Key Native Ecosystem Operational Plan for Ōtaki Coast

2024-2029

Contents

1. Purpose

The purpose of this five-year Key Native Ecosystem (KNE) operational plan for Ōtaki Coast KNE site is to:

- Identify the parties involved in preparing and delivering the operational plan
- Summarise the ecological values of the site and identify the threats to those values
- Outline the vision and objectives that guide management decision-making
- Describe the operational activities undertaken to improve ecological conditions (eg, ecological weed control), who will undertake the activities and the allocated budgets.

KNE operational plans are reviewed every five years to ensure the activities undertaken to protect and restore the KNE site are informed by experience and improved knowledge about the site.

This KNE operational plan is aligned to key policy documents that are outlined in Section 2.

2. Policy context

Under the Resource Management Act 1991 (RMA) [1] Regional Councils have responsibility for maintaining indigenous biodiversity, as well as protecting significant vegetation and habitats of threatened species.

Funding for the KNE programme is allocated under the Greater Wellington Long Term Plan (2021-2031)[2] and is managed in accordance with the Greater Wellington Biodiversity Strategy[3]. This sets a framework for how Greater Wellington protects and manages biodiversity in the Wellington region. Goal One of the Biodiversity Strategy - *Areas of high biodiversity value are protected or restored* - drives the delivery of the KNE programme.

Other important drivers for the KNE programme include the Natural Resources Plan[4] and the Regional Pest Management Plan 2019-2039[5].

3. The Key Native Ecosystem programme

The KNE programme is a non-regulatory programme. The programme seeks to protect some of the best examples of original (pre-human) ecosystem types in the Wellington region. Greater Wellington has identified sites with the highest biodiversity values and prioritized them for management[6].

KNE sites are managed in accordance with five-year KNE operational plans prepared by Greater Wellington's Environment Restoration team. Greater Wellington works with landowners, mana whenua and other operational delivery providers to achieve mutually beneficial goals.

KNE sites can be located on private or publicly owned land. Any work undertaken on private land as part of this programme is at the discretion of landowners and their involvement in the programme is entirely voluntary. Involvement may just mean allowing work to be undertaken on that land. Land managed by the Department of Conservation (DOC) is generally excluded from this programme.

Sites are identified as of high biodiversity value for the purposes of the KNE programme by applying the four ecological significance criteria described below.

Representativeness	**Rarity/ distinctiveness**	**Diversity**	**Ecological context**
The extent to which ecosystems and habitats represent those that were once typical in the region but are no longer commonplace	Whether ecosystems contain Threatened/At Risk species, or species at their geographic limit, or whether rare or uncommon ecosystems are present	The levels of natural ecosystem diversity present, ie, two or more original ecosystem types present	Whether the site provides important core habitat, has high species diversity, or includes an ecosystem identified as a national priority for protection

A site must be identified as ecologically significant using the above criteria and be considered "sustainable" for management to be considered for inclusion in the KNE programme. "Sustainable" for the purposes of the KNE programme is defined as: a site where the key ecological processes remain intact or continue to influence the site, and resilience of the ecosystem is likely under some realistic level of management.

4. Ōtaki Coast Key Native Ecosystem site

The Ōtaki Coast KNE site (77ha) is located on a northern stretch of the Kāpiti Coast. It contains a number of interconnected ecosystems extending along almost 5km of coastline from 250m south of the Mangaone Stream (at Te Horo Beach settlement) to 500m north of the Ōtaki River mouth Lagoon (see Appendix 1, Map 1).

The KNE site contains a dynamic and highly diverse mix of ecologically significant coastal and wetland ecosystems that are heavily influenced by the Ōtaki braided river system. These ecosystems include gravel beaches, the Ōtaki River estuary and lagoon, coastal turfs, the Katihiku freshwater wetlands, and the Mangaone Stream estuary and wetland. The KNE site supports a high concentration of indigenous fish, bird and plant species of conservation concern. The ecosystems present are shaped by frequent exposure and disturbance from ocean currents, tides and storms, and the impacts from flooding events.

The features of the Ōtaki River and estuary have been extensively modified and constrained by flood protection works that have been ongoing since the 1930s[7]. The construction of stop banks and other flood protection activities have greatly modified river processes including cutting off a large braid in the river that once flowed just north of the Katihiku Marae and past the Whakapawaewae wetland. This has reduced the dynamism of the river mouth and associated ecosystems, but important remnants of habitat remain.

The KNE site is surrounded by farmland and urban development but does provide an important connection within the wider landscape, being located within 5km of four other KNE sites: Waitohu Coast and Wetlands, Haruātai/Pareomatangi, Te Hapua Wetland Complex and Peka Peka Coast.

5. Parties involved

There are several organisations, groups and individuals that play important roles in the care of the Ōtaki Coast KNE site.

5.1. Landowners

The Ōtaki Coast KNE site has both private and public landowners:

- Greater Wellington owns a total of 26ha of the KNE site that includes the Ōtaki River and estuary, in-flow of the Rangiuru and Ngātoko streams and the river mouth lagoon. Greater Wellington's Flood Operations team manages these areas for flood protection purposes. In addition, 30ha of untitled coastal land including the mouth of the Mangaone Stream are managed by Greater Wellington
- Katihiku X Trust (who represent the Ngāti Huia ki Katihiku hapū) owns 13ha within the KNE site comprising the Whakapawaewae freshwater wetland, parts of the Ōtaki River hapua, and gravel beaches south of the river
- Kāpiti Coast District Council (KCDC) owns 1ha of the gravel beach within the KNE site at Te Horo Beach Settlement including a wetland associated with the Mangaone Stream mouth
- A 2.5ha section of Te Horo gravel beach and stony ridge south of the Ōtaki estuary is privately owned.

Land ownership boundaries are provided in Appendix 1, Map 2.

5.2. Operational delivery

Within Greater Wellington, four teams are responsible for delivering the Ōtaki Coast KNE operational plan.

- The Environment Restoration team leads the strategic planning, funding and coordination of biodiversity management activities and advice within the KNE site
- The Pest Plants and Pest Animals teams coordinate and implement ecological weed and pest animal control measures at the KNE site with funding from the Environment Restoration team's KNE programme budget
- The Flood Operations team manages areas of the Ōtaki River owned by Greater Wellington including the riverbed and associated flood control structures such as stop banks and flap gates according to the Otaki Flood Management Plan[8] and Otaki River Environment Strategy[9]
- The Environmental Restoration team also provides advice to landowners on sustainable land use, soil conservation and water quality on land adjacent to the KNE site. These land use activities are aligned with the broader ecological goals of the KNE programme in general and the Ōtaki Coast KNE operational plan in particular.

KCDC funds the management of parts of the KNE site as an Ecological Site of Significance (K231 Mangone Stream Mouth North) in accordance with the Kāpiti Coast District Plan[10].

The Katihiku X Trust manages the Katihiku wetlands in accordance with the recommendations outlined in the Restoration Plan for Katihiku[11].

The Friends of the Ōtaki River (FOTOR) is an incorporated community group which play an important role in representing the community in the management and development of the Ōtaki River and its environment. They operate a native plant nursery at the Ōtaki Flood Operations depot and have planted large areas of the northern riverbank as well as parts of the northern estuary within the KNE site.

Predator Free Te Horo is a recently formed community group aimed at reducing predator numbers in Te Horo township. They also intend to play a key role in servicing the trap and bait station network installed within the KNE site between the township and the Otaki River in 2024.

Greater Wellington supports these groups in the progression of their current projects as well as the development of appropriate new initiatives that the groups may propose.

5.3. Mana whenua partners

The Ōtaki Coast KNE site area is significant to Ngā Hapū o Ōtaki, who are mana whenua partners with Greater Wellington.

The area has been identified under the Natural Resources Plan for the Wellington Region (NRP)[12] as culturally important with particular reference to freshwater/wai and sea water/wai tai, recognising that these are areas where mana whenua lived and practiced māhinga kai, tauranga waka, kainga and wāhi tapu (see table 1).

