# Motukānuka Scientific Reserve: a new dryland reserve at Eyrewell, Waimakariri District, Canterbury

Melissa A S Hutchison<sup>1</sup>, Miles Giller<sup>2</sup> and Marley Ford<sup>3</sup>

<sup>1</sup> Tenax Consulting Ltd, Cashmere, Christchurch; melissa@tenax.co.nz
<sup>2</sup> North Canterbury Representative, QEII National Trust, Rangiora
<sup>3</sup> Wildland Consultants Ltd, Auckland

#### Introduction

One of the largest remaining areas of kānuka (*Kunzea serotina*)<sup>1</sup> forest in the Waimakariri District was recently purchased by the Department of Conservation (DOC), with assistance from the Nature Heritage Fund (Figs. 1-2, p. 67). A 13 ha block on Malbon Farm is now protected in perpetuity and has been named Motukānuka Scientific Reserve – the name means "island of kānuka" in Te Reo Māori (Fig. 3, p. 68). Kānuka forest/woodland covers approximately 11 ha of the reserve, with the remaining area dominated by exotic grassland. A previous article by Meurk et al. (1995, p 13) contained the following description of this site:

"This 10 ha area is one of the 2 largest remaining blocks of kanuka woodland and shrubland remaining on the Canterbury Plains (border of Upper Plains Ecological District). The kanuka is up to 6 m tall, and the oldest stems may be 50-100 years old. According to the manager there has been considerable increase in height of the bushes over the past 25 years. Possibly it has been in a recovery phase since some former burn-off. Where the canopy of kanuka is dense there is a thick carpet of moss on the ground, dominated by *Hypnum cupressiforme*, with occasional herbs such as *Dichondra repens*, *Leptinella serrulata*, and some grasses. The main woody associate of the kanuka is mingimingi (*Cyathodes juniperina*). There is one pine tree at the southwest corner.

<sup>&</sup>lt;sup>1</sup> *Kunzea serotina* is currently classified as "Threatened-Nationally Vulnerable" (de Lange et al. 2018a). All members of the Myrtaceae in New Zealand were classified as Threatened or At Risk in the latest conservation status assessment because of the potential threat of myrtle rust (*Austropuccinia psidii*) on their populations.



Projection: NZGD\_2000\_New\_Zealand\_Transverse\_Mercator

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Figure 1. Aerial photograph of Motukānuka Scientific Reserve, Eyrewell (source: Department of Conservation, May 2019).



Figure 2. Location of Motukānuka and Eyrewell Scientific Reserves at Eyrewell, Waimakariri District (source: Department of Conservation, May 2019).



**Figure 3.** Motukānuka Scientific Reserve – an 'island' of indigenous dryland vegetation surrounded by a sea of irrigated exotic pasture (source: Head 2016).

There are natural openings in the woodland where danthonia grass, lichens, mosses (especially *Racomitrium lanuginosum*), and both indigenous and introduced herbs occur, including some interesting species such as *Stackhousia minima*. Surprisingly, neither *Muehlenbeckia axillaris* nor the scabweeds (*Raoulia* spp.) were observed. These species are commonly associated with kanuka on flood plain terraces. Presumably the high terraces have lost these elements typical of the younger, fresher soils. Some stunted matagouri (*Discaria toumatou*) was noted, but *Melicytus alpinus* was not seen, though expected.

Rotary-slashed lanes have been cut through the block in a cross-shape dividing the whole into quadrants. This is for the purpose of providing stock and lambing shelter from winter cold and periodic heavy snowfalls. Along these lanes kanuka is regenerating, but they are also a locus for establishment of gorse. There is a water race running along the eastern boundary, and this is scheduled to be upgraded to take four times the current flow."

On 9 November 2019, an enthusiastic group of 18 Canterbury Botanical Society members, accompanied by Tom Hitchon (Department of Conservation Ranger, Mahaanui Office, Christchurch), visited Motukānuka Scientific Reserve (Fig. 4, p. 70).

#### **Ecological context and significance**

Before human arrival in Aotearoa/New Zealand, the vegetation of the Canterbury Plains consisted of a mosaic of woodland, scrub and short tussock grasslands on stony, free-draining soils; podocarp-hardwood forest on the more stable, moist soils; and wetlands on poorly drained soils (McEwen 1987, Meurk et al. 1995, Steven and Meurk 1996, , Winterbourn et al. 2008). Following European colonisation, the indigenous vegetation cover of the Plains has been almost completely destroyed as a result of agricultural development, with less than 1% of the original indigenous vegetation cover remaining. Despite most of the Canterbury Plains being recognised as a 'critically threatened' land environment (Holdaway et al. 2012, Walker et al. 2015), the ongoing loss of indigenous vegetation on the Canterbury Plains has continued over the last 20 years. Now less than 200 ha remains of the original 720,000 ha of kānuka forest that occupied the Plains and Culverden Basin (Ecroyd and Brockerhoff 2005).

