



Rivers and lakes with significant indigenous ecosystems

A report to support the draft Natural Resources Plan

A Perrie
S Greenfield
J Beaglehole

For more information, contact the Greater Wellington Regional Council:

Wellington
PO Box 11646

Masterton
PO Box 41

T 04 384 5708
F 04 385 6960
www.gw.govt.nz

T 04 830 4069
F 06 378 2146
www.gw.govt.nz

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www.gw.govt.nz
info@gw.govt.nz

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1. Introduction

Rivers, streams and lakes in the Wellington region with significant indigenous biodiversity values are listed in Table 16 of the Regional Policy Statement (RPS, GWRC 2013). This list has been updated for inclusion in Schedule F of the draft Natural Resources Plan for the Wellington region (dNRP, GWRC 2014). Schedule F is appended to this report (Appendix 1).

Methods used to identify the list of rivers, streams and lakes in Table 16 of the RPS (GWRC 2013) are documented in Warr et al. (2009). Aspects of the list that have been updated for inclusion in the dNRP and the methods used to do so are documented in this report.

Ecosystems and habitats with significant indigenous biodiversity values are those that meet the criteria set down in Policy 23 of the RPS (GWRC 2013) for representativeness, rarity, diversity and ecological context.

The information presented in Schedule F is based on the criteria established and applied in Warr et al. (2009), and the changes and updates contained within this report. The absence of a river or lake from this schedule does not necessarily preclude it from having a significant indigenous ecosystem. For example, new information may allow for additional rivers and lakes to be identified based on the criteria established in Warr et al. (2009) and in this report.

1.1 Background and report scope

Four criteria were used to identify rivers, streams and lakes with significant aquatic ecosystems listed in Table 16 of the RPS (GWRC 2013):

- 1) Rivers and streams with high macroinvertebrate health;
- 2) Rivers, streams and lakes that provide habitat for indigenous threatened/at risk fish species;
- 3) Rivers, streams and lakes that provide habitat for six or more migratory indigenous fish species; and
- 4) Rivers and streams that provide inanga spawning habitat.

Full details on the development and application of these criteria can be found in Warr et al. (2009).

Updating the list of rivers, stream and lakes with significant indigenous biodiversity values for inclusion in Schedule F of the dNRP did not involve any re-evaluation of the criteria previously developed in Warr et al. (2009) (ie, methods used to identify the criteria were not reviewed or updated). Instead, updates involved re-application of existing criteria using the latest information for the macroinvertebrate community health criterion and providing additional information for the rivers, streams and lakes already listed for the indigenous fish species criteria (habitat for indigenous threatened/at risk species and habitat for six or more migratory species). A number of corrections to errors in the original list in Table 16 of the RPS have also been made.

In addition to the update of Table 16 for its inclusion in Schedule F1, this report details the identification of lakes with significant aquatic plant communities. Lakes that meet this criterion are listed in Schedule F1c of the dNRP.

A table of known spawning and migration times for indigenous fish species is also included in Schedule F (Schedule F1b). The relevant technical background is documented separately in Perrie (2014).

1.2 Report outline

This report contains 4 sections:

- Sections 2 and 3 outline changes and updates made to the original list of rivers, streams and lakes listed in Table 16 or the RPS relating to sites with high macroinvertebrate community health and indigenous fish habitat (threatened/at risk species and six or more migratory species), respectively;
- Section 4 provides details on the methodology used to identify lakes with significant aquatic plant communities.

2. River and streams with high macroinvertebrate community health

This section provides a brief summary of the criteria relating to macroinvertebrate community health and its application in Warr et al. (2009). Changes made to Table 16 of the RPS for inclusion in Schedule F1 of the dNRP are also documented.

2.1 Criteria used in Warr et al. (2009)

Thresholds representing high macroinvertebrate health were identified for two macroinvertebrate metrics (MCI and the percentage of EPT taxa¹) (Table 2.1). The regression relationships between these macroinvertebrate metrics and indigenous forest and scrub cover in the upstream catchment (based on data from 78 river and stream sites in the Wellington region) were then used to identify indigenous forest and scrub cover thresholds corresponding to high macroinvertebrate health (Table 2.1). A lower indigenous forest and scrub vegetation cover threshold was identified for rivers and streams east of the Ruamahanga River to increase the representation of rivers and streams in the eastern Wairarapa (which have distinctive water quality and habitat characteristics due to the dominance of marine sedimentary geology).