Greater Wellington is committed to identifying ways in which kaitiakitanga can be strengthened by exploring opportunities for mana whenua partners to participate in the development and delivery of KNE operational plans both in relation to land owned by the Katihiku X trust as well as the rest of the KNE site.

Table 1: Mana whenua sites of significance in Ōtaki Coast KNE site[13]

Sites of significance	Mana whenua values
Te Awa o Ōtaki (Ōtaki River): Schedule B – Ngā Taonga Nui a Kiwa	ngā Mahi a ngā Tūpuna, Te Mahi Kai, Wāhi Whakarite, Te Mana o te Tangata, Te Manawaroa o te Wai, Te Mana o te Wai
Ōtaki Pā (Ferry reserve): Schedule C1	wāhi tūpuna, pā, mahinga kai, urupā, tohu ahurea, ara waka, kauhoe, wai ora, wai tai, wāhi whakawātea, wāhi whakarite
Ōtaki River – SH1 road bridge to river mouth: Schedule C1	urupā, wai ora, wai tai, papa kāinga, mahinga kai, puna raranga, puna rangoā, ara waka, tohu ahurea, kauhoe, kaukau, ngā mahi pārekareka i/ke te wai

Mangahānene Stream – Mangahānene: Schedule C1	mahinga kai, wai ora, ara waka, papa kāinga, puna raranga, puna rongoā, pā, tohu ahurea, kauhoe, wāhi whakawātea, wāhi whakarite
Rangiuru Stream – Pākākutu: Schedule C1	mahinga kai, ara waka, papa kāinga, puna raranga, pā, kauhoe, wai ora, tohu ahurea, wāhi whakawātea, wāhi whakarite
Ngātoko Stream – spring to Rangiuru junction: Schedule C1	waiora, papa kāinga, mahinga kai, ara waka, puna raranga, puna rongoā, wāhi whakawātea, wāhi whakarite

5.4. Stakeholders

DOC is not currently actively involved in site management. However, a large part of the KNE site, the Ōtaki River mouth, is recognised by DOC as a Designated Ecological Site (#98) for which protection could be investigated for protection as a wildlife reserve[14].

6. Ecological values

This section describes the various ecological components and attributes that make the KNE site important. These factors determine the site's value at a regional scale and how managing it contributes to the maintenance of regional biodiversity.

6.1. Ecological designations

Table 2, below, lists ecological designations at all or part of the Ōtaki Coast KNE site.

Table 2: Designations at the Ōtaki Coast KNE site

Designation level	Type of designation
National	Parts of the Ōtaki Coast KNE site have been identified by DOC as a Designated Ecological Site. • 98: Ōtaki River mouth (56.02 ha)
Regional	Parts of the Ōtaki Coast KNE site are scheduled under the Natural Resources Plan (NRP)[15] as Ecosystems and Habitats with Significant Indigenous Biodiversity Values: • River with Significant Indigenous Ecosystems – high macroinvertebrate community health: The Ōtaki River and all tributaries (Schedule F1) • River with significant indigenous ecosystems - Habitat for indigenous fish species of conservation interest: The Ōtaki River and all tributaries and, the Mangaone Stream and all tributaries (Schedule F1) • River with significant indigenous ecosystems - Habitat for 6 or more migratory indigenous fish species: The Ōtaki River and all tributaries and, Mangaone Stream and all tributaries (Schedule F1) • Known river and parts of the coastal marine area with īnanga spawning habitat: Ōtaki River, the Mangahānene Stream, and the Mangaone Stream (Schedule F1b) • Habitats for indigenous birds in rivers: Ōtaki River from downstream end of gorge to coastal marine area boundary (Schedule F2a) • Habitats for indigenous birds in the coastal marine area: Ōtaki River mouth - from CMA boundary to MHWS (Schedule F2c) • Significant Natural Wetland: Ōtaki River Mouth South and, Ōtaki River Mouth Lagoon & Rangiuru Wetland (Schedule F3) • Sites with significant indigenous biodiversity values in the coastal marine area: Ōtaki River mouth/Estuary (Schedule F4)
District	Parts of the Ōtaki Coast KNE have been identified by KCDC as Ecological Sites of Significance they are listed in the KCDC District Plan Heritage Register[16] as: • K027: Ōtaki River mouth (69.03 ha) • K231: Te Horo gravel beach (13.35 ha)

Other (non-ecological designations of relevance)	Parts of the Ōtaki Coast KNE site are scheduled under the Natural Resources Plan (NRP) as: • Contact recreation and Māori use: Regionally significant primary contact recreation rivers and lakes: Ōtaki River (Schedule H) • A significant geological feature in the coastal marine area: The Ōtaki River Mouth Hapua/Lagoon (Schedule J) • Community Drinking Water Surface Abstraction: Ōtaki River (Schedule M1)

6.2. Ecological significance

The Ōtaki Coast KNE site is considered to be of regional importance because:

- It contains highly **representative** ecosystems that were once more common in the region
- It contains ecological features that are **rare or distinctive** in the region, including several naturally uncommon ecosystems
- It contains high levels of ecosystem **diversity**, with several ecosystem types represented
- Its **ecological context** is valuable at the landscape scale as it contains a variety of inter-connected habitats which act as an ecological corridor and provide important core and seasonal habitats for threatened indigenous shorebird, fish, lizard and invertebrate species.

Representativeness

The Threatened Environment Classification system defines ecosystem and habitat threat categories nationally, based on percentage of indigenous cover remaining[17]. This system indicates that most of the KNE site is classified as Chronically Threatened because there is only 10-20% native vegetation remaining on these types of land in New Zealand. A smaller portion of the site, comprising mostly wetland areas, is considered Acutely Threatened with less than 10% indigenous cover remaining and the habitat under-protected on a national scale[18].

Wetlands are now considered an uncommon habitat type in the Wellington Region with approximately 2.3% of their original extent remaining[19]. The Ōtaki River Mouth South Wetland (Katihiku wetlands) and the Ōtaki River Mouth Lagoon Wetland, located within the Ōtaki Coast KNE site, are some of the few remnants of once widespread wetlands on the Kāpiti Coast[20].

Rarity/distinctiveness

The NRP identifies the Ōtaki coastline as having nationally significant geological features in the marine coastal area[21]. The Ōtaki River mouth is one of the few examples of a fluvially dominated, river mouth lagoon and barrier spit system in the North Island known as a hapua[22]. These non-estuarine systems are globally rare but are locally more common in New Zealand, particularly on the west coast of the South Island[23]. Hapua are different from more conventional river mouth estuaries in that they are unique to braided gravel rivers and coarse sediment coasts. These

distinct landform features are also characterised by the absence of saltwater flushing with the tides and instead the flow is dominated by outward flowing freshwater[24]. Hapua also have significant ecological and cultural value in that they provide key links for migrating fish, mahinga kai (traditional Māori food and resources) and are often associated with ecologically significant wetlands[25].

Several naturally uncommon ecosystem types[26,27] are present within the KNE site. These include coastal turfs classified as critically endangered; shingle beaches, coastal lagoons, stony beach ridges and braided river systems classified as endangered; and estuaries classified as vulnerable.

New Zealand's National Threat Classification System[28] recognises four plant, nine bird and seven fish species as Nationally Threatened or At Risk which are found within the KNE site. Nationally threatened species are listed in Appendix 2 and regionally threatened species are listed in Appendix 3.

Diversity

The KNE site contains several ecosystem types, ranging from the hapua, gravel beaches, raised stony ridges, estuarine habitat, freshwater wetlands and regenerating coastal forest. These varied ecosystem types and transitional ecotones provide a range of habitats to support a high diversity of flora and fauna.

The Singers and Rogers[29] classification of pre-human forest vegetation indicates the KNE site would have comprised several ecosystem types: hard tussock, scabweed gravelfield/stonefield (BR1) around the lower reaches and surrounding gravel banks of the Ōtaki River; spinifex, pīngao grassland/sedgeland (DN2) along the gravel beaches; oioi, knobby clubrush sedgeland (DN5) around the wider Ōtaki River mouth margins; swamp mosaic of flaxland (WL18), raupō reedland (WL19), and coprosma, twiggy tree daisy scrub (WL20) prominent around wetland areas. River margins were fringed by tōtara, mataī, ribbonwood forest (WF2) grading into pukatea, kahikatea forest (WF8).