Motukānuka Scientific Reserve is located in the High Plains Ecological District, within the Canterbury Plains Ecological Region. It is one of the largest areas of kānuka forest remaining on the Canterbury Plains (Meurk et al. 1995, Head 2016, Jones et al. 2016). Other sizeable kānuka stands include:

#### Canterbury Plains

- Eyrewell Scientific Reserve (2.3 ha, Fig. 2) (Molloy and Ives 1972, Ecroyd and Brockerhoff 2005).
- Bankside Scientific Reserve (2.4 ha) (Molloy 1971a).
- Claxby Farm (20 ha) (Meurk et al. 1995).
- Langstone Kānuka QEII covenants (3.4 ha) ca.70% of the kānuka was disturbed in 2013.
- Environment Canterbury land at Rakaia Island (Molloy 1971b).

### Culverden Basin

- Medbury Scientific Reserve (56 ha) ca.70% of the kānuka forest was burnt in 2003 (Head et al. 2005).
- Culverden Scientific Reserve (8 ha) scattered kānuka scrub and grassland.
- Lowry Kānuka QEII Covenant (8.2 ha).

Although the original vegetation and habitats at these sites have been substantially modified by human activities, these last remaining areas of indigenous dryland vegetation are of great ecological significance. As Meurk et al. (1995, p 16) stated:

"All of these sites are valuable in their own right. We can imagine that the original extensive woodlands, stretching across parts of the Canterbury Plains, displayed subtle variations in structure and species composition that reflected

gradients of soil texture and fertility, climate, disturbance frequency, and chance dispersal events. The small fragments that are left to us encapsulate various parts of these complex natural gradients and the historical setting to the subsequent farm development. Each has its own suite of species - a piece of the jig-saw; each is different, and tells us something more about the natural environment. ... The long-term future of these woodland ecosystems, including their animal inhabitants, will depend on there being large enough areas to encompass the full diversity of species and afford adequate buffering from weed and pest invasion and from incompatible, adjacent farming practices."

#### Vegetation and flora

The vegetation at Motukānuka Scientific Reserve is dominated by *Kunzea serotina* (de Lange 2014), which forms a relatively intact canopy (up to 4.5 m tall) over about 11 ha of the reserve (Fig. 1). What makes Motukānuka special is the diversity of native shrub, herb, orchid, moss and lichen species associated with the kānuka. Most of these species are now very rare on the Canterbury Plains, and a good number of them are classified as Threatened or At Risk nationally (de Lange et al. 2018a).

The dominance of bryophytes on the ground is a key feature of the reserve. Extensive areas of woolly moss (*Racomitrium* spp.) are present (Head 2016), along with *Hypnum cupressiforme, Polytrichum juniperinum*, and *Triquetrella papillata*, with *H. cupressiforme* sometimes forming raised mounds in more shaded locations (Fig. 5).



**Figure 4.** Canterbury Botanical Society members visited Motukānuka Scientific Reserve on 9 November 2019, accompanied by DOC Ranger Tom Hitchon (photo: M. Hutchison).



**Figure 5.** The dominance of mosses on the ground is a key feature of the reserve. Here mounds of *Hypnum cupressiforme* can be seen, along with a sparse and largely exotic-free understorey layer (photo: M. Giller).

Scattered native shrubs occur under the kānuka, including prickly mingimingi/mikimiki (*Leptecophylla* juniperina), matagouri (Discaria Risk-Declining). toumatou. classified as At native common broom (Carmichaelia australis), porcupine shrub (Melicytus alpinus agg.), niniao (Helichrysum lanceolatum), mānuka (Leptospermum scoparium, At Risk-Declining) and *Pomaderris amoena* – the Eyrewell area is the southern national distribution limit for this species. A single specimen of Coprosma intertexta (At Risk-Declining) was also seen during the Botanical Society visit. Several species of native lianes are present, including *Clematis forsteri*, C. marata, and Clematis quadribracteolata (At Risk-Naturally Uncommon).

