

Te Horo Gravel Beach

Interim Pest Plant Control and Restoration Strategy



Muelhenbeckia complexa holding coastal gravels



Coprosma acerosa growing behind native spinach in the driftwood belts of the beach gravels

Location and Background: The Te Horo Gravel Beach (THGB) includes the Mangaone river mouth and lies between the Ōtaki Estuary to the north and to the southern extent of the Te Horo Beach settlement. The 35 hectare THGB is on local council reserve land hash the ocean as the western boundary and private properties to the east. The THGB is part of a wider Greater Wellington Regional Council (GWRC) Key native Ecosystem (KNE) called Ōtaki Coast which includes the gravel dunes to the north of the Ōtaki River, and the Ōtaki Estuary with the associated Katihuku and Rangiuru wetlands.



Otaki Coast Key Native Ecosystem, Te Horo section



Scope and Aims: This document provides a strategy and work programme to restore the native vegetation communities to the Te Horo Gravel Beach. The focus of work will be to replace the exotic plant dominance with native plants, and to restore the natural native cover. This will be done by planning and implementing the removal of pest plants, thereby encouraging the regeneration of native species, and by restorative plantings of appropriate native species. This document will form part of the larger plan for the wider Ōtaki Coast KNE, which will be prepared in the 2013/14 year.

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Ecological significance: The THGB is sited within the Foxton Ecological District and sit amongst the dunelands of the Kapiti District at large. Gravel dune systems are rare north of the Cook Strait Ecological District in the North Island and are a nationally endangered rare ecosystem type. They are predominantly formed on rocky coasts where eroded material is pounded, rounded and deposited on land to form beaches. The THGB system differs in that it obtains its material from the dynamic and fast-flowing Ōtaki River. The steep Tararua catchment, multiple high rainfall events and short travel time to the ocean provides Ōtaki River with the energy to bring pebbles, stones and cobbles, along with large woody debris through the Ōtaki River system to be deposited on the beaches of Te Horo and Ōtaki.

The mix of large driftwood and gravels at the Te Horo Gravel Beach (THGB) along with several dense ground hugging native climbers provides important refugia for native invertebrates and lizards as well as substrate types that provide for a special assemblage of native plant species.

State of the Te Horo Gravel Dunes. The dynamic interaction of the stream/ river and ocean has been modified by human activity through stream straightening in the Mangaone Stream and stop-banking of the Ōtaki River. Past fires, and animal and plant pests have had a large detrimental impact on the native flora at THGB and still pose ongoing threats to the ecosystem.

Although several rare and threatened plant species are hanging on in the THGB the area has become significantly invaded and is now dominated by exotic invasive plant species.

Continuing Threats to Ecological Integrity of the THGB:

The impacts of environmental weeds and animal pests in natural ecosystems are well known and documented in New Zealand. These pests threaten the ecological structure, composition and processes that underpin and support local and regional biodiversity.

Pest Plants: The combined impacts of non-endemic plant species are devastating for the local ecology. The high light environment of the coastal environment and the ready ability of invasive plant spread along the dunelands make it ideal for weed establishment and weed expansion. Exotic climbers and creepers eg blackberry (*Rubus fruticosus agg.*) suffocate and strangle native trees degrading the canopy structure of native plant associations. This can lead to canopy collapse and creation of more light gaps further facilitating opportunities for future weed invasion. Woody weeds by comparison eg gorse (*Ulex europaeus*) and karo (*Pittosporum crassifolium*) have the ability to muscle and shoulder into areas, displacing the components and ultimately the structure of native plant communities. Smothering groundcover weed species such as iceplant (*Carpobretus edulis*) and gazania (*Gazania sp.*) arrest the ecological processes of seedling establishment and seedling recruitment preventing the natural regenerating of native plant communities.

... **Pest Animals:** Cats, rodents and mustelids (stoats, ferrets and weasels) predate on native bird species and also have an adverse impact on native invertebrates and lizards. Hedgehogs eat massive numbers of native invertebrates. Hares and rabbits can eliminate palatable plant species, and they undermine young native plantings naturally occurring, and in restorative plantings. Although not prime habitat at THGB possums destroy native forest through browsing and have an impact on the fledgling success of native bird species. A recent Animal Health Board programme has seen possum control being undertaken across the Te Horo plain.