This mosaic of vegetation types is now heavily modified due to clearance, drainage, fire, and flood management. Despite this modification parts of the KNE site are still broadly representative of some of these original ecosystem types, albeit in a regenerating form.

Ecological context

The KNE site is considered an important seasonal breeding site for wetland and shorebirds[30]. The Ōtaki River and Mangaone Stream mouths are important habitat for migrating and spawning native fish, including several threatened species such as piharau/lamprey (*Geotria australis*).

The KNE site is located within 3km of four other KNE sites: Peka Peka Coast, Te Hapua Wetland Complex, Waitohu Coast and Haruātai/Pareomatangi. Together these KNE sites form an important network of habitat linkages within the wider ecological landscape, enabling coastal, wetland and forest birds to forage, breed and disperse locally.

The site also forms part of the Ōtaki river corridor linking the coast with the Tararua mountain range through an otherwise agricultural and semi-urban landscape.

6.3. Ecological features

The Ōtaki Coast KNE site is located in Foxton Ecological District[31], which is characterised by Holocene sand-dune country. The climate is warm with westerly to north-westerly winds prevailing with frequent gales and an annual rainfall ranging between 800-1,000mm.

The operational areas of Ōtaki Coast KNE (see Appendix 1, Map 4) largely correspond to different ecosystem types identified within the site. The power of the Ōtaki River is the driving force creating these ecosystems while exposure to harsh coastal elements such as salt spray further shapes the habitats leading to distinct plant and animal communities across the site. While all of these ecosystems have been modified, resulting in a reduction of native species diversity to varying degrees, significant aspects of the former species assemblages remain.

Flora

North Lagoon - Operational area A

The lagoon is fringed mainly by *Isolepis prolifera and Schoenoplectus pungens* grading into *Carex geminata,* harakeke (*Phormium tenax*), toetoe (*Austroderia toetoe*), umbrella sedge (*Cyperus ustulatus*), *Gahnia setifolia*, and tī kōuka (*Cordyline australis*). On elevated areas taupata (*Coprosma repens*) is common along with plantings of mainly ngaio (*Myoporum laetum*). A large patch of raupō (*Typha orientalis*) dominates the central part of the wetland adjacent to a small tributary stream which feeds into the lagoon[32]. Tall fescue (*Lolium arundinaceum*) is the most abundant exotic species forming thick swards throughout the lagoon margin.

Whakapawaewae Wetland - Operational area B

The Whakapawaewae wetland is an ecologically important remnant of a once much more extensive series of wetlands which stretched across the coastal plain between the Ōtaki and Waikanae Rivers[33]. The native vegetation is mainly composed of harakeke, toetoe and tī kōuka with a thick understory of rautahi (*Carex geminata* and *Carex lessoniana*)[34] interspersed with introduced tall fescue (*Lolium arundinaceum*). Karamū (*Coprosma robusta*) and mingimingi (*Coprosma propinqua*) are scattered throughout the wetland and isolated patches of baumea (*Machaerina rubiginosa*), kutakuta (*Eleocharis sphacelata*), swamp fern (*Thelypteris confluens*), and tangle fern (*Gleichenia dicarpa*) are also present. The wetland margins contain occasional tussocks of fan-flowered rush (*Juncus sarophorus*) and soft rush (*Juncus effusus*) rushland[35].

Operational area B also includes the flap gate wetland[36] near the confluence of the Pahiko and Katihuku drains. Although heavily modified this riverine wetland provides an important area into which the whakapawaewae could be expanded, restoring a hydrological connection between the whakapawaewae wetland remnant and the Ōtaki River. The margins of this wetland are dominated by floating mats of *Isolepis prolifera* and kutakuta along with the invasive water celery (*Helosciadium nodiflorum*).

Ōtaki Braided River Corridor (Operational area C)

The lower reaches of the Ōtaki River is a fast-flowing, gravel braided system, limiting possibilities for tidal flats to form. Vegetation communities within the corridor are opportunistic due to the frequent overflow of the river and movement of the gravel beds. No revegetation and little weed control occurs in this area, but it does provide important feeding grounds for waterfowl.

South Bank (Operational area D)

The south bank of the river is a more dynamic environment than the northern lagoon due to more frequent changes to the river course in this direction. It contains small but highly significant areas of tidal flats including populations of the threatened species sea sedge (*Carex litorosa*) and quillwort (*Isoetes kirkii*). Other species include bachelors' button (*Cotula coronipifolia*), shore primrose (*Samolus repens*), remuremu (*Selliera radicans*), *Leptinella dioica,* slender clubrush (*Isolepis cernua*), ōioi (*Apodasmia similis*) and mudwort (*Limosella australis*). Closer to the flap-gate, where the freshwater influence is stronger sharp spike sedge (*Eleocharis acuta*), *Isolepis prolifera,* kuawa (*Schoenoplectus tabernaemontani*), and raupō become common.

This operational area also contains a large stable gravel flat which has been infested by pampas grass (*Cortaderia spp.*), gorse (Ulex europaeus), crack willow (*Salix fragilis x S. euxina*), and brush wattle (*Paraserianthes lophantha*), amongst many other weeds. Some native species have also colonised the area such as māhoe (*Melicytus ramiflorus*), karamū, tutu (*Coriaria arborea*), *Haloragus erecta,* mamaku (*Cyathea dealbata*) and whekī (*Dicksonia squarrosa*). Some areas of flat closer to the river contain large patches of sand sedge (*Carex pumila*).

Gravel beach (Operational area E)

The gravel beach between the Ōtaki River and Te Horo township is a much different dune system to the sand dunes found in other parts of the Kapiti Coast. Wave action has created a pronounced strand zone of driftwood debris, behind a low gravel bank, largely devoid of vegetation. On the edge of this strand zone sand wind grass (*Lachnagrostis billardierei*), sand sedge, pōhuehue (*Muehlenbeckia complexa*), kōkihi /beach spinach (*Tetragonia implexicoma*) and rauparaha/shore convolvulus (*Calystegia soldanella*) are common with scattered areas of the regionally rare tātaraheke/sand coprosma (*Coprosma* acerosa) also present. Harakeke, taupata (*Coprosma repens*) and clubrush/wīwī (*Ficinia nodosa*) are the most common native species throughout the rest of the coastal strip. Due to past vegetation clearance many of the species that would likely have been common in this area are missing, limiting the natural regeneration potential of the site. Instead weed species are filling much of the gaps with marram (*Calamagrostis arenaria*), gorse, ice plant (*Carpobrotus edulis*), boxthorn (*Lycium ferocissimum*), pampas, and karo (*Pittosporum crassifolium*) common throughout.

Mangaone Stream, estuary and wetland (Operational area F)

The Mangaone Stream mouth has been highly modified with the mouth diverted in the 1950's, the banks channelised, and the estuary margins drained for pasture[37]. Small but surprisingly intact remnants of estuary wetland are found either side of

the stream mouth. Unfortunately, due to frequent flood management cuts to the stream mouth these wetlands are now permanently separated from the steam. The remnants contain ōioi and sea rush (*Juncus kraussii var. australiensis*) with patches of harakeke, giant umbrella sedge, *taupata* and toetoe also present[38]. The banks of the stream are dominated by floating sweet grass (*Glyceria maxima*).

Fauna

Birds

The KNE site provides significant habitat for a range of native bird species, with the Ōtaki River and estuary supporting a high diversity and abundance of native riverbed nesting shorebirds. The site has been recognised as providing important habitat for the largest breeding populations of pohowera/banded dotterel (*Charadrius bicinctus*; Nationally Vulnerable) and black-fronted dotterels (*Elseyornis melanops;* Naturally Uncommon) on the west coast of the North Island south of the Manawatu River [39, 40]. These populations represent approximately 8% of the Wellington region's populations of both dotterel species which breed on the Ōtaki River each year[41]. The KNE site also supports a large poaka/pied stilt (*Himantopus leucocephalus;* Not Threatened) colony with 3% of the Wellington region's population of pied stilts breeding on the Ōtaki River each year[42].