Growing in amongst the bryophytes are a variety of native herbs such as *Brachyglottis bellidioides*, *Celmisia gracilenta*, pātōtara (*Leucopogon fraseri*), dryland button daisy (*Leptinella serrulata*, At Risk-Declining, Fig. 6) and *Hypericum involutum* (At Risk-Declining, Fig. 7); orchids such as *Caladenia lyallii* and the sun orchid *Thelymitra longifolia* (Fig. 8, p. 72); and grasses such as *Microlaena stipoides* and silver tussock (*Poa cita*). *Leptinella filiformis* (Threatened-Nationally Critical) has recently been planted at the site by DOC (Fig. 9, p. 72). This species was regarded as extinct for over a decade until it was rediscovered in a lawn in Hanmer Springs in 1998, and was subsequently propagated (de Lange 2020a).



**Figure 6.** Scattered patches of dryland button daisy, *Leptinella serrulata* (classified as At Risk-Declining) occur under kānuka in the reserve (photo: M. Hutchison).



**Figure 7.** *Hypericum involutum* (At Risk-Declining) is occasional under kānuka in the reserve (photo: M. Hutchison).

Senecio dunedinensis (classified as 'At Risk-Naturally Uncommon') was previously noted at Motukānuka Scientific Reserve (Head 2016), although the grey Senecio seen during the Botanical Society visit on 9 November 2019 (Fig. 10, p. 72) was not Senecio dunedinensis s.s. or the entity usually called Senecio aff. dunedinensis. Senecio dunedinensis s.s. has leaves that appear almost succulent, glabrescent, and dark green to brown in colour, and it typically grows in open sites, mostly on schist and limestone outcrops where the soil is actively eroding. The entity usually referred to as *Senecio* aff. *dunedinensis* is typically maroon-black in colour and has toothed to lyrate-pinnatifid basal leaves. The *Senecio* with narrow, grey leaves at Motukānuka did not fit either of these descriptions, and is probably best referred to as *Senecio* aff. *quadridentatus* (Peter de Lange pers. comm., see https://inaturalist.nz/observations/35521761). There appear to be multiple entities lurking under *Senecio quadridentatus* awaiting description (de Lange 2020b).



**Figure 8.** Occasional plants of the sun orchid *Thelymitra longifolia* occur in the reserve (photo: M. Hutchison).



**Figure 9.** *Leptinella filiformis* (Threatened-Nationally Critical) has recently been planted at Motukānuka Scientific Reserve by DOC (photo: M. Hutchison).



**Figure 10.** This un-described native groundsel, referred to as *Senecio* aff. *quadridentatus* for now, was seen in a few places in the reserve (photo: M. Hutchison).



**Figure 11.** Young plants of karo (*Pittosporum ralphii*), kōhūhū (*P. tenuifolium*), and hybrids between these species were common in the reserve. These 'non-local' species are not a natural feature of dryland vegetation at this site (photo: M. Hutchison).

Seedlings and young saplings of karo (*Pittosporum ralphii*) and kōhūhū (*P. tenuifolium*) were relatively common under the kānuka (Fig. 11 above). Athough kōhūhū occurs naturally throughout much of Canterbury, neither of these

*Pittosporum* species are considered to be native to the dryland kānuka forests around Eyrewell and should ideally be removed. They are being spread by birds from gardens and other plantings in the area. Scattered gorse (*Ulex europaeus*) is present in canopy gaps and along the cleared strips through the kānuka – DOC staff have been carrying out control of the gorse and it will no doubt require an ongoing effort to prevent it from becoming more common in the reserve.

### Lichens

Terricolous lichens are common under the kānuka canopy and in canopy gaps at Motukānuka Scientific Reserve. These include Cladonia furcata (Fig. 12), C. tenerrima, and C. confusa, along with Cladia aff. inflata and Pulchrocladia retipora. A variety of corticolous lichens were seen on kanuka trunks and branches. These include the gold dust lichen (Chrysothrix sp., Fig. 13) and foliose lichens such as Menegazzia subpertusa, Notoparmelia cunninghamii (Fig. 14, p. 74), Parmotrema perlatum and Pseudocyphellaria neglecta (Fig. 15, p. 74). Other corticolous lichens include species that are commonly found in urban and disturbed habitats, such as Physcia adscendens, Physcia jackii, and Teloschistes velifer. Lichen species identified during previous visits, such as Menegazzia cf. dielsii could have been misidentified. This Menegazzia could instead be the more common species Menegazzia subpertusa, which was identified during the Bot Soc trip. Lichens can be difficult to identify in the field, and some species (particularly crustose lichens, e.g. Lecanora spp. and Lecidea spp.) require microscopy or chemical tests to reach species-level identification. Some of the species recorded by Meurk et al. (1995) are synonyms, for example *Peltigera spuria* is now regarded as a synonym of *P*. didactyla, and the common lichen known as Cladia aggregata is now referred to as Cladia gorgonea (de Lange et al. 2018b).