Other impacts: Although not within the scope of this document the following issues will need to be considered in the course of restorative actions to ensure success of ecological restoration. They will be addressed in the upcoming KNE plan.

Tides and saline influence: the extent and degree of erosion of the beach especially when global warming and associated storm surge is considered. Without the protection of Kapiti Island from the

predominant north-westerlies the dunes are subject to ferocious winds that may blow continuously for days. This has a big impact on native vegetation and seedling establishment as well as to potential restoration plantings.

Cultural Factors: Local Hapu are keen to be management partners in the wider KNE and have strong connections to the land and water across the Ōtaki Coast. Three community groups are active in the KNE area; the Ōtaki Friends of the River and Rangiuru by the Sea are involved in restoration activities to the north, and the Mangaone Care Group restore the riparian zone around the Mangaone Stream.

The THGB lies adjacent and to the north of the Te Horo Beach township and is a large part of recreation for locals. Activities range from cycling, dog walking, and exercise to recreational fishing. The impacts of these activities need to be balanced with ecological restoration in an inclusive and sensitive way. In addition there are many properties directly adjoining the public parts of the Corridor. These may provide reservoirs of invasive pest plants and animals. Key human impact issues include:

- ... **Garden dumping:** the prevalence and extent of these practices need to be addressed and infringing people need to be informed and persuaded to desist before enforcement is taken.
- ... **Rubbish dumping:** this comes from those living outside the community and is a regular occurrence on the northern parts of the THGB. This needs attention.
- ... **Encroachment and eco-vandalism:** the prevalence and extent of these practices need to be addressed and infringing landowners informed. The planting of exotic and/ or non-eco-sourced species within the THGB system is not compatible with ecological restoration and reduce the ecological integrity of the area.
- ... **Vehicle access:** vehicular access is by mainly 4WD but is not exclusive to access tracks. Native plant communities are sensitive to the impact of vehicles especially on the gravel dunes. In consultation with the community this may need to be addressed in the long term.
- ... **Fire:** large belts of driftwood provide plenty of combustible material. In the past irresponsible people have caused much damage to surrounding vegetation.

Restoration strategy

The strategy will treat the THGB as one restoration site. The focus will be on implementing staged broad scale weed control. Restoration planting will be undertaken where there are suitable opportunities and there is community support, keeping in mind sound ecological principles and goals. If an area of particular focus is identified (e.g. Mangaone estuary) a site specific restoration plan may be required.

Restoration opportunities will be generally sited within the following parameters which define the flow of labour and resources such as:

1. Community aspirations may drive restoration in particular areas. Gateways and entrance ways to the dunes may be earmarked for future plantings. It is important that a degree of flexibility is maintained to deal with this type of contingency. Of importance however, is that should a new site be designated then adequate resources to perform best practice for site preparation and maintenance should be secured prior to commencement of work.
2. Building on current pest plant control and restorative efforts: Over the last 10 years invasive plants of high impact including Boneseed (*Chrysanthemoides molinifera*) and Evergreen buckthorn (*Rhamnus alaternus*) have been controlled across THGB as part of Greater Wellington's Regional Pest Management Strategy. In spring 2010 initial weed control efforts targeted environmental weeds south of the Mangaone. In the spring of 2011 follow up occurred for 1km north of the Mangaone. Species targeted included boxthorn (*Lycium ferocissimum*), pampas (*Cortaderia selloana/ jubata*), gorse and iceplant. In late 2012 mid 2013 large areas of gorse in the THGB were sprayed north of the Sims Rd access.
3. Corrections Department: rubbish removal has occurred both north and south of the Mangaone Stream and will be done periodically by the Corrections Department.

Te Horo Gravel Beach Pest Plant Five Year Strategy

This general strategy is a guideline only. Budget availability may determine the amount of and level of priority of pest plant control undertaken in any given season. Other inputs such as local residents assistance or Corrections Department labour may be able to augment weed control efforts and accelerate the programme. The key is to prioritise control of pest plants which have the greatest ecological impact in the gravel beach system.

