

Riparian Sites of Significance Based on the Habitat
Requirements of Selected Bird Species :
Technical Report to Support Policy Development



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April 2007

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Front Cover Photo
Royal Spoonbill on Whanganui River tidal flats
Photo: Suzanne Lambie

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EXECUTIVE SUMMARY

The riparian zone represents a gradation of habitats influenced by flooding from a nearby waterway. The ability to identify all of the Region's significant riparian zones based on biological diversity is hampered by a lack of information on those species that are riparian dwellers and where they can be found. Due to information constraints, this technical document focuses on the distribution of a select few bird species.

Coastal observations of royal spoonbill and wrybill, and regional observations of banded dotterel, black-fronted dotterel, and nankeen night heron are used to determine riparian sites of significance (SOS-R). These native species are selected on the basis that they are listed in one of the threatened categories under the New Zealand Threat Classification System (Hitchmough, 2002), or they are charismatic and easily recognised, or their habitat requirements encompass the requirements of other organisms which can be protected by proxy, or the native breeding population is limited to our Region.

Each species is classified by their critical habitat requirements. The known distribution of each of these species coupled with their critical habitat requirements are mapped as SOS-R. Combining the habitat requirements based approach and species distribution approach provides assurance to conservationists that the habitats where the species live are accounted for in decision-making, while concurrently providing resource users assurance that resource use is not hindered by conservative policy across the entire resource.

This investigation falls short of identifying sites of significance based on other fauna and flora. Criteria for assessing the significance of riparian zones are proffered as a way of mitigating this shortfall. Obvious omissions are discussed.

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1. Introduction

1.1 Planning context

This technical report outlines the process of identifying and defining riparian sites of significance (SOS-R) based on the distribution of selected bird species in the Manawatu-Wanganui Region. The bird species selected have critical habitat requirements that, if resources are managed in sympathy to those habitat requirements, the avian biological diversity of the Region's riparian habitats may be preserved.

This document is part of a series of water-resource focused technical reports prepared to support the development of new water management policy (Figure 1). This policy will be incorporated into Horizons' second-generation plan and combined Regional Plan/Policy Statement (the One Plan).

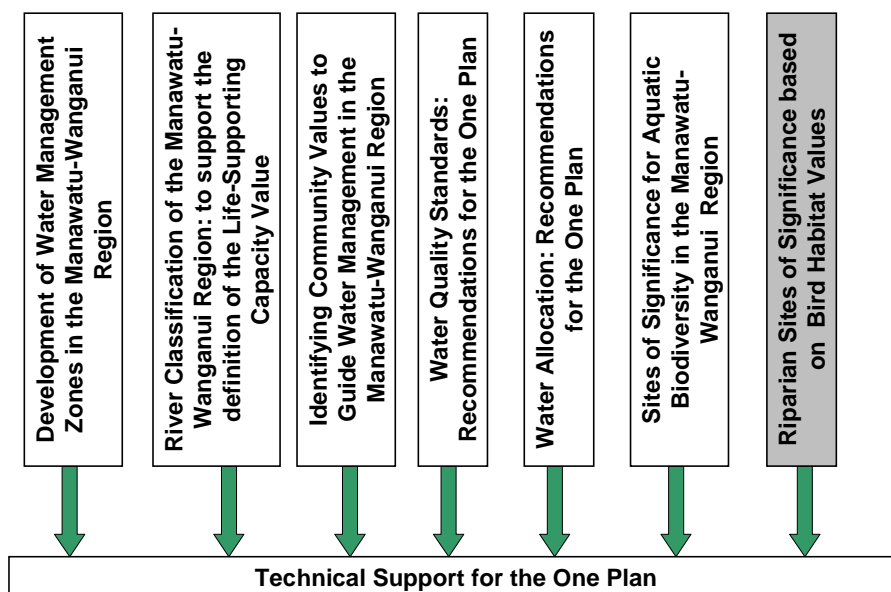


Figure 1: Planning context for the Riparian Sites of Significance (SOS-R) report in relation to other technical reports supporting the One Plan.

1.2 Project objectives and scope

The objective of the project is to identify river reaches that can be considered SOS-R based on riparian biodiversity values. Riparian biodiversity encompasses the community of species that inhabit the margins of the Manawatu-Wanganui Region's rivers, including estuaries. The ecology of these communities is somewhat different from terrestrial and permanently wet communities because riparian margins contain species adapted to periodic inundation and dry periods. However, an attempt to account for the full gamut of riparian biological diversity is not possible with current information.

The scope of the project is therefore limited to identifying and mapping river reaches that can be considered significant based on a small suite of the Region's native birds. Criteria for the selection of these indicator species are defined based on the general principles that they have critical requirements of riparian habitat and the focus of our attention on their conservation is needed for preserving the Region's biological diversity.

The process of mapping SOS-R using a select few species results in overlooking other potentially significant riparian habitats. The scope of the project is extended to identifying additional criteria that may be applied to resource consent applications to determine if there is significant riparian habitat involved.

The process also leads to purposeful and obvious species and habitat omissions. These omissions and some justification for exclusion are listed in Appendix 2.

The outcomes of this project are:

- The identification of, and critical habitat requirements for, selected native riparian bird species.
- The mapping of the extent of the distribution of those species.
- Determining further criteria to assess the significance of riparian sites that presently cannot be mapped.

The key questions addressed in this report are:

- What are the significant taxa on which to base the identification of significant sites?
- What are the critical habitat requirements of these taxa?
- How were the sites of riparian significance defined?
- What might be missed using the approach adopted in this technical document, and how might new SOS-R be identified in the future?

2. Defining the biodiversity values of riparian habitat

Riparian habitat represents a gradation of vegetation and substrate (underlying geology) from that which is often influenced by a waterbody to that which is infrequently flooded. The ecological values that make riparian biological diversity distinctive from aquatic or terrestrial habitats, is based on flora and fauna that require an aquatic and terrestrial component to certain aspects of their life stages (eg. inanga, wading birds and whio), that are adapted to periodic inundation (such as kahikatea flood plain forest), or that require a specific habitat type that tends to also be associated with waterbodies (ie. the use of gravel bed rivers by banded dotterel).

The scope of this investigation has been limited to a selected suite of riparian birds. The main reason for choosing birds is because avian species distribution information is more readily available than most other native taxa. Any attempt to catalogue all of the species that are strictly riparian habitat users and then identify all of the places they exist is hampered by a lack of information on what those species might be (obvious examples include soil micro-organisms and invertebrates) and where they are in the Manawatu-Wanganui Region.