**Figure 12.** The fruiticose lichen *Cladonia furcata* is occasional on the ground at Motukānuka Scientific Reserve (photo: M. Hutchison).



**Figure 13.** The bright yellow gold dust lichen (*Chrysothrix* sp.) is common on kānuka trees in the reserve (photo: M. Hutchison).



**Figure 14.** *Notoparmelia cunninghamii,* an occasional corticolous lichen on *Kunzea serotina* (photo: M. Ford).



**Figure 15.** The corticolous lichen *Pseudocyphellaria neglecta* growing at the base of *Kunzea serotina* (photo: M. Ford).

#### Plant and lichen species list

During the visit by Canterbury Botanical Society on 9 November 2019, a list of all vascular plant species was compiled, and efforts were made (by Marley Ford and Melissa Hutchison) to identify the various lichen and moss species observed (Table 1). Photographs of selected plant and lichen species seen during the visit have been collated into a project on the iNaturalist NZ-Mataki Taiao website: https://inaturalist.nz/projects/Motukānuka-scientific-reserve-eyrewell-canterbury

**Table 1.** Plant and lichen species recorded as present (Y) at Motukānuka Scientific Reserve by Meurk et al. (1995), Head (2016; only selected plant species were noted) and members of the Canterbury Botanical Society (CBS) on 9 November 2019. During the Botanical Society visit the abundance of each species present was scored using five categories: D = Dominant, A = Abundant, F = Frequent, O = Occasional, R = Rare.

Scientific name	Conservation status (de Lange et al. 2018a, 2018b, Rolfe et al. 2016)	Meurk et al. (1995)	Head (2016)	CBS (2019)
GYMNOSPERMS				
Pinus radiata*	-	Y	Y	-
ANGIOSPERMS				
DICOTS				
Achillea millefolium*	-			R

Anthriscus caucalis*	-			F
Aphanes inexspectata*	-			R
Bellis perennis*	-			R
Brachyglottis bellidioides	Not Threatened	Y	Y	0
Capsella bursa-pastoris*	-			R
Cardamine hirsuta*	-			R
Carex breviculmis	Not Threatened			R
Carmichaelia australis	Not Threatened	Y	Y	0
Celmisia gracilenta	Not Threatened	Y	Y	0
Cerastium fontanum*	-			0
Cerastium glomeratum*	-			0
Cirsium vulgare*	-			0
Clematis forsteri	Not Threatened			R
Clematis marata	Not Threatened			0
Clematis quadribracteolata	At Risk-Naturally Uncommon	Y	Y	-
Coprosma crassifolia	Not Threatened			R
Coprosma intertexta	At Risk-Declining			R
Coprosma propinqua	Not Threatened	Y	Y	F
Coprosma rhamnoides	Not Threatened		Y	0
Coprosma x cunninghamii	-			R
Crassula sieberiana	Not Threatened			R
Crepis capillaris*	-			0
Cytisus scoparius*	-		Y	0
Dichondra repens	Not Threatened		Y	А
Digitalis purpurea*	-			R
Discaria toumatou	At Risk-Declining	Y	Y	0
Euchiton audax	Not Threatened	Y		R
Fumaria officinalis*	-			R
Galium aparine*	-			R
Galium propinquum	Not Threatened	Y		0
Geranium molle*	-			R