	Year 1	Year 2	Year 3	Year 4	Year 5
Priority 1	Gorse, Blackberry, Japanese honeysuckle, Boxthorn, boneseed, evergreen buckthorn, iceplant on gravel ridge	Gorse, Follow up on Blackberry, Japanese honeysuckle, Boxthorn, boneseed, evergreen buckthorn, Start karo control.	Complete gorse and iceplant. Blackberry, Japanese honeysuckle, everlasting pea, climbing dock. Continue karo	Gorse, iceplant and all climbers; Blackberry, Japanese honeysuckle, everlasting pea, climbing dock. Continue karo	Gorse, iceplant and all climbers; Blackberry, Japanese honeysuckle, everlasting pea, climbing dock. Finish karo
Priority 2	Agapanthus, periwinkle, Spiked rush, outlying karo Kikuyu & marram grass	Agapanthus, periwinkle, everlasting pea, climbing dock. Spiked rush, Kikuyu & Marram grass	Agapanthus, periwinkle Spiked rush, Kikuyu & Marram grass rollback. Gazanias	Complete woody weed sweep of reserve (except bulk karo area). Marram, kikuyu rollback, high impact groundcovers	Complete woody weed sweep of reserve. Finish marram, kikuyu, high impact groundcovers
Priority 3	Everlasting pea, pig's ear wild turnip, gazania, climbing dock	Everlasting pea, wild turnip, pig's ear, gazania, climbing dock	Complete woody weed sweep of reserve (except bulk karo area)	Low ranked ecological weeds	Low ranked ecological weeds
Priority 4	Acacias, correa, pine, lupin, banksia	Acacias, correa, pine, lupin, banksia	Low ranked ecological weeds		

All species targeted are known environmental weeds that are causing significant impacts in this special ecosystem.

Pest Plant Control Checklist:

- ... Identify, map and release spray around any natural associations of rare or threatened native plant communities . f
- ... Prioritise weeds of highest impact (see appendix i) f
- ... Consider type of chemical/s that will kill the range of plants on site. *Ref.* Agrichem manual. f
- ... Consider seasonality of plants and efficacy of chemicals in colder temperatures f
- ... Consider current climatic events and effects on target plants e.g. salt loading, drought, f
- ... Consider installation of permanent monitoring fixtures and photo points. f

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Restoration Planting Strategy

Over the time span of the pest plant control work, native species will be planted to replace weed species ensuring that appropriate native plant communities will develop. In this exposed and harsh environment it is critical that the correct species are used and that restoration is well planned and staged.

Table 1: List of appropriate native species for Te Horo Gravel Beach

Tauhinu – <i>Ozothamnus leptophyllus</i> ‘Cottonwood’*	Koromiko – <i>Hebe stricta</i> var. <i>stricta</i>
Toe toe - <i>Austroderia fulvida</i> (NB: not <i>Austroderia toe toe</i>)	Mingimingi – <i>Coprosma rhamnoides</i> *
Pātītī – <i>Poa cita</i> ‘Silver tussock’	Mapou - <i>Myrsine australis</i> **
Wiwi – <i>Ficinia nodosa</i> ‘Knobby club rush’	Akeake - <i>Dodonaea viscosa</i> (green only)**
Harakeke – <i>Phormium tenax</i> ‘swamp flax’	Akakura – <i>Olearia solandri</i> ‘Coastal tree daisy’*
Tatarakeke - <i>Coprosma acerosa</i> (sprawling ground cover)	Akiraho – <i>Olearia paniculata</i> **
Taupata - <i>Coprosma repens</i> ‘mirror plant’	Manuka – <i>Leptospermum scoparium</i> **
Mingimingi – <i>Coprosma propinqua</i> *	Kanuka – <i>Kunzea ericoides</i> **
Ti kouka - <i>Cordyline australis</i> ‘cabbage tree’*	Whauwhaupaku – <i>Pseudopanax arboreus</i> ‘five finger’**
Ngaio - <i>Myoporum laetum</i> *	Mahoe - <i>Meliccytus ramiflorus</i> ‘whiteywood’**