The list of birds used in this investigation is very short. Reasons for excluding some birds include their lack of riparian specificity or their abundance. Not all birds found in riparian zones have specific needs of riparian habitat (for example bellbirds, tui, and fantail) and some riparian species are so common that their inclusion risks making all habitat significant (eg. shags and pukeko). Also, the careful selection of one or two “indicator” species that have critical habitat requirements that encompass the habitat requirements of lots of other species should result in the identification of sites that protect a number of unlisted bird species.

The following criteria are applied to justify the selection of certain bird species over others;

- The species is native or endemic and has specific or obligate habitat requirements that tend to be associated with riparian zones, and
- The species is listed in one of the acutely or chronically threatened categories (per Hitchmough, 2002), or
- The species is easily recognised and by protecting habitats for this species, the habitat of less recognisable, vagrant, migratory, or rare species is protected, or
- The species only breeds in the Horizons Region.

Using these criteria, wrybill (*Anarhynchus frontalis*), royal spoonbill (*Platalea regia*), banded dotterel (*Charadrius bicinctus*), black-fronted dotterel (*Charadrius melanops*), and nankeen night heron (*Nycticorax caledonicus*) have been selected as the indicators for SOS-R. Table 1 presents the justification for the inclusion of these species along with their critical habitat requirements and the human activities that impact on the species in the Manawatu-Wanganui Region.

The process of selecting these species leads to omissions, not only by excluding other bird species but also in not addressing other rare and threatened species or communities. Appendix 2 discusses obvious omissions.

Table 1: Critical habitat requirements for selected avian biodiversity values.

Species	Justification for inclusion	Critical habitat requirements ¹	Activities/threats	Most at risk where and when
Wrybill (Ngutuparore)	Nationally vulnerable ² - circa 5000 birds ³ . Endemic. Easily recognised. Habitat requirements overlap other wader species.	Silty to sandy feeding areas in and around estuaries/river mouths. Roosting beaches.	Damming/dredging of silt beds. Re-vegetation of estuarine shingle beds. Vehicular disturbance.	Estuaries/river mouths. Throughout the year.
Royal spoonbill (Kotuku-ngutupapa)	Charismatic. Small numbers on the increase – circa 610 birds in 1995 ³ . Easily recognised. Habitat requirements overlap most migratory and vagrant waders.	Tidal mudflats. Will roost in trees, although this is not obligatory.	Dredging of mudflats. Vehicular disturbance. Removal of existing trees from estuary margin/removal of favoured roosting sites.	Estuaries/river mouths. Throughout the year.
Banded dotterel (Tuturiwhatu)	Gradual decline ² – circa 50,000 birds mainly in the South Island ³ . Only breed in NZ. Easily recognised and already grounded in Horizons policy.	Shingle areas on river margins and sandy areas near river mouths. Inland birds generally move to the coast for winter roost.	Any activity that results in the loss of shingle habitat and nesting site disturbance – channelisation, sand and gravel extraction, vehicle traffic, re-vegetation of shingle beds, and damming.	River and estuary shingle and sand bars. Vulnerable while nesting which starts around July with young fledged by January.
Black-fronted dotterel (black-fronted plover)	Nationally uncommon ² - circa 300 birds in the Manawatu ³ . Easily recognised and already grounded in Horizons policy.	Shingle river beds and sandy areas near river mouths. Generally stay on the rivers all year round.	Any activity that results in the loss of shingle habitat and nesting site disturbance – channelisation, sand and gravel extraction, vehicle traffic, re-vegetation of shingle beds, and damming.	River and estuary shingle and sand bars. Vulnerable while nesting which starts around August and with young fledged by February. Also vulnerable to disturbance at coastal/estuarine post-breeding roosting areas.
Nankeen night heron (rufous night heron)	The Whanganui River population (estimated between 15 to 30 birds) ⁴ is believed to be the only self introduced breeding population in New Zealand ³ .	Nest in low lying and dense woody vegetation cover within convenient flying distance of water. Roost in similar vegetation during the day and feed by the river after dusk.	Complete removal of the willow habitat where they are breeding without gradual replacement of sympathetic vegetation cover.	At localised sites (as mapped). Throughout the year.

¹ Based on descriptions from Heather and Robertson, 1996.
² Hitchmough, 2002.
³ Heather and Robertson, 1996.
⁴ Jim Campbell pers. com.

2.1 Habitat and species-based approaches to mapping SOS-R

It is important to be aware of the distinction between a species-based approach to mapping (maps of species locations) and a habitat-based approach to mapping (maps of habitats based on physical descriptors), and to note this research attempts to hybridise both approaches. A species-based approach tends to lead to maps of sites where the species has been seen recently or historically, with little attempt to determine other places where they are likely to live but no records exist. Such an approach can fail to recognise significant sites. This approach can also lead to maps that define sites of significance outside the riparian margin. It is not the role of Horizons to protect these species in all of the habitats where they are found.

A habitat-based approach tends to map all habitats related to a species, irrespective of where the species has been recently or historically recorded. Such an approach can lead to recognising too many sites as significant which hinders resource use, and undermines the usefulness of such information.

This research has attempted to hybridise both approaches by grouping species into suites of habitats based on their critical habitat requirements, identifying broad regions where the suite of species has been recently recorded, and mapping those river reaches within species zones that match the habitat requirements. Described below are the habitat-species typologies that are used to describe the river reaches mapped as SOS-R. Section 3 describes the river reach identification process in detail.

2.1.1 Gravel and sand habitat (dotterel)

Gravel and sand habitat (dotterel) habitat-species typology includes shingle banks, sand, and shell areas in river beds and river mouths where banded and black-fronted dotterel nest, roost or feed. Gravel and sand beds represent a critical nesting habitat requirement of dotterel. Nesting dotterel are most vulnerable between late July and early January. After January most individuals including fledglings are able to move away if disturbed. The availability of undisturbed coastal and estuarine gravel and sand banks in habitual roosting and loafing areas is a post-breeding requirement of banded dotterel, which is captured in the gravel and sand habitat (dotterel) habitat typology. This habitat type is also used by wrybill for roosting, though it is captured under the wader habitat typology. The predominant activities that threaten these species include gravel and shingle extraction from rivers and estuaries during nesting season, coastal sand extraction, vehicle traffic, conversion of habitat by weeds, and river channelisation.