Helichrysum lanceolatum	Not Threatened			R
Hieracium lepidulum*	-			R
Hieracium praealtum*	-			0
Hydrocotyle novae zelandiae	Not Threatened	Y		R
Hypericum involutum	At Risk-Declining	Y		0
Hypochaeris radicata*	-	Y		F
Kunzea serotina	Threatened-Nationally Vulnerable	Y	Y	D
<i>Lepidium</i> sp.*	-			R
Leptecophylla juniperina	Not Threatened	Y		А
Leptinella filiformis <sup>1</sup>	Threatened-Nationally Critical			R
Leptinella pusilla	At Risk-Declining		Y	-
Leptinella serrulata	At Risk-Declining		Y	R
Leptinella squalida	Not Threatened			F
Leptospermum scoparium	At Risk-Declining	Y	Y	R
Leptostigma setulosum	Not Threatened	Y		0
Leucopogon fraseri	Not Threatened	Y		F
Melicytus alpinus agg.	Not Threatened		Y	R
Muehlenbeckia complexa	Not Threatened			R
Oxalis exilis	Not Threatened			R
Pilosella officinarum*	-	Y	Y	0
Pittosporum ralphii <sup>2</sup>	Not Threatened			0
Pittosporum tenuifolium <sup>2</sup>	Not Threatened		Y?	0
Pittosporum tenuifolium $\times P$ . ralphiii <sup>2</sup>	-			R
Plantago lanceolata*	-			R
Plantago major*	-			R
Polycarpon tetraphyllum*	-			R
Pomaderris amoena	Not Threatened		Y	R
Ribes sanguineum*	_			R
Rubus fruticosus agg.*	-			R
Rumex acetosella*	-	Y		F

Senecio glomeratus	Not Threatened			Ο
Senecio aff. quadridentatus <sup>3</sup>	Not Threatened		Y	R
Sisymbrium officinale*	-			R
Solanum chenopodioides*	-			0
Solanum laciniatum	Not Threatened			R
Stackhousia minima	Not Threatened	Y		-
Stellaria media*	-			F
Taraxacum officinale*	-			R
Taraxacum 'red-seed'*	-			R
Trifolium dubium*	-			R
Trifolium repens*	-			R
Trifolium subterraneum*	-			R
Ulex europaeus*	-	Y	Y	F
Verbascum thapsus*	-			R
Veronica arvensis*	-			R
Vicia sativa*	-			R
Wahlenbergia albomarginata	Not Threatened	Y		-

## MONOCOTS

-	Y	Y	F
-	Y		А
			R
-	Y	Y	А
Not Threatened	Y		0
-			0
Not Threatened	Y		-
-	Y	Y	F
-			R
-			R
-			R
Not Threatened			F
Not Threatened			R
	- - Not Threatened - Not Threatened - - - - Not Threatened Not Threatened Not Threatened	-Y-Y-Y-YNot ThreatenedY-Y	-YY-YY-YYNot ThreatenedYNot ThreatenedYY-YYNot ThreatenedINot ThreatenedINot ThreatenedI

Poa pratensis*	-		0
Rytidosperma spp.		Y	F
Rytidosperma unarede	Not Threatened	Y	-
<i>Vulpia</i> sp.*	-		0

\_

\_

ORCHIDS				
Caladenia lyallii	Not Threatened			R
Microtis unifolia	Not Threatened			0
Prasophyllum colensoi	Not Threatened		Y	-
Thelymitra longifolia	Not Threatened	Y	Y	0
Thelymitra sp. (slim, bronze)				R

FERNS AND FERN ALLIES			
Asplenium flabellifolium	Not Threatened		R

BRYOPHYTES				
Breutelia affinis	Not Threatened	Y		0
Campylopus clavatus	Not Threatened	Y		0
Campylopus introflexus	Not Threatened	Y		-
Frullania sp.				R
Hypnum cupressiforme	Not Threatened	Y		А
Polytrichum juniperinum	Not Threatened	Y		0
Racomitrium lanuginosum	Not Threatened	Y		-
Racomitrium pruinosum	Not Threatened		Y	?O
Thuidium fufurosum	Not Threatened			R
Triquetrella papillata	Not Threatened	Y		F

LICHENS AND FUNGI	

Agaricales		Y	-
Austroparmelina labrosa	Not Threatened		0
<i>Buellia</i> sp.			R
<i>Chrysothrix</i> sp. <sup>4</sup>			0

Cladia gorgonea <sup>5</sup>	Not Threatened	Y	0	
Cladia aff. inflata			0	
Cladonia capitellata		Y	-	
Cladonia chlorophaea	Not Threatened	Y	0	
Cladonia confusa	Not Threatened		0	
Cladonia furcata	Not Threatened		0	
Cladonia tenerrima	Not Threatened		0	
Hypogymnia spp.		Y	-	
Hypotrachyna sp.			R	
<i>Lecanora</i> sp.			R	
Lecidea sp.			R	
Lycoperdon sp.		Y	-	
Menegazzia cf. dielsii		Y	-	
Menegazzia subpertusa	Not Threatened		0	
Notoparmelia cunninghamii	Not Threatened		R	
Parmotrema perlatum	Not Threatened	Y	F	
Peltigera didactyla <sup>6</sup>		Y	-	
Peltigera cf. dolichorhiza		Y	-	
Physcia adscendens	Not Threatened		0	
Physcia jackii	Not Threatened		0	
Pseudocyphellaria neglecta <sup>7</sup>		Y	R	
Pulchrocladia retipora	Not Threatened		R	
Ramalina celastri	Not Threatened		F	
Ramalina glaucescens	Not Threatened		0	
Ramalina sp.		Y	-	
Teloschistes velifer	Not Threatened	Y	-	
Usnea sp.		Y	-	
Xanthoparmelia mougeotina	Not Threatened	Y	-	
Xanthoparmelia cf. scabrosa		Y	-	_
<i>Xanthoparmelia</i> sp. (brown) <sup>8</sup>		Y	R	
Xanthoria parietina	Not Threatened		R	