Other threatened bird species known to be present include; tōrea pango/variable oystercatcher (*Haematopus unicolor;* Recovering), taranui/caspian tern (*Hydroprogne caspia;* Nationally Vulnerable), tarāpunga/red-billed gull (*Chroicocephalus scopulinus;* Declining), māpunga/black shag (*Phalacrocorax carbo;* Naturally Uncommon), kāruhiruhi/pied shag (*Phalacrocorax varius;* Recovering), kotuku ngutupapa/royal spoonbill (*Platalea regia;* Naturally Uncommon), ngutu pare/wrybill (*Anarhynchus frontalis;* Nationally Vulnerable), pīhoihoi/New Zealand pipit (*Anthus novaeseelandiae;* Declining), and tara/white-fronted tern (*Sterna striata;* Declining) [43,44,45,46,47].

Much of the coastline of the KNE would be expected to provide suitable habitat for kororā/little blue penguin but as yet none have been recorded.

A comprehensive list of threatened native bird species recorded within the KNE site can be found in Appendix 2.

Fish and kōura

The Ōtaki River supports a wide range of native fish species in a variety of habitats from the upper catchment to the river mouth[48]. Thirteen native fish species have been recorded in the Ōtaki River and Mangaone Stream, most of which are diadromous[49]. Nine species of fish classified as threatened have been recorded including short-jawed kōkopu (*Galaxias postvectis*; Nationally Vulnerable), piharau/lamprey (*Geotria australis*)*;* Nationally Vulnerable), giant kōkopu (*Galaxias argenteus*; Declining), tuna/longfin eel (*Anguilla dieffenbachia;* Declining), torrentfish (*Cheimarrichthys fosteri;* Declining), kōaro (*Galaxias brevipinnis;* Declining), īnanga (*Galaxias maculatus;* Declining), bluebill bully (*Gobiomorphus hubbsi;* Declining) and dwarf galaxid (*Galaxias divergens;* Declining) [50,51,52,53]. In addition, kōura/freshwater crayfish (Paranephrops planifrons; Declining) are common in the lower catchment of the Ōtaki River[54,55].

Other non-threatened native fish species known to be present within the KNE site include the shortfin eel (*Anguilla australis*), banded kōkopu (*Galaxias fasciatus*), common bully (*Gobiomorphus cotidianus*) and redfin bully (*Gobiomorphus huttoni*)[56,57.]

A comprehensive list of threatened native fish species recorded within the KNE site can be found in Appendix 2.

Reptiles

The northern grass skink (*Oligosoma polychroma,* Not Threatened) has previously been recorded at the river mouth[58,59] and was also recorded during a survey of the coastline between the river and Mangaone stream in 2023. Other species such as the ornate skink (*Oligosoma ornatum;* At Risk-Declining) and the copper skink (*Oligosoma aeneum*; Not Threatened) have also been recorded in the vicinity[60]. Additionally, the driftwood debris along the gravel beaches within the KNE are believed to provide suitable habitat for lizard species commonly found along the coast[61].

Invertebrates

Katipō (*Latrodectus katipo;* At Risk-Declining) have been found both immediately north and south of the KNE and suitable habitat for this species exists within the KNE site.

7. Threats to ecological values at the KNE site

Ecological values can be threatened by human activities, and by introduced animals and plants that change ecosystem dynamics. The key to protecting and restoring biodiversity as part of the KNE programme is to manage key threats to the ecological values at each KNE site. Appendix 4 presents a summary of all known threats to the Ōtaki Coast KNE site.

7.1. Key threats

The primary threats to the ecological values of the Ōtaki Coast KNE site are ecological weeds, pest animals, off-road recreational driving and altered hydrology.

Ecological weeds are widespread throughout the KNE site ranging from exotic climbers, ground-covering plants, exotic grasses and woody tree species. The presence of ecological weeds can affect the biodiversity values of the site by outcompeting and displacing native vegetation and affecting the structure and composition of ecosystems. This further hinders the natural regeneration of native vegetation and reduces species diversity and the availability of food resources for native animals.

Pest animals affect the estuary, wetland, and shore habitat mainly through direct predation of birds and lizards. Stoats (*Mustela erminea*), weasels (*Mustela nivalis*), ferrets (*Mustela furo*), feral and domestic cats (*Felis catus*), rats (*Rattus* spp.) and hedgehogs (*Erinaceus europaeus*) and even possums (*Trichosurus vulpecula*) can all pose a serious threat to nesting shorebirds through predation of both adults, chicks, and eggs, while uncontrolled domestic dogs can chase parents off a nest. Native lizards are also highly vulnerable to predation by introduced mammals. Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) graze native vegetation and impact regeneration, as prey they can also boost ferret and stoat numbers, exacerbating predation of native animals.

Despite being a prohibited area for vehicles under the KCDC district plan[62] vehicles continue to cause significant damage to vegetation and shorebird breeding success throughout the site. Vehicle access also increases the risk from fire, one of which in 2024 destroyed part of the remaining population of the regionally threatened sand coprosma. Continual vehicle damage has necessitated the removal of some areas from the KNE site (northern sand spit, and Te Horo coastal strip) due to their level of degradation.

Altered hydrology negatively impacts the ecology of wetlands around both the Ōtaki River and Mangaone Stream by reducing the frequency of water recharge during flooding. Examples of activities which modify flow regimes include water extraction, water diversion, installation of hard structures (eg, stop banks, culverts, piping, flood gates), and gravel extraction.

8. Vision and objectives

8.1. Vision

The Ōtaki Coast KNE site comprises functioning and interconnected coastal and wetland ecosystems dominated by healthy, regenerating native vegetation communities and supporting thriving native fauna.

8.2. Objectives

Objectives help to ensure that operational activities carried out are contributing to improvements in the ecological condition of the site.

The following objectives will guide the operational activities at the Ōtaki Coast KNE site.

1. ***Protect and enhance the coastal shore bird populations and habitat***
2. ***Protect and enhance habitat for native lizard species***
3. ***Protect and enhance the habitat for rare and threatened plant species***
4. ***Enhance the landscape regeneration potential of the KNE site***
5. ***Support the local community and Ngāti Huia ki Katihiku as kaitiaki of the KNE site***

9. Operational activities

Operational activities are targeted to work towards the objectives listed above (Section 8). The broad approach to operational activities is described briefly below, and specific actions, with budget figures attached, are set out in the operational delivery schedule in Section 11 (Table 3).

The primary management activities undertaken in the KNE site are ecological weed control, pest animal control and revegetation.

Weed control has been a main focus of management in the past but now needs to be combined more closely with revegetation to effectively restore resilient communities of native vegetation.

Pest animal control is being expanded to create an extensive network across the entire site to provide a greater level of protection for shorebirds and native lizards.

9.1. Ecological weed control

The aim of weed control at the Ōtaki Coast KNE site is to reduce the distribution and density of existing weed populations and exclude some species from reinvading the site. This will help to encourage natural regeneration of native plant communities and increase overall native species dominance, in line with objectives of this plan.

Intensive weed control will be focussed around areas of restoration planting and existing areas of significant native vegetation such as the Whakapawaewae wetland, Mangaone stream mouth wetlands, and tātaraheke/sand coprosma site. Extensive weed control will be employed through periodic sweeps of the coastal strip, in particular to reduce the risk of highly invasive weeds gaining a foothold.

The gravel bank between the river and the stop bank requires mechanical removal of dense pampas and gorse followed by spraying. This will be funded and undertaken by the Flood Operations team. This area will be largely maintained in grassland through mowing before sections are restored back to native vegetation.

Ecological weed species recorded at the KNE site and a ranking of their potential ecological impact are listed in Appendix 5.

9.2. Pest animal control

The aim of pest animal control at the KNE site is to protect native bird and lizard populations from predation so that they can fully utilise the habitat remaining within the KNE site in line with objectives 1 and 2 of this plan.