2.1.2 Tidal mud/silt habitat and estuarine roosts (waders)

Tidal mud/silt habitat and estuarine roosts (waders) habitat-species typology includes tidal mudflats and tidal mud or silt river margins where these species feed, and their roosting areas. The roosts tend to be places habitually used and include trees on the river margin, shingle and sand bars and islands, and wharf structures. Mud and silt represent a critical feeding habitat requirement for royal spoonbill and wrybill. The predominant activities that threaten these

species include dredging and vehicular disturbance in estuaries, and the complete removal of habitually used roosting structures without replacement.

2.1.3 Nankeen night heron roosts

Riverside roosts are a critical habitat requirement for nankeen night heron. This habitat-species typology is dense woody vegetation along the Whanganui River where these birds are known to nest and roost. The main threat is the complete removal of vegetation without replacement. The identification of nankeen night heron SOS-R is predominantly a species-based approach.

2.2 Summary

Table 2 summarises the habitat typologies mapped as SOS-R.

Table 2: Habitats mapped as SOS-R.

Mapped habitat	Critical habitat requirements	Species
Gravel and sand (dotterel)	River and estuarine shingle, gravel and sand beds – nesting, roosting and feeding habitat and habitual post-breeding loafing areas.	Banded dotterel, black-fronted dotterel
Tidal mud/silt habitat and estuarine roosts (waders)	Tidal mudflats, mud/silt river margins – feeding habitat. Estuarine shingle, gravel sand and shell beds, trees and structures close to river habitually used for roosting or loafing.	Royal spoonbill, wrybill
Nankeen night heron roosts	Dense woody vegetation along Whanganui River where these birds occur. Roosting and nesting habitat.	Nankeen night heron

3. Mapping methodology

3.1 Data sources

The primary reference for the first cut of all bird distributions was based on Portable Document Format (PDF) maps provided by Chris Robertson of the Ornithological Society of New Zealand Inc. (OSNZ), using provisional unpublished atlas data from a national survey of bird distribution (1999-2004). The atlas data are 10 km by 10 km grid squares that depict the presence of each bird species based on thousands of hours of volunteer observations between December 1999 and November 2004. For dotterel, the total (regional) OSNZ observations of the presence of banded and black-fronted dotterel were used. For the waders, only coastal OSNZ observations of wrybill and spoonbill were used. The atlas grid squares are based on the New Zealand Geodetic Datum 1949. It is important to note that the coarse scale of the atlas grids contributes an average spatial error of +/-5 km to the analysis.

Additional dotterel data was sourced from the Department of Conservation (DoC) on the Manawatu, Pohangina, Rangitikei, and Oroua rivers (Viv McGlynn, Wanganui Conservancy. pers. com. Sept. 2006). The degree of spatial error is at least 100 m because the source coordinates were transcribed into New Zealand Map Series 260 standard. Dotterel in the Waiouru Military Training Area were mapped from known and presumed likely river reaches based on personal communication with John Mangos (New Zealand Defence Force pers. com. Sept 2006) for tributaries of the Moawhango Dam. A small number of coordinates from Horizons data and additional observations by Horizons staff (Elaine Iddon, Dannevirke. pers. com. Jan. 2007) were also used to select potential river reaches for dotterel that were not picked up using the OSNZ data.

The Horizons River Environment Classification layer in Horizons' geographic information system (GIS) was used to depict the Region's rivers. The spatial error was not determined, but probably insignificant compared to bird data.

The New Zealand Land Resources Inventory (LRI) GIS layer was used to refine river reaches that were selected as significant habitat for dotterel. The layer was queried for loose and gravelly top rock types including alluvium and gravel, and the ashes of Ngauruhoe, Taupo, and older eruptive events. The spatial error was not determined, but probably insignificant compared to bird data.

3.2 River reach selection and vetting process

All river reaches falling within the OSNZ grid squares were selected as being potential riparian sites of significance.

For gravel and sand (dotterel), river reaches from the Moawhango River were added to OSNZ dotterel reaches and then the data set was further rendered into areas where gravel habitat was likely based on the LRI layer. Dotterel sites from other sources were then added as reaches 1 km upstream and 1 km downstream of the observation.

Due to the spatial uncertainty introduced by the OSNZ bird data, each reach was visually scrutinised using underlying colour photos at scales no more coarse than 1:5000. Where it was obvious the underlying habitat would not support dotterel, reaches were deleted unless they provide a contiguous corridor between adjacent suitable reaches. The result of this rule is that small tributaries (predominantly stream order 1 or 2) have been removed.

In the most severe case, one entire combined banded and black-fronted dotterel OSNZ grid square in the Manawatu has not had any valid river reaches assigned to it. This grid is centred north of Foxton near SH1 and is not associated with the Manawatu River mainstem or estuary. The landscape here is predominantly sand dunes and pasture with small streams, drains and wetlands. It is likely the dotterel are not solely associated with river or stream riparian habitat here and are instead associated with dunelands or wetlands, which are outside the scope of this technical report.

In cases where there is uncertainty (eg. gravel reaches with no supporting dotterel presences data between two dotterel data points) significance was preferentially assigned if it led to linking confirmed habitats. The accidental inclusion of non-gravelly reaches will have no bearing on the outcome of gravel extraction decision-making. Assigning significance under uncertainty is the case for the Manawatu River from Oringi downstream to the confluence of the Mangatera Stream, and on the Mangahao River between Marima and Mangahao.

Significance is not assigned between dotterel observations on the Rangitikei River above the State Highway 3 bridge at Bulls and Rangitikei Estuary observations. There is anecdotal information that dotterel were not often seen below the bridge, supported by an absence of observations from OSNZ data and DoC data. This is also the case for the Manawatu River below Shannon to the Whirokino Cut

