	Botanical name	Common name	Slip		
			1	2	3
*	*Leycesteria formosa*	Himalayan honeysuckle	-	C	-
*	*Epilobium ciliatum*	tall willowherb	-	-	C
	Stellaria decipiens (incl. *parviflora*)	native chickweed	-	-	C
*	*Sagina procumbens*	mossy pearlwort	-	-	C
*	*Bellis perennis*	daisy	-	-	C
	Epilobium nummularifolium	creeping willowherb	-	-	C
*	*Senecio vulgaris*	groundsel	-	-	C
*	*Callitriche stagnalis*	starwort	-	-	C
	Asplenium hookerianum	maidenhair spleenwort	-	-	C
*	*Crepis capillaris*	hawksbeard	-	-	C
*	*Sonchus asper*	prickly sow thistle	-	-	C
*	*Myosotis ?arvensis*	field forget-me-not	-	-	C
*	*Cardamine hirsuta*	bitter cress	-	-	C
*	*Senecio sylvaticus*	wood groundsel	-	-	C
	Acaena anserinifolia	piripiri, biddibid	-	-	C

Braided river berm transition, a climate resilience project

Greg Stanley

Team Leader, Braided River Revival, Environment Canterbury

Introduction: our catchments and communities

The unique values of Waitaha Canterbury's braided rivers [1] are well known, as are many of the challenges and threats to their natural value. Loss of habitat – wetlands, braid-plains, or terrestrial vegetation – frequently form the introductory context of our presentations. It is due to habitat loss and land modification that my job as part of the Regionwide Berm Transition Project [2] exists.

My name is Greg Stanley and I have worked with vegetation on modified river berms with Environment Canterbury for the last decade. My work has been primarily located in the lower reaches of the Waimakariri and Rakahuri rivers with a focus on the retention and encouragement of native vegetation among our exotic flood protection assets.

Environment Canterbury is responsible for the provision and maintenance of flood protection assets in many of the populated reaches along our region's rivers [3]. Flood protection assets take many forms. These include the stopbanks bounding the lower reaches, the lateral groyne structures to re-direct flows to the centre of the channel, and the linear poplar and willow lines that form the structural defences against peak fluvial energies. Further to this, drainage is managed in vast networks of cleared channels, gates and culverts, and exotic vegetation is controlled to ensure the ongoing success of flood defences.

Prior to modification, the Waitaha landscape was host to a whole range of fascinating habitat types, many of which were a product of disturbance and perturbation regimes driven by flooding processes. Our various plant communities were often established successfully in low nutrient environments, low rainfall areas and poor soils. They were well adapted to surviving in very challenging and dynamic conditions.

In many ways, the exotic flood protection vegetative arrangements are very successful in performing their function. They establish rapidly where they are placed and form dense arrangements of roots and stems, binding the silts and stones together, creating the desired linear bank structures. Their consequent impacts, however, create much wider issues beyond the intended rows and arrangements. The most obvious example of this is the intrusion of willow into wetlands and upland montane tributaries.

In the berm areas, these exotic rows and stands of trees are thick with vine and tree weed species. These include old man's beard (*Clematis vitalba*), ivy (*Hedera helix*), sycamore (*Acer pseudoplatanus*), and grey willow (*Salix cinerea*) that are able to grow rapidly in these disturbed, high-light environments. With the deciduous tree cover, there are still very high light levels beneath the thin canopy, and with both willow and poplar producing flowers prior to leaf formation, the period when the trees are in full leaf is very short with leaves often beginning to fall from as early as February. This further exacerbates weed growth beneath these exotic stands allowing berm lands to become dense infestations of very low plant diversity.

Few native plant species have survived in these modified, weed-filled berms. Notable survivors are often the most fecund native plants that wreak havoc in our urban gardens – the plants often seen growing thick in the understorey or between the cracks in the pavement. These typically include: tī kōuka, karamu, kōwhai, harakeke and kōhūhū. It is also not uncommon to see *Muehlenbeckia* species, *Haloragis erecta*, groundsel, *Blechnum*, *Polystichum*, and *Carex* species. These plants occur as satellites and small pockets of habitat in the sea of weeds.