The predator control network was significantly expanded in 2024. DOC250 kill traps are used to target ferrets, stoats, weasels, and hedgehogs, while Ambush ground-based bait stations baited with brodifacoum are used to target rats. A small number of Tims traps are used to target possums. The extent of the control network is shown in Appendix 1, Map 5. The portion of the network on Katikiku X Trust land is serviced by Ngāti Huia ki Katihiku kaitiaki in line with objective 5 of this plan while the rest is serviced by GW Pest Animals staff with future community involvement possible. GW Pest Animals staff complete a yearly audit of the entire network.

Rabbitt and hare control will only occur on a reactive basis if populations reach unacceptable levels. Feral cats are common in the wider area, as observed in a 2024 camera trap survey. Due to the proximity of the site to residential areas with domestic cats control options require further investigation.

9.3. Revegetation

The aim of revegetation at the Ōtaki Coast KNE site is to reestablish native species dominance by restoring plant communities that closely resemble those once found there. Revegetation and enrichment planting can help to improve the structure and natural function of existing remnants and by increasing species richness can improve their resilience to environmental change. Revegetation will also help to provide a seed source to aid natural regeneration and enhance essential habitat for native animals in line with the objectives of this plan.

Revegetation of a degraded site of this size is a long-term process. Current funding levels provide for planting of only around half a hectare per year. Over the course of this plan revegetation will focus on the coastal strip south of the river mouth, working from both the north and south ends. Along with the coastal strip GW will continue to support FOTOR to complete restoration planting around the north lagoon.

Revegetation will be complemented by intensive weed control to effectively replace weed cover and reduce opportunities for reinvasion. Planting is planned to complement the existing natural values of the site. All plants will be locally sourced from natural populations and species selected that are adapted to the conditions of the specific ecosystem types found on the site. The Restoration Plan for Katihiku, 2013[63] provides lists of suitable species for revegetation that can be applied to the wider site.

10. Future opportunities

The Ōtaki River Estuary is currently tightly constrained by Flood Protection stop banks. Particularly on the southern side, it may be possible in the future as part of the current flood plain management plan review, to relocate part of the stop banks downriver. This would allow flow to return to the Whakapawaewae wetland and the former river channel which flowed past Katihiku marae. This would have significant ecological benefits to the KNE site, cultural benefits to Ngāti Huia ki Katihiku, and potentially improvements to flood resilience as explored in the ‘Room for Rivers’ concept[64].

Vehicles continue to be a major threat to the KNE site. Vehicles could be effectively excluded from much of the site south of the Ōtaki River by the installation of limited fencing and gates at the end of Sims Rd and near the Mangaone Stream. Additionally, wire-rope fences could be repaired and gates locked to prevent vehicle access to most parts of the northern estuary. Successful implementation would likely require coordination between GW and KCDC and support from the local community and NHoŌ.

11. Operational delivery schedule

The operational delivery schedule shows the actions planned to achieve the stated objectives for the Ōtaki Coast KNE site, and their timing and cost over the five-year period from 1 July 2024 to 30 June 2029. The budgets are indicative only and subject to change. Operational areas (see Appendix 1, Map 4) are also subject to change according to operational needs over the course of the operational plan.

Table 3: Operational delivery schedule for the Ōtaki Coast KNE site

Objective	Activity	Operational area	Intended 5-year outcome	Implementing party	Annual budget
1, 2, 3, 4	Ecological weed control Targeted control of priority ecological weeds	Entire KNE	Reduction in distribution and abundance of priority weed species	GW Pest Plants team	$13,700
1, 3, 4	Ecological weed control Large-scale vegetation removal	D	Significant reduction in the area of gravel flat coved by weed species	GW Flood Operations team	$5,500 (funded by GW Flood Operations)
1, 4, 5	Revegetation Planting of appropriate species	A	Native vegetation dominance over at least half of the lagoon margin	Friends of the Ōtaki River	$1,000
2, 3, 4, 5	Revegetation Planting of appropriate species	E	2ha of the coastal strip planted	GW Environment Restoration team / Ngāti Huia ki Katihiku / Te Horo community	$6,000
1, 2, 5	Pest animal control Traps and bait stations are serviced at least every 3 months	Entire KNE	Increased breeding success of rare shorebirds, growing populations of native lizards Possums <5% RTC* Rats <10% TTI** Mustelids <2% TTI*	Friends of the Ōtaki River / Ngāti Huia ki Katihiku / Pest Free Te Horo / GW Pest Animals team	$4,600
Total					**$30,800**

*RTC = Residual Trap Catch. The control regime has been designed to control possums to this level, but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met.

**TTI = Tracking Tunnel Index. The control regime has been designed to control rats/mustelids to this level, but monitoring will not be undertaken. Experience in the use of this control method indicates this target will be met.

12. Funding contributions

12.1. Budget allocated by Greater Wellington

Table 4: Greater Wellington allocated budget for the Ōtaki Coast KNE site

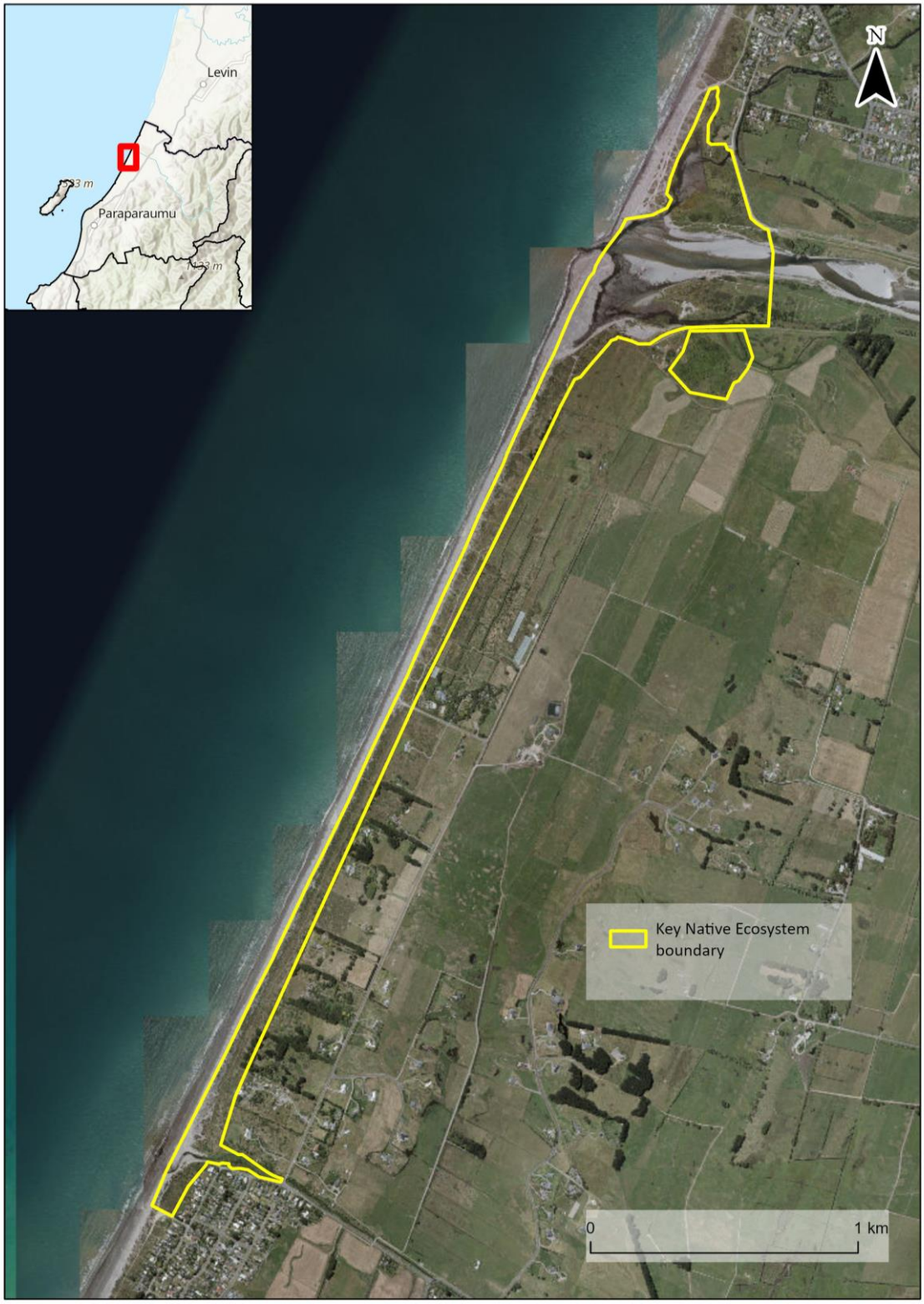
Management activity	Annual budget
Ecological weed control	$13,800
Pest animal control	$4,750
Revegetation	$7,000
Total	**$25,550**