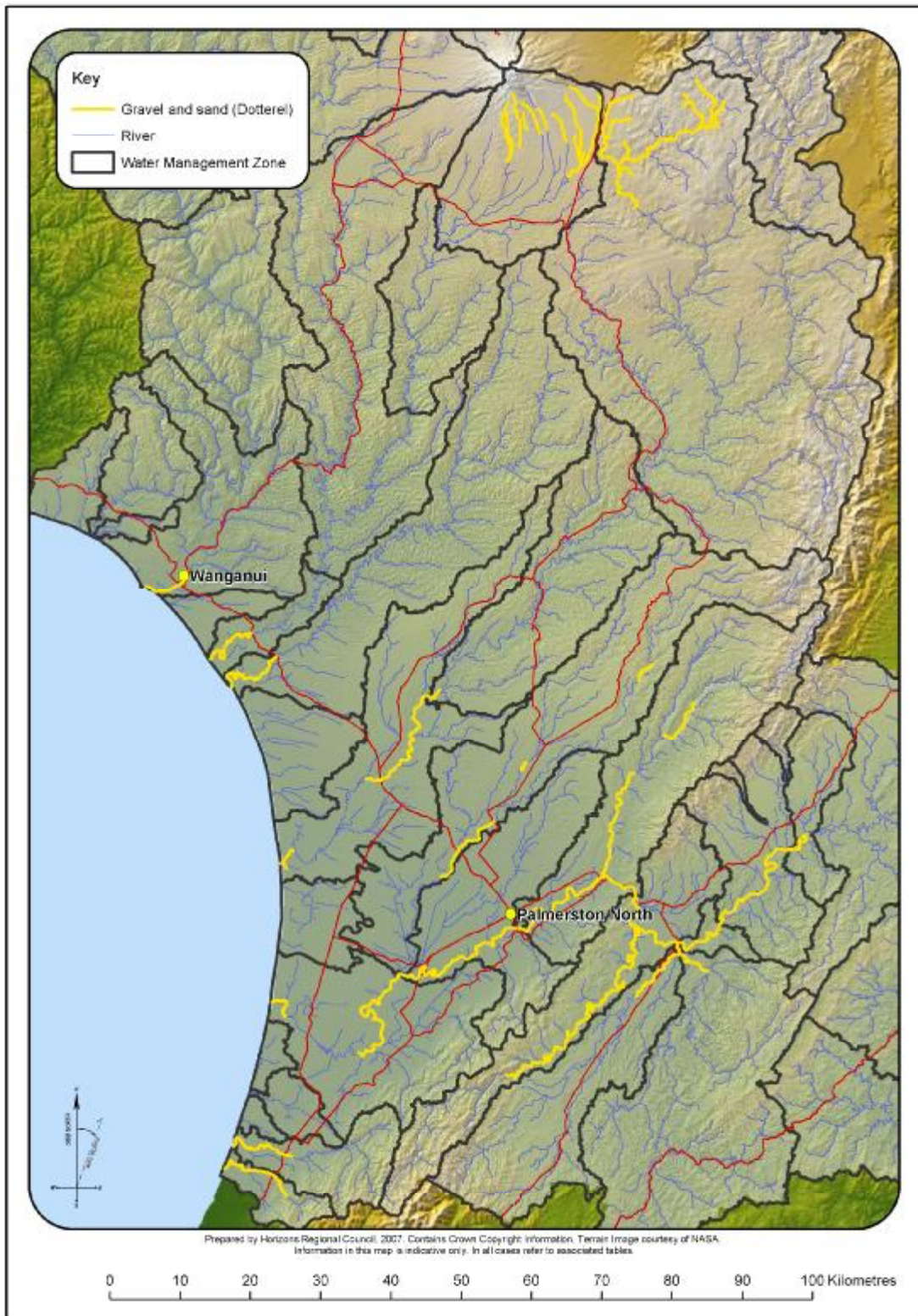
For the tidal mud and silt habitat and estuarine roosts (waders), coastal spoonbill and wrybill OSNZ observations were combined with tidal river reaches to identify potential sites of significance. Each reach was visually scrutinised using underlying colour photos at scales no more coarse than 1:5000 to make certain the river substrate was likely to be mud, silt, sand, shingle, or shell.

For nankeen night heron, point locations of the Whanganui River populations were provided by Jim Campbell (Doc, Wanganui Conservancy. pers. com. Aug. 2006). The river reaches mapped are those within 1 km upstream and downstream of these points and having dense vegetation near the river.

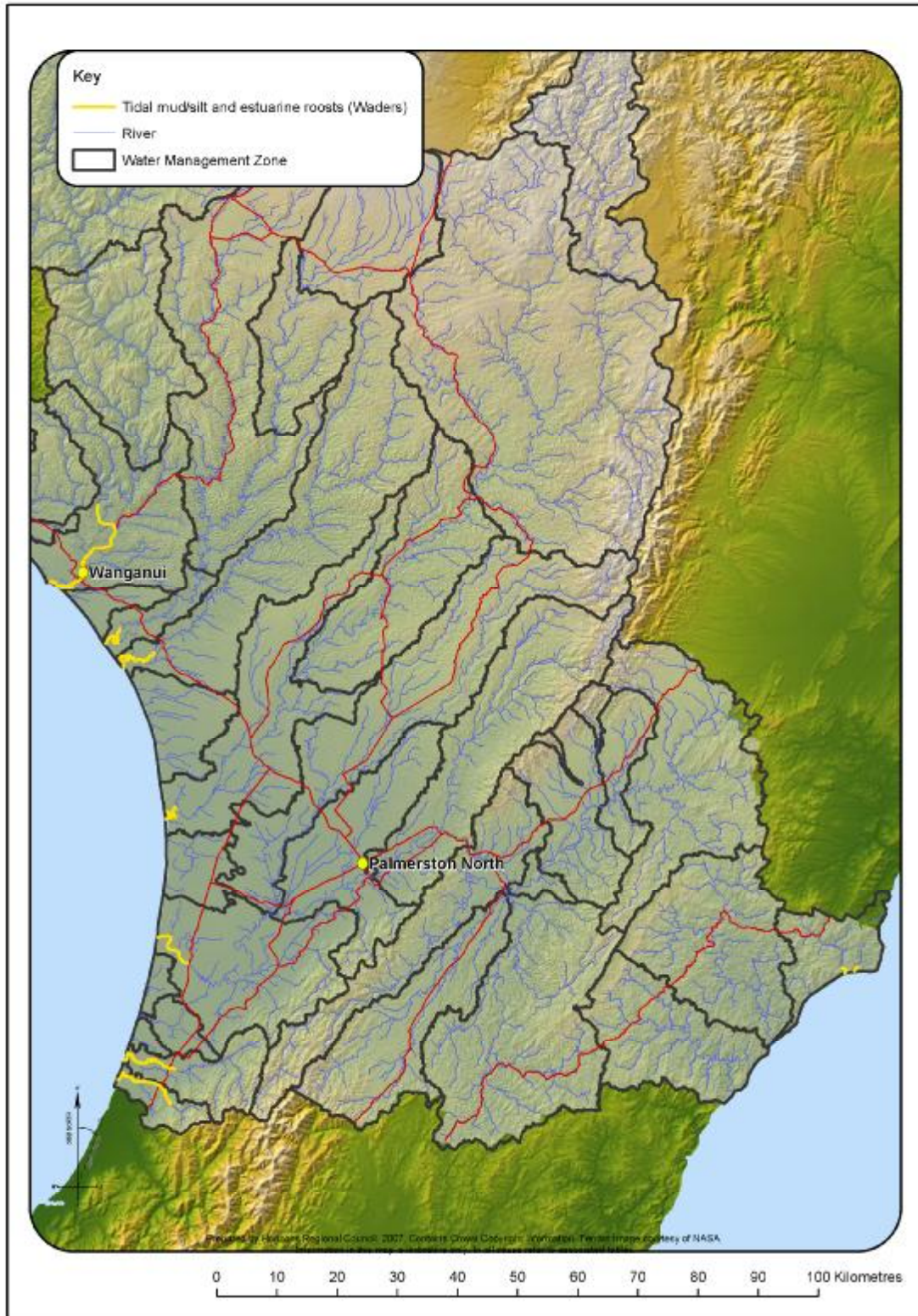
The combined error introduced by the datasets used has not been calculated statistically. The resulting sites of significance are as pragmatic and accurate as the available information will allow.

