattered rushes ( <i>Juncus</i> sp.) but the site does not appear to contain indigenous vegetation or meet any of the significance criteria.
OX001	V006	Loburn Kowai Road Wetland	The site contains a small waterway and wet pasture with indigenous rushes (mainly <i>Juncus edgariae</i> ), but the vegetation and stream channel are modified, and the site does not meet any of the significance criteria.
OX010	V066	No. 2 Road Shrub	The previous indigenous vegetation (kānuka forest) has been cleared.
OX017	V036	Bald Hills Creek	The site contains sparse, scattered indigenous plants and the vegetation is dominated by exotic trees (willows) and other exotic plant species (i.e. it does not constitute indigenous vegetation). The site does not meet any of the significance criteria.

## 5. CONCLUSIONS

The ecological significance of c.140 sites in the Waimakariri District was assessed using the criteria in the Canterbury Regional Policy Statement (Environment Canterbury 2013). In total, 115 Significant Natural Areas (SNAs) were identified, comprising 49 existing Vegetation and Habitat Sites (Deliverable 1) and 66 new sites (Deliverable 2, which includes 12 QEII Trust covenants). The SNAs cover 1,926.35 hectares in total, including 1,102.37 hectares that occur on threatened land environments with less than 20% indigenous vegetation cover remaining.

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