12.2. Budget allocated by KCDC[65]

Table 5: KCDC allocated budget for the Ōtaki Coast KNE site

Management activity	Annual budget
Ecological weed control	$5,380
Total	**$5,380**

Appendix 1: Ōtaki Coast KNE site maps

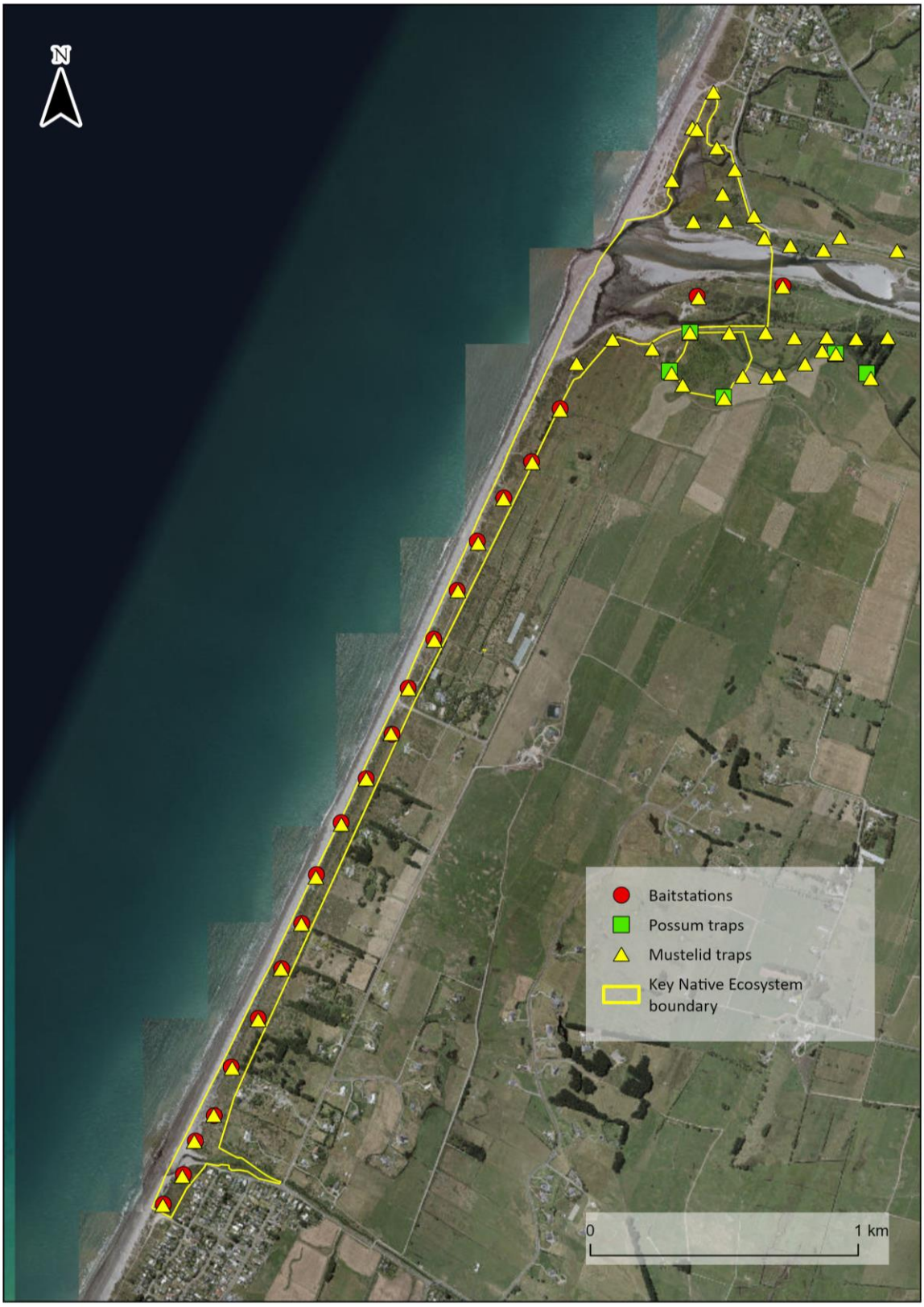


Map 1: The Ōtaki Coast KNE site boundary

Map 2: Land ownership for the Ōtaki Coast KNE site

Map 3: Singers and Rogers classification of pre-human forest vegetation types for the Ōtaki Coast KNE site

Map 4: Ecological weed control operational areas in the Ōtaki Coast KNE site



Map 5: Pest animal control in the Ōtaki Coast KNE site

Appendix 2: Nationally threatened species list

The following table lists Nationally Threatened and At Risk species that are resident in, or regular visitors to, the Ōtaki Coast KNE site.

The New Zealand Threat Classification System (NZTCS) lists species according to their threat of extinction. The status of each species group (plants, reptiles, etc) is assessed over a five-year cycle[66]. Species are regarded as Threatened if they are classified as Nationally Critical, Nationally Endangered or Nationally Vulnerable[67]. They are regarded as At Risk if they are classified as Declining, Recovering, Relict or Naturally Uncommon.

Table 6: Nationally Threatened and At Risk species at the Ōtaki Coast KNE site

Scientific name	Common name	Threat status	Observation
Plants(vascular)[68]			
Carex litorosa	Sea sedge	At Risk-Declining	Urlich and Carter 2013[69]
Coprosma acerosa	Sand coprosma	At Risk-Declining	Rob Cross, KCDC, pers obs 2018
Isoetes kirkii	Quillwort	At Risk-Declining	Hamish Carson, pers obs 2012
Birds[70]			
Anarhynchus frontalis	Wrybill	Threatened-Nationally Vulnerable	McArthur et al, 2015[71]
Anthus novaeseelandiae	NZ pipit	At Risk-Declining	McArthur et al, 2015
Charadrius bicinctus	Banded dotterel	Threatened-Nationally Vulnerable	McArthur et al, 2015
Charadrius obscurus	New Zealand dotterel	Threatened-Recovering	Rachael Ashdown, 2024 https://ebird.org/atlasnz/checklist/S181972661[72]
Chroicocephas scopulinus	Red-billed gull	At Risk-Declining	McArthur et al, 2015
Elseyornis melanops	Black-fronted dotterel	At Risk-Naturally Uncommon	McArthur et al, 2015;
Falco novaeseelandiae	New Zealand falcon	Threatened-Nationally Vulnerable	https://ebird.org/checklist/S66072842
Haematopus unicolor	Variable oystercatcher	At Risk-Recovering	McArthur et al, 2015;
Hydroprogne caspia	Caspian tern	Threatened-Nationally Vulnerable	McArthur et al, 2015;

Scientific name	Common name	Threat status	Observation
Phalacrocorax carbo	Black shag	At Risk-Naturally Uncommon	McArthur et al, 2015;
Phalacrocorax varius	Pied shag	At Risk-Recovering	McArthur et al, 2015;
Platalea regia	Royal spoonbill	At Risk-Naturally Uncommon	McArthur et al, 2015;
Sterna striata	White-fronted tern	At Risk-Declining	McArthur et al, 2015;
Freshwater fish[73]			
Anguilla dieffenbachii	Longfin eel	At Risk-Declining	Thompson, 2011[74]; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019[75]
Cheimarrichthys fosteri	Torrentfish	At Risk-Declining	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019
Galaxias argenteus	Giant kōkopu	At Risk-Declining	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2019
Galaxias brevipinnis	Kōaro	At Risk-Declining	Thompson, 2011; NIWA freshwater fish database 2019
Galaxias divergens	Dwarf galaxias	At Risk-Declining	Thompson, 2011
Galaxias maculatus	Īnanga	At Risk-Declining	Boffa Miskell Ltd, 2001[76]; Taylor & Kelly, 2001[77]; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019
Galaxias postvectis	Shortjaw kōkopu	Threatened-Nationally Vulnerable	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018
Geotria australis	Lamprey (Piharau)	Nationally Vulnerable	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018
Gobiomorphus hubbsi	Bluegill bully	At Risk-Declining	Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018
Gobiomorphus huttoni	Redfin bully	At Risk-Declining	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019

Appendix 3: Regionally threatened species list

The following table lists regionally threatened species that have been recorded in the Ōtaki Coast KNE site.