3.3 Maps of riparian sites of significance (SOS-R)

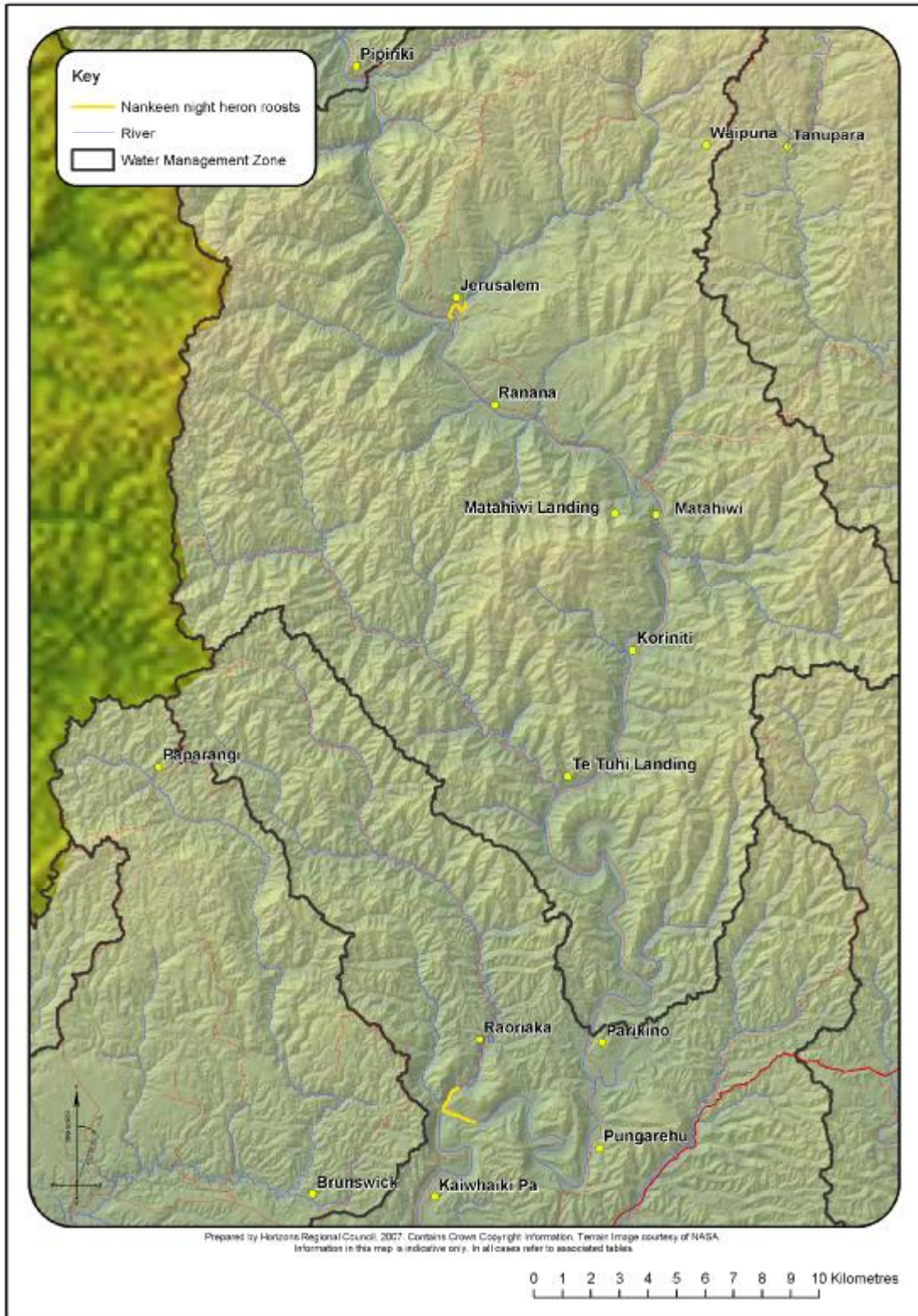
Map 1 to Map 3 depict the locations of riparian sites of significance (SOS-R) as the sites relate to each of the habitat-species typologies described in Section 2. Map 4 depicts the location of SOS-R as the combination of Map 1 to Map 3.