In the face of climate change it is safe to assume that our infestations will only get worse. The weed species we have are the most able to capitalise on freshly disturbed sites. With any increase in disturbance through flood-scour or similar events, these infestations will presumably continue to self-perpetuate. This could further drive down the already low diversity, potentially pushing out any remaining native remnants in the lower reaches. We may see berm infestations migrating further upstream and putting pressure on our higher value habitats in the upper reaches. In many ways, now could be our last chance to establish some diversity into the vegetation structures of the lower reaches.

So what is Berm Transition?

The Berm Transition Project is one of Environment Canterbury's six Climate Resilience Programme of Flood Risk Management Projects [4], part-funded [5] by the Ministry for Business, Innovation and Employment's Kānoa - Regional Economic Development & Investment Unit (Kānoa – RDU). The goal of this project is to transform selected areas

within the managed braided river berms into multi-value areas, enhancing their function, resilience and diversity. The project seeks to increase the resilience of flood protection vegetation through the establishment or retention of diverse, native plant communities in the understorey.

The primary actions of our project are targeted invasive weed control, followed by strategic sub-canopy native plantings. With the majority of our native low plain community being evergreen, there will be less available light for pest species to re-establish, reducing weed intrusion in the long-term. With increased stratification and less available intruding light, our vine weed species will be less able to form dense infestations, conferring a benefit to the flood protection stands we're working within. Furthermore, the installation of mature phase trees (including tōtara, mātai, kahikatea and others) in these areas will allow us to move toward full native canopy in the longer term.

The approaches described above are essentially our clumsy attempt to "mimic" nature, or at least to seek to work in a similar direction growth-wise. The chosen work sites often contain several wild plants, sometimes kōwhai, tī kōuka or tutu. The plant list we install is intended to supplement the existing stands, and plantings are placed into sheltered sub-canopy areas neighbouring these locations of observable native recruitment. Once the plantings are installed, contractors performing upkeep will be focused on the retention of all wild seedlings of native species that are recruited into the planted areas, including the groundsels, vines and fern species listed above. In this way, the installed planting asset is "keyed in" to an area of existing native function with the two working together and establishing more quickly as a result (Fig. 1).

Figure 1. One of many planting areas on the Ashley River near Glentui. These areas are wrapped around the southern and eastern margins of standing native and exotic vegetation.

In support of the above idea, we try to emphasize the following message to our contractors:

> *Native wild recruits are significantly stronger and more resilient than propagated nursery plants. They are the priority, and their successful establishment is of higher importance than the success of our planted units.*

This is fairly obvious when you consider the selection process inherent to propagation. A full range of fruit or seeds is taken from the parent and then spread into duff trays or similar and kept warm and regularly watered. The seedlings are grown in uniform, optimum conditions. For a seedling to establish in the wild, however, it must survive hostile conditions again and again to make it through to a one-year-old plant. The levels of disturbance, browsing and competition are forcing these seedlings to be either extremely lucky or extremely hardy; presumably both. It is these plants that we need to prioritize in order to achieve a successful, resilient future berm.

This approach to weeding and supplementary planting alongside a fractured native assemblage is based on some successful wild reserves managed by Environment Canterbury on the Waimakariri River. In one example at the Sanctuary Reserve in Coutts Island (at the end of Coutts Island Road north of the Clearwater development), we had tutu, kōwhai, tī kōuka and karamu growing sparsely throughout a riparian area of around 30 ha. Targeted weeding and supplementary planting was undertaken (none of the wild species were installed, only the chosen additions). Five years on, with an emphasis on seedling retention, the plantings are well established and nearing canopy closure with wild karamu and tutu throughout. Interestingly, the wild seedlings are growing twice as quickly in height as the installed propagates of comparable type. There are also berm transition sites outside of these infested "terrestrial/riparian planting" style sites. Notable examples are some of our foothills sites, e.g. on the Waihi, Opihi or Orari rivers, where our only action is extensive targeted weeding. These sites already receive a high degree of ambient native seedling recruitment with patchy mixed-aged, sub-canopy communities already present (Fig. 2).