A methodology to create regional threat lists was developed by a collaborative group comprising representatives from DOC, regional councils and a local authority. The resulting regional threat listing methodology leverages off the NZTCS, but applies a species population threshold adjusted to the regional land area under consideration (relative to the national land area) for species that are not nationally threatened. The assigned regional threat status cannot be lower than that of the national threat status, but can be higher, (e.g. a Nationally Vulnerable species could be assessed as being Regionally Critical). Other assessments made in the regional threat listing process include identifying populations that are national strongholds and the use of regional qualifiers, such as natural or historic range limits.

Table 7: Regionally threatened species recorded in the Ōtaki Coast KNE site

Scientific name	Common name	Regional Threat status	Observation
Plants (vascular)[78]			
Carex litorosa	Sand sedge	Critical	Mike Urlich, GWRC, pers obs 2013
Coprosma acerosa	Sand coprosma	Declining	Rob Cross, KCDC, pers obs 2018
Isoetes kirkii	Quillwort	Vulnerable	Hamish Carson, pers obs 2012
Birds[79]			
Anarhynchus frontalis	Wrybill	Threatened -Migrant	McArthur et al, 2015
Anthus novaeseelandiae	NZ pipit	Declining	McArthur et al, 2015
Charadrius bicinctus	Banded dotterel	Vulnerable	McArthur et al, 2015
Charadrius obscurus	New Zealand dotterel	Critical	Rachael Ashdown, 2024 https://ebird.org/atlasnz/checklist/S181972661
Chroicocephas scopulinus	Red-billed gull	Vulnerable	McArthur et al, 2015
Elseyornis melanops	Black-fronted dotterel	Vulnerable	McArthur et al, 2015
Falco novaeseelandiae	New Zealand Falcon	Critical	https://ebird.org/checklist/S66072842

Scientific name	Common name	Regional Threat status	Observation
Haematopus unicolor	Variable oystercatcher	Vulnerable	McArthur et al, 2015
Himantopus leucocephalus	Pied stilt	Vulnerable	McArthur et al, 2015
Hydroprogne caspia	Caspian tern	Critical	McArthur et al, 2015
Phalacrocorax carbo	Black shag	Critical	McArthur et al, 2015
Phalacrocorax varius	Pied shag	Vulnerable	McArthur et al, 2015
Platalea regia	Royal spoonbill	At Risk-Coloniser	McArthur et al, 2015
Sterna striata	White-fronted tern	Endangered	McArthur et al, 2015
Freshwater fish[80]			
Anguilla dieffenbachii	Longfin eel	Declining	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019
Cheimarrichthys fosteri	Torrentfish	Declining	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019
Galaxias argenteus	Giant kōkopu	Vulnerable	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2019
Galaxias brevipinnis	Kōaro	Declining	Thompson, 2011; NIWA freshwater fish database 2019
Galaxias divergens	Dwarf galaxias	Declining	Thompson, 2011
Galaxias maculatus	Īnanga	Declining	Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019
Galaxias postvectis	Shortjaw kōkopu	Endangered	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018
Geotria australis	Lamprey (Piharau)	Vulnerable	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018
Gobiomorphus hubbsi	Bluegill bully	Declining	Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018
Gobiomorphus huttoni	Redfin bully	Declining	Thompson, 2011; Caleb Royal, Ngā Hapū o Ōtaki, pers obs 2018; NIWA freshwater fish database 2019

Appendix 4: Threat table

Table 8 presents a summary of all known threats to the Ōtaki Coast KNE site including those discussed in section 7.

Table 8: Threats to the Ōtaki Coast KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
Ecological weeds		
EW-1	Climbing weeds smother and displace native vegetation often causing canopy collapse. They also inhibit native plant regeneration and alter vegetation structure and composition. Key weed species include Japanese honeysuckle (*Lonicera japonica*), blackberry (*Rubus fruticosus* agg.) and German ivy (*Delairea odorata*) (see full list in Appendix 5)	Entire KNE site
EW-2	Ground covering ecological weeds smother and displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include iceplant (*Carpobretus edulis*), periwinkle (*Vinca major*), arum lily (*Zantedeschia aethiopica*) and Agapanthus (*Agapanthus praecox* subsp. *Orientalis)* (see full list in Appendix 5)	Entire KNE site
EW-3	Exotic grass species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include pampas (*Cortaderia selloana/C. jubata*), kikuyu (*Pennisetum clandestinum*) and marram grass (*Ammophila arenaria*) (see full list in Appendix 5)	Entire KNE site
EW-4	Woody weed species displace native vegetation, inhibit indigenous regeneration, and alter vegetation structure and composition. Key weed species include willows (*Salix* spp.), brush wattle (*Paraserianthes lophantha*), boxthorn (*Lycium ferocissimum*) and karo (*Pittosporum crassifolium*) (see full list in Appendix 5)	Entire KNE site
EW-5	Aquatic weeds out-compete native aquatic species and choke watercourses. Key weed species include parrots feather (*Myriophyllum aquaticum*), reed sweet grass (*Glyceria maxima*) and cape pond lily (*Aponogeton distachyos*) (see full list in Appendix 5)	A, B, D and F
Pest animals		
PA-1	Mustelids (stoats[81,82] (*Mustela erminea*), ferrets[83,84] (*M. furo*) and weasels[85,86] (*M. nivalis*)) prey on native birds, lizards and invertebrates, reducing their breeding success and potentially causing local extinctions	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
PA-2	Rats (*Rattus* spp.) browse native fruit, seeds and vegetation. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and native birds[87,88]	Entire KNE site
PA-3	Feral and domestic cats (*Felis catus*) prey on native birds[89], lizards[90] and invertebrates[91], reducing native fauna breeding success and potentially causing local extinctions[92]	Entire KNE site
PA-4	Hedgehogs (*Erinaceus europaeus*) prey on native invertebrates[93], lizards[94] and the eggs[95] and chicks of ground-nesting birds[96]	Entire KNE site
PA-6	Possums (*Trichosurus vulpecula*) browse palatable canopy vegetation until it can no longer recover[97,98]. This destroys the forest's structure, diversity and function. Possums may also prey on native birds[99] and invertebrates	Entire KNE site
PA-6*	House mice (*Mus musculus*) browse native fruit, seeds and vegetation, and prey on invertebrates. They compete with native fauna for food and can reduce forest regeneration. They also prey on invertebrates, lizards and small eggs and nestlings[100,101]	Entire KNE site
PA-7*	Rabbits (*Oryctolagus cuniculus*) and hares (*Lepus europaeus*) graze on palatable native vegetation and prevent natural regeneration in some environments[102]. Rabbits are particularly damaging in sand dune environments where they graze native binding plants and restoration plantings. In drier times hares especially, will penetrate into wetland forest areas browsing and reducing regenerating native seedlings	Entire KNE site
PA-8*	Wasps (*Vespula* spp.) adversely impact native invertebrates and birds through predation and competition for food resources. They also affect nutrient cycles in beech forests[103]	Entire KNE site
PA-9*	Brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) prey on native fish and compete with them for food resources[104]	C
Human activities		
HA-1*	Garden waste dumping often leads to ecological weed invasions into natural areas. Common weed species introduced at this KNE site include periwinkle (*Vinca major*) and Japanese honeysuckle (*Lonicera japonica*)	Entire KNE site
HA-2*	Recreational vehicles such as 4WDs and motorbikes can cause damage to dune and gravel beach systems and disturbance of the native ecosystem	A, C, D, E, F
HA-3*	Recreational use such as tramping, mountain biking and horse riding can cause damage and disturbance of the native ecosystem. It is also likely to disturb native fauna and introduce ecological weeds	Entire KNE site