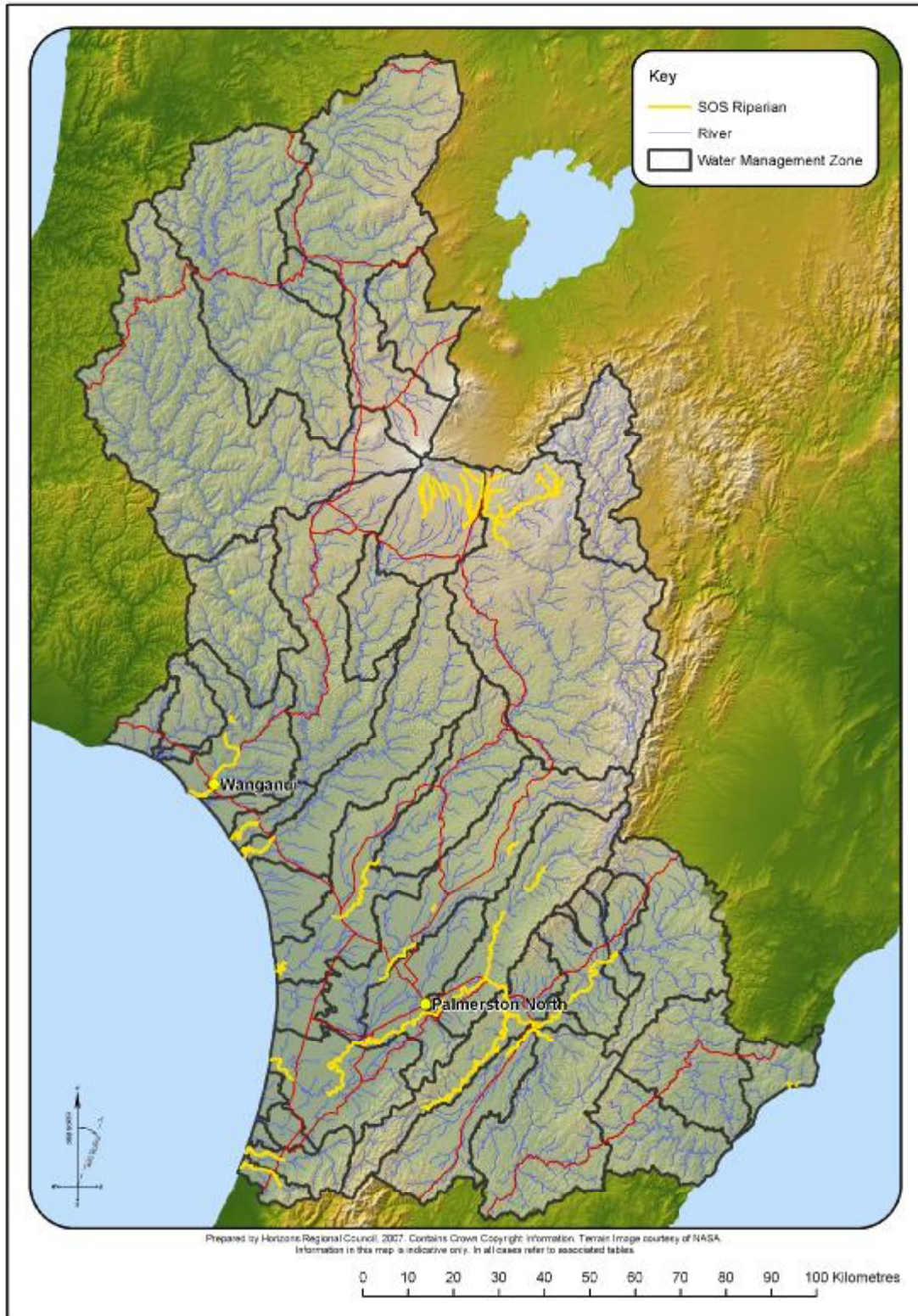
Map 1: Gravel and sand (dotterel) habitat-species typology.



Map 2: Tidal mud/silt and estuarine roosts (waders) habitat-species typology.



Map 3: Nankeen night heron habitat-species typology.



Map 4: Riparian sites of significance (SOS-R).

4. Other criteria considered but not adopted in this report

There are likely to be riparian sites of significant biological diversity that cannot be identified from the approach taken in this report. Three additional criteria of significance that may overcome this shortfall were considered in drafting this report but have not been applied to the SOS-R maps for reasons explained below. These criteria may be used on a case by case basis to identify significant riparian habitats in resource consent applications to use river resources. Applying these criteria to resource consent applications would capture riparian sites that are considered significant in other contexts but are not identified in the SOS-R maps.

4.1 Criterion 1: Terrestrial representativeness

The site is within the 50 year flood extent or within 20 m of a water body, and the vegetation is classified as representative under the terrestrial criteria of ecological significance.

The vegetation has a probability of being flooded at least once in 50 years and is close enough to provide shading, woody structure, shelter, feeding and breeding habitat to a variety of in-stream and stream-side fauna. The 50 year flood extent has been modelled for the flood plains and it can be reasonably assumed a flood of this magnitude and frequency will influence vegetation. Where the 50 year flood model doesn't fit, 20 m is proposed as a pragmatic rule of thumb.

The terrestrial extent criterion needs no new policy written or analysis in this technical document – significant terrestrial sites are dealt with under terrestrial biodiversity policy and technical analysis. Sites of terrestrial significance are determined using case by case application of terrestrial criteria, so riparian sites that are captured under the terrestrial context are unable to be mapped. Terrestrial controls to protect biodiversity values could apply in such sites.

4.2 Criterion 2: Aquatic significance

The site provides a 20 m buffer of indigenous vegetation to one or both sides of a reach of river identified as a site of significance – aquatic.

The use of riparian habitat by whio and inanga (for example) are addressed under the aquatic sites of significance. The 20 m buffer applied to significant aquatic sites is adopted as a practical terrestrial definition of the limit of the riparian vegetation. There is no need to map the terrestrial extent of the SOS-R identified in this criterion or apply any additional policy because this has been achieved under significant sites – aquatic.

The extent of the riparian site is only that which is within 20 m of the waterbody and not the full extent of contiguous vegetative cover. However, if the site is also identified as a terrestrial site of significance, then the riparian component of the site should be considered to cover the greater extent of the 20 m buffer or 50 year flood extent.

4.3 Criterion 3: Rarity and distinctiveness

The site consists of indigenous vegetation, or is bare substrate and is within 20 m of a river, or lake, or mean high water springs (MHWS), or is in the 50 year flood zone;

AND

The site is known to support any threatened species or provides habitat for a critical life stage of any threatened species.

Threatened species are those classified as nationally critical, nationally endangered, nationally vulnerable, in serious decline, in gradual decline, sparse, or data deficient - as compiled by Hitchmough (2002). The criterion can be applied as a reasonable expectation in standards of practise for river bed disturbance, such as gravel extraction, that require applicants to first identify that the species is not present.

Presently, there is a deficiency of data on the distribution of rare and threatened species which may make site assessment for significance arduous. However, in the case of all native mammals, birds, amphibians, and lizards, their protection under the Wildlife Act over-rides the Resource Management Act so resource users are obliged to check anyway.

5. Obvious omissions

The narrow focus of this report has lead to obvious and purposeful omissions of other riparian species and riparian communities, and overlooks the role some riparian margins contribute to landscape ecology and maintaining biological diversity. This report also avoids adopting sites identified as ecologically important by other agencies. The omissions and reasons for them are detailed in Appendix 2.