Figure 2. Wild recruitment at the sanctuary with **left,** karamu and *Pterostylis* orchids; **right,** māhoe and *Pteridium* species.

At Kaikōura in the braided river kānuka forests of the Kowhai, Luke Creek, Waimangarara and Oaro rivers, we are undertaking extensive control of old man's beard, ivy, hawthorn, barberry and many other species. Lastly, in the dryland habitats of the mid-plain we are working with ecologists from multiple agencies to define works and control weed species encroaching the low stature moss fields and dryland communities that are host to many remnant and threatened species (Fig. 3).

Figure 3. *Muehlenbeckia axillaris* and *Raoulia australis* on the Hurunui River.

Outlook

Berm transition has given us the opportunity to begin the process of managing satellite native remnants in the lower reaches and to establish new habitat patches that will benefit both riparian areas and our flood protection plantings. It incorporates wider strategies including the Ngāi Tahu philosophy of environmental and resource management, Ki Uta Ki Tai (from the mountains to the sea) [6] and the functional corridor concept. It will allow us to turn areas of marginal remnant value into areas of focused management that should quickly become future seed sources and circuit breakers in our infestation problem.

The risk of flooding and its associated damage is an ever-present part of working within the stopbanks. While floodwaters can be destructive and disruptive, they will rarely destroy an entire asset, instead carving fresh lines and channels, often increasing habitat patchiness; dismantling the straight lines and naturalizing the clumsy blocks. We are confident that with their history of responding to the disturbance of flooding, our native plant

assemblages will be able to continue to grow successfully in the managed berm lands of our rivers.

Similarly, society can pose risks to plantings through direct damage, waste dumping, and fires impacting riverine areas across the region on a regular basis. Ultimately the benefits will always outweigh the risks. Successful and visible native plantings in berm-lands can serve as visual education opportunities for communities, displaying what a functional native community can look like alongside the status quo. Furthermore, it can re-emphasize the values we still have further inland, and passively advocate for their ongoing protection. Being able to communicate the cost of re-establishing a stand of this type and then compare that to the cost of protecting an unprotected patch of habitat upstream is a very useful conversation tool as most communities will emphasize the value that they can immediately see ahead of those unseen.

We're hoping to take a large first step towards a stable, diverse berm land with our project and I look forward to being able to share what we achieve, with the hope that it will be significant.

For those interested in knowing more, keep an eye on our Regionwide River Berm Transition webpage [2]. The project sites are mapped and works are underway. You should also start to see an influx of iNaturalist records at our locations as our contractors detail their observed assemblages. Beyond our funding there will still be opportunities for us to continue this work and its ongoing upkeep, albeit at a smaller scale.

We appreciate the opportunity to share this work with you all and wish you the all the best as you botanize. Āku mihi nui.

Links to further reading

[1] Waitaha Canterbury's braided rivers. https://www.ecan.govt.nz/your-region/your-environment/our-natural-environment/our-regions-biodiversity/braided-rivers/

[2] Regionwide planting and berm transition. https://www.ecan.govt.nz/your-region/your-environment/river-and-drain-management/climate-resilience-and-flood-protection-funding/regionwide-planting-and-berm-transition/

[3] River and drain management. https://www.ecan.govt.nz/your-region/your-environment/river-and-drain-management/

[4] Climate resilience and flood protection. https://www.ecan.govt.nz/your-region/your-environment/river-and-drain-management/climate-resilience-and-flood-protection-funding/

[5] Resilient rivers. https://www.ecan.govt.nz/your-region/your-environment/river-and-drain-management/climate-resilience-and-flood-protection-funding/

[6] Ki Uta Ki Tai (from the mountains to the sea). https://tewaihora.org/ki-uta-ki-tai/

A tī kōuka among *Muehlenbeckia australis* and blackberry on the Orari.