Threat code	Threat and impact on biodiversity in the KNE site	Operational area/location
HA-4*	Historic flood protection management including the installation of stopbanks and floodgates have altered the hydrological conditions of the estuaries. This has impacted on the long-term viability of some wetland habitats and restricted native fish passage	A, B, C, D, F
HA-5*	Encroachment of residential gardens into the KNE site from urban areas causes habitat loss and introduces ecological weeds	E, F
HA-6*	Barriers to native fish passage are present in streams within the KNE site preventing migrating fish from completing their life-cycle	A, B, D, F
HA-7*	Poor water quality affects a range of species in the estuary and stream. High nutrient levels and contaminants within watercourses are often caused by upstream land management practices and pollution events including development practices, forestry and agricultural practices, road run-off and storm water entering the watercourse, and sceptic tank leakages	A, B, C, D, F
HA-8*	Freshwater activities such as boating, fishing, white baiting and duck shooting can introduce aquatic weed species to waterways	A, B, C, D, F
HA-9*	Over-fishing, particularly of whitebait, may reduce fish stocks to non-sustainable levels	A, B, C, D, F
Other threats		
OT-1*	Edge effects affect regenerating forests by changing environmental conditions (eg, soil moisture or temperature levels), changing physical environment (eg, different plant assemblages compared to the interior) and changing species interactions (eg, increased predation by invasive species) [105,106]	B
OT-2*	Extreme environmental weather patterns or events such as sea level rise and storm surges can result in increased storm damage and/ or complete inundation of sea water into the KNE site dramatically affecting the condition of the vegetation communities and/or breeding succession of shorebirds within the KNE site	Entire KNE site

*Threats marked with an asterisk are not addressed by actions in the operational delivery schedule

Appendix 5: Ecological weed species

The following table lists key ecological weed species that have been recorded in the Ōtaki Coast KNE site through surveys by GW staff (Environment Restoration and Pest Plants team) and contractors.

The distribution and density of individual species is recorded. Three levels of distribution (localised, patchy and widespread) and density (sparse, abundant and dense) are used to describe these aspects of infestations of each species.

Table 9: Ecological weed species recorded in the Ōtaki Coast KNE site

Scientific name	Common name	Priority	Level of distribution	Management aim
Anredera cordifolia	Madeira vine	Very high	Localised and sparse	Eradication, surveillance
Asparagus aethiopicus	Bushy asparagus	Very high	Localised and sparse	Eradication, surveillance
Carpobretus edulis	Ice plant	Very high	Widespread and abundant	Suppression
Chrysanthemoides monilifera subsp. *monilifera*	Boneseed	Very high	Localised and sparse	Exclusion
Cortaderia spp.	Pampas	Very high	Widespread and abundant	Suppression
Lycium ferocissimum	Boxthorn	Very high	Scattered and abundant	Suppression
Helichrysum petiolare	Licorice plant	Very high	Scattered and sparse	Exclusion
Paraserianthes lophantha	Brush wattle	Very high	Scattered and abundant	Exclusion
**Pittosporum crassifolium*	Karo	Very high	Localised and abundant	Suppression
Rhamnus alaternus	Evergreen buckthorn	Very high	Localised and sparse	Exclusion
Salix cinerea	Grey willow	Very high	Localised and abundant	Exclusion
Agapanthus praecox subsp. *orientalis*	Agapanthus	High	Localised and sparse	Suppression
Aponogeton distachyos	Cape pond lily	High	Localised and abundant	No management
Calamagrostis arenaria	Marram	High	Scattered and abundant	Suppression
Correa alba	Correa	High	Scattered and sparse	Exclusion
Crocosmia × *crocosmiiflora*	Montbretia	High	Localised and abundant	Suppression

Scientific name	Common name	Priority	Level of distribution	Management aim
Delairea odorata	German ivy	High	Scattered and sparse	Suppression
Dimorphotheca fruticosa	Osteospermum	High	Localised and sparse	Suppression
Euphorbia characias	Wulfen spurge	High	Localised and sparse	Exclusion
Glyceria maxima	Floating sweet grass	High	Localised and abundant	Suppression
Juncus acutus	Sharp rush	High	Localised and abundant	Suppression
Iris pseudacorus	Yellow flag iris	High	Localised and sparse	Eradication
Lonicera japonica	Japanese honeysuckle	High	Widespread and sparse	Suppression
Lupinus arboreus	Lupin	High	Localised and abundant	No targeted management
Passiflora tripartita var. mollissima	Banana passionfruit	High	Localised and abundant	Exclusion
Pennisetum clandestinum	Kikuyu	High	Scattered and abundant	Suppression
Populus alba	Silver poplar	High	Localised and abundant	Exclusion
Rubus fruticosus agg.	Blackberry	High	Localised and sparse	Suppression
Salix fragilis x *S. euxina*	Crack willow	High	Localised and abundant	Suppression
Stenotaphrum secundatum	Buffalo grass	High	Localised and abundant	Suppression
Tradescantia flumenensis	Tradescantia	High	Localised and abundant	Suppression
Ulex europaeus	Gorse	High	Widespread and abundant	Suppression
Vinca major	Periwinkle	High	Scattered and abundant	Suppression
Zantedeschia aethiopica	Arum lily	High	Scattered and abundant	Suppression
Acacia sophorae	Coastal wattle	Moderate	Scattered and sparse	Exclusion
Allium triquetrum	Onion weed	Moderate	Localised and abundant	No targeted management
Aloe arborescens	Tree aloe	Moderate	Localised and sparse	Exclusion

Scientific name	Common name	Priority	Level of distribution	Management aim
Arctotis stoechadifolia	Arctotis	Moderate	Scattered and sparse	Exclusion
Artemisia verlotiorum	Mugwort	Moderate	Localised and sparse	No targeted management
Banksia integrifolia	Banksia	Moderate	Scattered and sparse	Suppression
Cotyledon orbiculata	Pig's ear	Moderate	Localised and abundant	Exclusion
Gazania linearis	Gazania	Moderate	Scattered and sparse	Suppression
Gazania rigens	Gazania	Moderate	Scattered and sparse	Suppression
Genista monspessulana	Montpellier broom	Moderate	Localised and abundant	Suppression
Helosciadium nodiflorum	Water celery	Moderate	Localised and sparse	No targeted management
Lathyrus latifolius	Everlasting pea	Moderate	Scattered and sparse	Suppression
Lolium arundinaceum subsp. arundinaceum	Tall fescue	Moderate	Widespread and abundant	Suppression
Sambucus nigra	Elderberry	Moderate	Localised and sparse	Exclusion
Yucca gloriosa	Yucca	Moderate	Scattered and sparse	Exclusion
Calystegia silvatica	Great bindweed	Low	Localised and abundant	Suppression
Cupressus macrocarpa	Macrocarpa	Low	Localised and sparse	Exclusion
Galega officinalis	Goat's rue	Low	Localised and sparse	Suppression
Malva arborea	Tree mallow	Low	Localised and sparse	Suppression
Pinus radiata	Radiata pine	Low	Scattered and abundant	Exclusion
Rumex sagittatus	Climbing dock	Low	Scattered and sparse	Suppression
Senecio elegans	Purple groundsel	Low	Scattered and sparse	No targeted management
Tropaeolum majus	Nasturtium	Low	Localised and sparse	Suppression

* Denotes a New Zealand native plant that is not locally native to the KNE site

References

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