6. Recommendations

This investigation has defined riparian sites that are significant for a selected group of riparian birds. These birds require specific conditions within riparian habitat that are critical to their continued presence in the Manawatu-Wanganui Region.

The identified SOS-R are as pragmatic and accurate as the available information will allow. While it is possible this process has identified SOS-R that are not significant, these sites can confidently be adopted for making river resource management decisions that are sympathetic with the critical habitat requirements of dotterel and waders.

- It is recommended these sites be adopted for policy-making around the protection of significant sites of riparian habitat.

It is possible that there remain unidentified sites of significant dotterel and wader habitat, and other sites that may be significant for other fauna and flora.

- It is recommended that the other criteria posed in this technical document for identifying sites of significance outside the mapped SOS-R be applied to resource consent applications for riparian marginal works or in-stream works.
- It is recommended that riparian sites of significance identified by other agencies, such as DoC, be mapped where data and political conditions permit.

7. References

Heather, B. D. and Robertson, H. A. 1996. *The Field Guide to the Birds of New Zealand*. Viking, Penguin Books (NZ) Ltd. Auckland.

Hitchmough R. 2002. *New Zealand Threat Classification System lists*. Biodiversity Recovery Unit, Department of Conservation. Wellington.

OSNZ. In press. *Provisional unpublished atlas data from a national survey of bird distribution (1999-2004) undertaken by the Ornithological Society of NZ Inc.* Access provided by Chris Robertson. Please note that publication or circulation of the original maps in any form, and their use for any other purpose is not permitted, without further permission being granted by OSNZ.

8. Appendix 1: Description of SOS-R river reaches

Management Zone	Sub-zone	River	Description	Riparian Habitat Value
Manawatu Weber to Tamaki	Weber-Tamaki	Manawatu River	From approx. NZMS 260 U23:708-003 To approx. U23: 737-025 (confluence with Mangatera Stream).	Gravel and sand (dotterel)
Manawatu Tamaki to Hopelands	Tamaki-Hopelands	Manawatu River	From approx. NZMS 260 T24:614-897 To approx. U23:708-003.	Gravel and sand (dotterel)
Hopelands to Tiraumea	Hopelands-Tiraumea	Manawatu River	From the confluence with the Tiraumea River at approx. NZMS 260 T24:553-871 to approx. T24:614-897.	Gravel and sand (dotterel)
Tiraumea	Lower Tiraumea	Tiraumea River	From the confluence with the Manawatu River at approx. NZMS 260 T24:553-871 to the confluence with the Makairo Stream at approx. T24:597-831.	Gravel and sand (dotterel)
Mangatainoka	Lower Mangatainoka	Mangatainoka River	From the confluence with the Tiraumea River at approx. NZMS 260 T24:557-856 to approx. T24:495-786.	Gravel and sand (dotterel)
Upper Gorge	Upper Gorge	Mangahao River	From the Manawatu Gorge at approx. NZMS 260 T24:495-938 to the confluence with the Tiraumea River at approx. NZMS 260 T24:553-871.	Gravel and Sand (dotterel)
	Upper Mangahao	Mangahao River	From approx. NZMS 260 T24:469-826 to approx. T25:309-684.	Gravel and sand (dotterel)
	Lower Mangahao	Mangahao River	From the confluence with the Manawatu River at approx. NZMS 260 T24:496-892 to approx. T24:469-826.	Gravel and sand (dotterel)
Middle Manawatu	Middle Manawatu	Manawatu River	From Teachers' College at approx. NZMS 260 T24:332-891 to the Manawatu Gorge at approx. T24:495-938.	Gravel and sand (dotterel)
	Upper Pohangina	Pohangina River	From approx. NZMS 260 T23:534-168 to approx. T23:577-213.	Gravel and sand (dotterel)
	Middle Pohangina	Pohangina River	From approx. NZMS 260 T23:464-043 to approx. T23:493-113.	Gravel and sand (dotterel)
	Lower Pohangina	Pohangina River	From the confluence with the Manawatu River at approx. NZMS 260 T24:448-965 to approx. T23:464-043.	Gravel and sand (dotterel)
Lower Manawatu	Lower Manawatu	Manawatu River	From the confluence with the Oroua River at approx. NZMS 260 S24:164-825 to Teachers' College at approx. T24:332-891.	Gravel and sand (dotterel)
Oroua	Upper Oroua	Oroua River	From approx. NZMS 260 T23:500-242 to approx. T23:519-267.	Gravel and sand (dotterel)
	Middle Oroua	Oroua River	From approx. 200 m upstream of SH3 bridge at approx. NZMS 260 S23:243-005 to SH54 bridge at approx. S23:293-044.	Gravel and sand (dotterel)
	Lower Oroua	Oroua River	From approx. 300 m upstream of Kopane Bridge at approx. NZMS 260 S24:218-965 to approx. 200 m upstream of SH3 bridge at approx. S23:243-005.	Gravel and sand (dotterel)
	Kiwitea	Kiwitea Stream	From approx. NZMS 260 T23:332-116 to approx. T23:339-127.	Gravel and sand (dotterel)