ALGAE		
Trentepohlia sp.		R

\* Introduced species

<sup>1</sup> Planted at the site by DOC.

<sup>2</sup> 'Non-local' native species, i.e. species that are native to New Zealand but do not occur naturally at this site.

<sup>3</sup> Referred to as *Senecio dunedinensis* by Head (2016).

<sup>4</sup> *Chrysothrix candelaris* was recorded by Meurk et al. (1995) but this species is now not thought to occur in New Zealand (James et al. 2019).

<sup>5</sup> Referred to as *Cladia aggregata* by Meurk et al. (1995).

<sup>6</sup> Called *Peltigera spuria* in Meurk et al. (1995) but that species is now regarded as a synonym of *P. didactyla*.

<sup>7</sup> Referred to as *Pseudocyphellaria crocata* by Meurk et al. (1995).

<sup>8</sup> Referred to as *Neofuscelia* sp. by Meurk et al. (1995).

#### Management of kānuka remnants on the Plains

With a relatively limited range of woody species, it might easily be assumed that maintaining the diversity of flora within dryland remnants such as Motukānuka Scientific Reserve would be relatively straight-forward. However, experience at nearby reserves and covenanted dryland associations indicates otherwise (Ecroyd and Brockerhoff 2005). The mature kanuka canopy of such dryland associations tends to be relatively open and the understorey is generally very sparse, and in some cases virtually absent. This allows a substantial amount of light to reach the groundcover of bryophytes, forbs and graminoids – enough to allow several exotic plant species to recruit and persist. Some exotics are likely to have limited ecological impacts. However, a few are capable of suppressing the native groundcover to the point of almost complete dominance. A photopoint sequence at a recently-fenced, nearby covenant illustrates both the speed and the degree of this process, where a groundcover initially dominated by native species can be rapidly overtaken by a dense sward of cocksfoot (Dactylis glomerata, Figs. 16-19, p. 81). Similarly, red fescue (Festuca rubra) has shown an ability to completely dominate open areas, resulting in a thick thatch of organic material that prevents survival or recruitment of most native species (Fig. 20, p. 83). Such highly visible changes may also bring about more insidious changes, such as the suppression of mycorrhizal fungal associates that are important for establishment and growth of kanuka.



**Figure 16.** January 2008. The groundcover of a recently grazed kānuka remnant is dominated by *Microlaena stipoides* and mosses with scattered sweet vernal (*Anthoxanthum odoratum*) (Langstone Covenant - photo: M. Giller).



**Figure 17.** July 2011. Cocksfoot (*Dactylis glomerata*), no longer suppressed by grazing livestock, begins to establish and set seed (photo: M. Giller).



**Figure 18.** October 2014. Cocksfoot is becoming widespread, though not yet fully dominant (photo: M. Giller).



**Figure 19.** September 2017. Without suppression, cocksfoot has largely displaced the original native groundcover (photo: M. Giller).

Hindsight is a great thing and it is likely to be difficult to resurrect the former groundcover in those remnants where such dramatic changes have occurred. However, much of Motukānuka Scientific Reserve has somehow retained a relatively exotic-free groundcover and now provides an opportunity to adopt a range of more proactive management approaches. It has survived a considerable period of extensive farming impacts and the current assemblages will doubtless reflect that. We cannot be certain about all of the species the pre-human versions of these dryland associations supported, and we cannot exactly replicate the various original drivers of those associations. Thus it seems prudent to accept that what has persisted, modifications and all, should be the focus of protection. Any changes to management have the potential to drive further ecological changes, possibly for the better, though possibly also for the worse. For instance,

the removal of all grazing may reduce herbivory of palatable species but appears to promote the invasion by cocksfoot and increased thatch build-up of other exotic grasses. Some means of limiting cocksfoot, red fescue and other exotic grasses from asserting such dominance then needs to be considered. Options include some degree of strategic grazing, selective application of non-selective herbicides, general application of selective herbicides, and mechanical or manual control.