The species marked with an asterisk * require varying amounts of initial shelter, but will slowly adapt to higher levels of exposure provided they are planted skilfully. Two asterisks ** means more shelter required. It is natural for plants growing in harsh conditions to assume prostrate, wind-shorn and stunted forms; particularly if they are growing on the ‘front line’. Wiwi provides excellent low shelter, and Harakeke provides the best tall shelter (up to 2.5m, depending on the type). Shrub species will form dense, mutually sheltering stands, with the hardiest species growing up first to provide suitable habitats for softer plants.



Six-year-old restoration planting in high exposure at Mangaone estuary, Te Horo, showing wind-shorn association of

manuka, taupata, *Hebe stricta* and *Olearia solandri* with emergent Ti kouka (cabbage trees).

There is no pristine coastal forest in Kāpiti, but areas of similar exposure to the Te Horo gravel dunes that have regenerated or that have been successfully restored during the last 15 years, such as in Queen Elizabeth Park, demonstrate the sort of early succession native plant communities that could be restored at Te Horo. There is clear evidence in Queen Elizabeth Park of tall kanuka forest

in the back dunes within 100m of the high tide mark. If this forest had not been lost to fire during the 1960's, a diverse broadleaf forest would be regenerating beneath it.



Two kanuka that survived a fire at the north end of Queen Elizabeth Park show the height of the regenerating forest in the 1960's. The seaward kanuka is providing shelter from the prevailing salt-laden wind to the one on the left.



Restored and naturally regenerating native vegetation within 100m of the high tide line in Queen Elizabeth Park.

Mahoe, taupata, whauwhaupaku (five-finger), kanuka, akiraho and toe toe thrive behind sheltering harakeke (swamp flax).

Plants purchased from nurseries have led a spoiled life in ideal growing conditions. They are nearly always soft and vulnerable to harsh conditions until they have ‘hardened off’ and adapted to the real world. This can take up to two years. If you have a green thumb, try growing your own plants from seed collected from naturally occurring local plants that are succeeding in the environment you intend them for, and start the hardening off process from the time they are small by gradually increasing the amount of exposure.

It is important that these existing planted sites be earmarked for weed clearance and maintenance before embarking on new plantings. It is imperative that all existing revegetation and restoration sites have capacity for weed maintenance before embarking on new restoration sites. Being unable to maintain existing and future plantings for exotic weeds leads to plant failures, increased maintenance requirements and can dispirit community groups. Best practice guidelines should be adopted for site preparation and maintenance.

Planting guidelines checklist

- ... Use hardy, early successional plant species for rapid establishment (appendix 2). f
- ... Consider rabbit/hare browsing and plant protection for palatable species. f
- ... Consider the use of mulch and/ or the use of slow release fertiliser. f
- ... Consider plant and bag size (root trainer versus PB3 etc). f
- ... Consider trimming leggy plants one month before planting. f
- ... Consider local wind effects and planting behind shelter. f
- ... Consider hardening off plants prior to planting. This is critical. f
- ... Consider time of year to plant and if possible plant early (May). f
- ... Consider plant spacings (0.8 to 1m). f
- ... Keep records of plant numbers and species. f
- ... Consider micro-site conditions such as: exposure, soils and substrate. f
- ... If site preparation is compromised consider species that will compliment chemical used in spray release e.g. haloxyfop on grasses amongst broadleaf plantings or triclopyr on broadleaf weeds amongst native grass plantings f
- ... In time consider introducing rare and threatened species (contact GWRC or KCDC Biodiversity Departments). f
- ... Create a list of eco-sourced species that are suitable for the site and ensure that Greater Wellington's and Kāpiti Coast District Council's eco- sourcing policies are adopted and adhered to. f

Appendix i: Te Horo Gravel Beach: Pest plant species list.