Management Zone	Sub-zone	River	Description	Riparian Habitat Value
Coastal Manawatu	Coastal Manawatu	Manawatu River	From the river mouth at approx. NZMS 260 S24:977-787 to approx. 100 m downstream of the SH1 bridge at approx. S24:027-744.	Gravel and sand (dotterel) Mud/silt habitat and estuarine roosts (waders)
			From approx. NZMS 260 S24:101-715 to the confluence with the Oroua River at approx. S24:164-825.	Gravel and sand (dotterel)
Middle Rangitikei	Upper Moawhango	Moawhango River and tributaries	From approx. NZMS 260 T20:468-948 to source.	Gravel and sand (dotterel)
	Middle Moawhango	Moawhango River	From approx. NZMS 260 T20:495-916 to approx. T20:468-948.	Gravel and sand (dotterel)
Lower Rangitikei	Lower Rangitikei	Rangitikei River	From approx. NZMS 260 S23:200-221 to approx. S23:217-231.	Gravel and sand (dotterel)
Coastal Rangitikei	Coastal Rangitikei	Rangitikei River	From approx. NZMS 260 S23:111-104 to approx. S23:200-221.	Gravel and sand (dotterel)
	Tidal Rangitikei	Rangitikei River and Estuary	From the river mouth at approx. NZMS 260 S24:990-983 to approx. S23:010-001.	Gravel and sand (dotterel)
Paetawa	Paetawa	Mangoihe Stream	From the confluence with the Whanganui River at approx. NZMS 260 R21:889-813 to approx. 1 km upstream of Jerusalem at approx. 894-818.	Nankeen night heron roosts
Lower Whanganui	Lower Whanganui	Whanganui River	From the confluence of the Whanganui River and the Kauarapaoa Stream at approx. NZMS 260 R22:886-537 to 1 km upstream at approx. R22:897-532.	Nankeen night heron roosts
		Kauarapaoa Stream	From the confluence of the Whanganui River and the Kauarapaoa Stream at approx. NZMS 260 R22:886-537 to 1 km upstream at approx. R22:891-544.	Nankeen night heron roosts
		Whanganui River	From NZMS 260 R22:861-422 to R26:878-505 (near Kaiwhaiki).	Mud/silt habitat and estuarine roosts (waders)
	Coastal Whanganui	Whanganui River and Estuary	From the river mouth at approx. NZMS 260 R22:799-378 to SH3 bridge at approx. R22:861-422.	Gravel and sand (dotterel) Mud/silt habitat and estuarine roosts (waders)
Upper Whangaehu	Upper Whangaehu	Whangaehu River and tributaries	Upstream from approx. NZMS 260 T20:397-960 to source.	Gravel and sand (dotterel)
		Makahikatoa Stream and tributaries	Upstream from approx. NZMS 260 T20:396-008 to source.	Gravel and sand (dotterel)
		Wahianoa Stream	Upstream from approx. NZMS 260 T20:370-024 to source.	Gravel and sand (dotterel)
	Tokiahuru	Unnamed tributary of the Tokiahuru stream	Upstream from approx. NZMS 260 T20:359-022 to source.	Gravel and sand (dotterel)
		Unnamed tributary of the Tokiahuru stream	Upstream from approx. NZMS 260 T20:341-027 to source.	Gravel and sand (dotterel)
		Unnamed tributary of the Te Unuunuakapuataeriki stream	Upstream from approx. NZMS 260 T20:329-999 to source.	Gravel and sand (dotterel)

Management Zone	Sub-zone	River	Description	Riparian Habitat Value
		Te Unuunuakapuataeriki stream and tributaries	Upstream from approx. NZMS 260 T20:311-980 to source.	Gravel and sand (dotterel)
Coastal Whangaehu	Coastal Whangaehu	Whangaehu River	From the river mouth at approx. NZMS 260 R23:890-274 to the SH3 bridge at approx. S23: 949-311.	Gravel and sand (dotterel) Mud/silt habitat and estuarine roosts (waders)
Turakina	Lower Turakina	Turakina River	From the river mouth at approx. NZMS 260 S23:921-234 to the SH3 bridge at approx. S23:985-279	Gravel and sand (dotterel) Mud/silt habitat and estuarine roosts (waders).
Ohau	Lower Ohau	Ohau River	From the river mouth at approx. NZMS 260 S25:922-582 to approx. S25:007-569.	Gravel and sand (dotterel) Mud/silt habitat and estuarine roosts (waders).
East Coast	East Coast	Wainui River	From approx. NZMS 260 V24:117-727 to approx. V24:113-738.	Mud/silt habitat and estuarine roosts (waders).
		Tuatane Stream	From approx. NZMS260 V24:132-730 to approx. V24:136-737.	Mud/silt habitat and estuarine roosts (waders).
Waikawa	Waikawa	Waikawa Stream	From NZMS S25:910-551 (river mouth) to S25:000-511.	Gravel and sand (dotterel) Mud/silt habitat and estuarine roosts (waders).

9. Appendix 2: Purposeful Omissions

Species, taxonomic group, or ecological concept	Why this was omitted
Wetland riparian birds, eg. spotless crane, Australasian bittern	The critical habitat requirements of rare and threatened wetland birds are protected under wetland policies.
Waders, eg. pied stilt, oystercatcher	The critical habitat requirements of other native and endemic waders, whether they are threatened, vagrant and/or migratory, can be met using the selected wader species. In addition to the mapped SOS-R, the large scale protection of estuaries under wetlands policy and mapped coastal protection zones gives sufficient address to the habitat requirements of other estuarine inhabitants.
Gulls, cormorants and terns, eg. black-billed gull, black-fronted tern	While some species are threatened, the inclusion of members of this group could result in the classification of all rivers as having significant riparian habitat.
Ducks and rails, eg. grey duck, whio, pukeko	For grey duck, no further protection can be offered under significant riparian habitat than is offered in other policy initiatives such as wetlands protection, and under the Wildlife Act. Whio have been addressed in the technical report for aquatic sites of significance. Inclusion of the ducks and rails could result in the classification of all rivers and lake margins as having significant riparian habitat.
Aquatic invertebrates with riparian life stages, eg. dragonfly, mayfly	Too broad (almost all NZ aquatic inverts fall into this category). Some protection of values occurs from protecting habitat for birds and native fish, and policies to maintain water quality.
Fish, eg. inanga	The native fish that use riparian vegetation for egg-laying have been excluded from this report because they are considered in aquatic sites of significance.
Other rare or endangered obligate riparian invertebrates, fungi and microbes	There is no information available at this time on which, if any, species from these taxa are only found in riparian habitats, nor information on their distribution.
Indigenous flora	Rare and threatened riparian plants and communities of plants, such as wetlands and flood plain forests are accounted for under sites of significant terrestrial biological diversity
Loafing and moulting areas where coastal and sea birds periodically congregate, outside the definition of riparian habitat	The birds are protected under other legislation outside the influence of regional councils. Pasture and other habitats outside the definition of riparian used by the selected bird species have also been excluded. It is not the role of Horizons to protect these species in every place that they are seen.
Ecological corridors	The tendency for riparian marginal habitat to link terrestrial reserves, such as corridors of indigenous vegetation linking terrestrially significant sites, is adequately catered for in the criteria for identifying sites of significant terrestrial biological diversity.
Biodiversity "hot spots"	Other than where explicitly stated with reference to wader habitat, this research has not attempted to map riparian sites based on the diversity of species seen. Any mapping exercise that attempts to define sites of high biological diversity is faced with an arbitrary decision on how many species constitutes a diverse site.
Sites identified by other agencies, eg. Recommended Areas for Protection (RAPs - DoC), QEII covenants	Sites identified by other agencies that are within 20 m of a waterway, or are on floodplains could be mapped as SOS-R, but sufficient and stronger policy provisions are advised under sites of significant terrestrial biological diversity.



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