A previous Canterbury Botanical Society Journal article by Meurk and Greenep (2003) introduces the concept of adopting a range of management regimes – a management gradient – in the expectation that at least one regime might suit a particular species or suite of species, thereby providing optimal opportunity for all species still present to be retained somewhere in the mix. With limited resources at our disposal it may not be possible to adopt the full range of ideal management practices – management might need to be adaptive, responding to apparent successes and shortcomings.

The timely recognition of changes can inform management decision-making. Photopoints can help portray visually obvious changes in larger species. Less obvious species may require routinely-repeated surveys of representative plots to accurately track any trends.

One potential management input was clearly demonstrated in a nearby kānukadominated dryland remnant during its rehabilitation after large-scale disturbance. Like most such sites, kānuka recruitment into the pre-disturbance intact groundcover of bryophytes and grasses appeared to be very limited, resulting in relatively even-aged kanuka cohorts that over time favoured some associates and limited others. Subsequent large-scale disturbance of the kānuka canopy and groundcover resulted in a strong recruitment of kanuka and other seedlings (Fig. 21, p. 83), diversifying kanuka stand structure and potentially diversifying habitat opportunities for associated species. Several species not recorded under or around even-aged older kanuka stands volunteered after the disturbance, including *Geranium retrorsum* (Threatened-Nationally Vulnerable) and *Pelargonium inodorum*. These species appear to retain a bank of long-lived seeds in the soil awaiting such disturbance events. Whilst legally protected sites are typically protected from mass physical disturbances, perhaps there is scope to artificially provide a calculated degree of disturbance, effectively mimicking what might have occurred in the past when parts of our plains landscape were more vulnerable to natural disturbance events. A disturbance gradient could maintain a mosaic of diverse associations, from older dense kanuka stands to younger fragmented stands, to relatively open kānuka-free glades – each with their suites of floral and faunal associates.

Members of the Canterbury Botanical Society greatly enjoyed our visit to Motukānuka Scientific Reserve. The resulting plant species list is relatively short compared to most forest associations, but this is not all-inclusive. There will be a broad array of other biota, including invertebrates and fungi that we did not even try to identify. Given that so few remnants of dryland flora and fauna remain on the Canterbury Plains, the retention of the full diversity that remains is surely a top priority. Experience at nearby dryland reserves and covenants indicates that this will be far from straight-forward. Management of the full range of native biodiversity at Motukānuka Scientific Reserve might just need a little more cunning and inventiveness than is customary.



**Figure 20.** Undisturbed red fescue can build up a mattress-like thatch of organic material which prevents the survival or recruitment of most native species (Langstone Covenant - photo: M. Giller).



**Figure 21.** Provided there is a seed source available, disturbance of the ground cover, accompanied by short-term suppression of exotic grasses, can result in vigorous recruitment of kānuka and several associated dryland plant species (Langstone Covenant - photo: M. Giller).

#### Acknowledgements

We thank the Department of Conservation for allowing the Canterbury Botanical Society to visit Motukānuka Scientific Reserve and to publish this article. We particularly thank Tom Hitchon for accompanying us during our visit, and Anita Spencer (DOC Mahaanui Office) for providing maps and information about the reserve.

#### References

- de Lange PJ. 2014. A revision of the New Zealand Kunzea ericoides (Myrtaceae) complex. *PhytoKeys* 40: 1–185.
- de Lange PJ, Rolfe JR, Barkla JW, Courtney SP, Champion PD, Perrie LR, Beadel SM, Ford KA, Breitwieser I, Schönberger I, Hindmarsh-Walls R, Heenan PB, Ladley K. 2018a. Conservation status of New Zealand indigenous vascular plants, 2017. *New Zealand Threat Classification Series 22*. Wellington: Department of Conservation.
- de Lange P, Blanchon D, Knight A, Elix J, Lücking R, Frogley K, Harris A, Cooper J, Rolfe J. 2018b. Conservation status of New Zealand indigenous

lichens and lichenicolous fungi, 2018. *New Zealand Threat Classification Series* 27. Wellington: Department of Conservation.