Common name	Scientific name	Distribution	Ecological Impact
Acacia	<i>Acacia sophora</i>	Few sites	Moderate
Agapanthus	<i>Agapanthus praecox</i>	Widespraed but sparse	High
Arctotis	<i>Arctotis stoechadifolia</i>	Localised and abundant	Low
Artemesia	<i>Artemesia s.</i>	Few sites	Medium
Banksia	<i>Banksia integrifolia</i>	Few sites	High
Blackberry	<i>Rubus fruticosus</i>	Localised and abundant	Very High
Boneseed	<i>Chrysanthemoides monilifera</i>	Few sites	Very High
Boxthorn	<i>Lycium ferocissimum</i>	Localised and abundant	Very High
Broomrape	<i>Orobranche</i>	Widespread but sparse	Low
Canadian fleabane	<i>Conzya canadiensis</i>	Localised and abundant	low
Century plant	<i>Agavesp</i>	Few sites	Low
Cleavers	<i>Gallium aparine</i>	Localised and sparse	Low
Climbing dock	<i>Rumex sagittatus</i>	Widespread but sparse	Medium
Correa	<i>Correa alba</i>	Few sites	Medium
Evergreen Buckthorn	<i>Rhamnus alaternus</i>	Few sites	Very High
Everlasting pea	<i>Lathyrus latifolius</i>	Localised and abundant	High
Gazania	<i>Gazania rigens</i>	Widespread but sparse	Medium
German ivy	<i>Senecio mikanoides</i>	Localised and abundant	High
Goats rue	<i>Galega officinalis</i>	Localised and abundant	High
Gorse	<i>Ulex europaeus</i>	Widespread and abundant	Very High
Iceplant	<i>Carpobretus edulis</i>	Widespread and abundant	Very High
Japanese honeysuckle	<i>Lonicera japonica</i>	Few sites	Very High
Karo	<i>Pittosporum crassifolium</i>	Widespread and abundant	Very High
Kikuyu Grass	<i>Pennisetum clandestinium</i>	Localised and abundant	High

Lupin	<i>Lupinus arboreus</i>	Widespread but sparse	Medium
Macrocarpa	<i>Macrocarpa cupressus</i>	Few trees	Low
Marram grass	<i>Ammophila arenaria</i>	Widespread and abundant	High
Montbretia	<i>Crocasmia X crocosmifolia</i>	Localised and sparse	High
Montpellier broom	<i>Teline monspelliuana</i>	Localised and sparse	Medium
Nasturtium	<i>Nasturtium officinale</i>	Localised and abundant	Medium
Nightshade	<i>Solanum nigrum</i>	Widespread but sparse	Low
Onion weed	<i>Allium triquetum</i>	Localised and abundant	Medium
Pampas	<i>Cortaderia selloana/ jubata</i>	Few sites	Very high
Periwinkle	<i>Vinca major</i>	Localised and sparse	High
Pig's ear	<i>Cotyledon orbiculata</i>	Localised and abundant	High
Pine	<i>Pinus radiata</i>	Few sites	Medium
Purple groundsel	<i>Senecio elegans</i>	Widespread but sparse	Low
Quiver grass	<i>Brizamajor</i>	Widespread and abundant	Low
Sowthistle	<i>Sonchus oleraceus</i>	Widespread but sparse	Low
Spiked rush	<i>Juncus acutus</i>	Localised and sparse	High
Tall fescue	<i>Festuca arundinacea</i>	Widespread and abundant	Low
Tree lucerne	<i>Chamaecytisus palmensis</i>	Few sites	Low
Tree mallow	<i>Lavatera arborea</i>	Few sites	Low
Vetch	<i>Vicia sativa</i>	Widespread but sparse	Low
Wild turnip	<i>Brassica rapa ssp. silvestris</i>	Widespread but sparse	Medium
Yucca	<i>Yucca sp</i>	Few sites	Low

Note: The issue of non-local native weeds in the Wellington Region is strongly recognised by DoC, GWRC and KCDC as well as NGO's such as the Wellington Botanical Society and Forest and Bird. Karo for example has been controlled in more than 100 biodiversity sites by the various agencies and groups across all parts of the region.