- de Lange PJ 2020a. *Leptinella filiformis*. Fact Sheet. New Zealand Plant Conservation Network. https://www.nzpcn.org.nz/flora/species/leptinellafiliformis/ (Date accessed: 3 August 2020).
- de Lange PJ. 2020b. *Senecio dunedinensis*. Fact Sheet. New Zealand Plant Conservation Network. https://www.nzpcn.org.nz/flora/species/seneciodunedinensis/ (Date accessed: 9 July 2020).
- Ecroyd CE, Brockerhoff EG. 2005. Floristic changes over 30 years in a Canterbury Plains kānuka forest, and comparison with adjacent vegetation types. *New Zealand Journal of Ecology* 29(2): 279–290.
- Head N, Molloy BPJ, Spencer A. 2005. Re-establishment of *Leptinella filiformis* into suitable remnant habitats in Canterbury: a progress report. *Canterbury Botanical Society Journal 38*: 87–93.
- Head N. 2016. *Botanical and ecological values of a kānuka remnant on Kānuka Downs Farm*. Unpublished report for the Department of Conservation, Christchurch.
- Holdaway RJ, Wiser SK, Williams PA. 2012. A threat status assessment of New Zealand's naturally uncommon ecosystems. *Conservation Biology 4*: 619–629.
- James M, Blanchon D, de Lange PJ. 2019. How many species of *Chrysothrix* do we have in New Zealand? *Trilepidea (New Zealand Plant Conservation Network newsletter)*, October 2019.
- Jones C, Spencer A, Head N. 2016. *Nature Heritage Fund Application. 11 ha Kānuka Block, Eyrewell West, Canterbury Plains*. Unpublished report. Department of Conservation, Christchurch.
- McEwen WM. 1987. *Ecological regions and districts of New Zealand*. Third revised edition in four 1:500,000 maps. Booklet to accompany Sheet 3: descriptions of districts in central New Zealand, from eastern Wairarapa to Akaroa, also Chathams, not shown on map. Publication No. 5 (in four parts). Part 3. Wellington: New Zealand Biological Resources Centre, Department of Conservation.
- Meurk CD, Bellingham P, MacMillan B. 1995. The last kānuka landscape on the Canterbury Plains? *Canterbury Botanical Society Journal* 29: 11–24.
- Meurk CD, Greenep H. 2003. Practical conservation and restoration of herbaceous vegetation, *Canterbury Botanical Society Journal* 37: 99–108.
- Molloy BPJ. 1971a. Possibilities and problems for nature conservation in a closely settled area. *Proceedings of the New Zealand Ecological Society* 18: 25–37.

- Molloy BPJ. 1971b. Bankside a new Scientific Reserve on the Canterbury Plains. *Proceedings of the New Zealand Ecological Society* 17: 47–51.
- Molloy BPJ, Ives DW. 1972. Biological Reserves of New Zealand 1. Eyrewell Scientific Reserve, Canterbury. *New Zealand Journal of Botany 10(4)*: 673–700.
- Rolfe JR, Fife AJ, Beever JE, Brownsey PJ, Hitchmough RA. 2016. Conservation status of New Zealand mosses, 2014. *New Zealand Threat Classification Series 13*. Wellington: Department of Conservation.
- Steven CJ, Meurk CD. 1996. Low and High Plains Ecological Districts, Plains Ecological Region, Canterbury. Protected Natural Areas Programme. Unpublished Draft Survey Report. Department of Conservation, Canterbury Conservancy, Christchurch.
- Walker S, Cieraad E, Barringer J. 2015. The Threatened Environment Classification for New Zealand 2012: A guide for users. *Landcare Research Report LC2184*. Manaaki Whenua-Landcare Research.
- Winterbourn M, Knox G, Burrows C, Marsden I. (eds.) 2008. *The Natural History of Canterbury. Third edition*. Christchurch: Canterbury University Press.

## The usefulness of students' herbarium labels

#### Paula Greer

Research Technician, Allan Herbarium, Manaaki Whenua / Landcare Research

As a research technician at the Allan Herbarium the main part of my job is entering the historical data from specimens' labels. Most of this is basic, sometimes including only the species name, with limited or no location information let alone who collected or determined it, or even when it was collected. Then there are collections made by students of a bygone era, often specific to course papers that have been repeated for years, if not decades. These are more fulsome and can be revealing.

It was a requirement for each second year Bachelor of Agricultural Science student at Canterbury Agriculture College to make a herbarium collection of 50 grasses and legumes, 50 weeds, 50 native plants, and seeds of 50 plants (pers. comm. R Lucas, Lecturer and Alumnus, Lincoln University / Canterbury Agriculture College). Many of these collections show that the students