The indigenous forest and scrub cover thresholds were used to predict rivers and streams with high macroinvertebrate community health across all river and stream catchments in the Wellington region.

Table 2.1: Macroinvertebrate metric thresholds and corresponding catchment indigenous forest and scrub cover thresholds used to identify rivers and streams with high macroinvertebrate health

Invertebrate metric	Significant river ecosystem threshold	Corresponding catchment indigenous forest and scrub cover threshold (%)	
		West of Ruamahanga River	East of Ruamahanga River
MCI	115	70	60
Proportion of EPT taxa (%)	50	70	60

The percentage cover of indigenous forest and scrub in river and stream catchments was estimated using the Land Cover Database (LCDB) version 1² (the LCDBv1 is based on imagery from 1996/97 (LCDB 2014)) and results compared to the criteria in Table 2.1. For most catchments indigenous forest and scrub cover was calculated at the fourth order or greater scale. However, for rivers and streams draining directly to the coast or lakes, indigenous forest and scrub cover was calculated for each catchment regardless of size.

Although not mentioned in Warr et al. (2009), any river and stream catchments with more than 5% cover of urban land use were precluded from the list of

¹ MCI = Macroinvertebrate Community Index, a biotic index that uses tolerance scores assigned to macroinvertebrate taxa based on their sensitivity to organic pollution to calculate a stream health score (Stark 1985). Although the MCI was originally formulated to represent the effects of organic pollution in hard-bottomed streams it has been shown to adequately represent a range of water quality and habitat impacts (apart from the effect of heavy metals). EPT taxa = Ephemeroptera, Plecoptera and Trichoptera taxa. These taxa are considered to be generally the most sensitive to pollution and habitat degradation.

² Although Warr et al. 2009 incorrectly states that LCDBv2 was used.

rivers and streams with high macroinvertebrate health. Both internationally and locally even small areas of urban land use in a catchment can result in a significant decrease in macroinvertebrate community health (Walsh et al. 2005; GWRC unpublished data). Catchments less than 300 hectares in area were also excluded except where they adjoin larger catchments that meet the criteria.

2.2 Changes made to Table 16 of the RPS for its inclusion in Schedule F1

An updated list of rivers and streams with high macroinvertebrate community health was produced by recalculating the proportion of indigenous forest and scrub cover in river and stream catchments using LCDB version 3 and comparing this with the criteria in Table 2.1. LCDBv3 was the most up-to-date land cover information available³ and is based on LUCAS satellite imagery from 2008/09 (LCDB 2014). The LCDBv3 vegetation categories used to calculate the proportion of indigenous forest and scrub in the upstream catchment were: indigenous forest, fernland, gorse and/or broom, manuka and/or kanuka, matagouri or grey scrub, broadleaved indigenous hardwoods, sub-alpine shrubland, mixed exotic shrubland, alpine grass/herbfield and tall tussock grassland.

Analysis was undertaken using ArcMap v10.1. A map of river and stream with catchments predicted to support high macroinvertebrate community health is included in Appendix 2.

Recalculation of indigenous forest and scrub cover using LCDBv3 resulted in a number of changes to the list of rivers and streams with high macroinvertebrate community health. In addition to rivers and streams being added or deleted due to changes in indigenous forest and scrub cover a number of errors in the original Table 16 of the RPS were corrected. In many cases these corrections involved the addition of small catchments that met the indigenous forest and scrub criteria but were omitted, in error, from Table 16. Key changes in Schedule F1 of the dNRP compared to Table 16 of the RPS are listed in Table 2.2.

Table 2.2: Key changes to the list of rivers with high macroinvertebrate health in Schedule F1 of the dNRP compared to Table 16 of the RPS

River/stream catchment	Nature of change	Reason for change
Oteranga Stream	Addition	Increase in indigenous forest/scrub cover
Gollans Stream	Addition	Increase in indigenous forest/scrub cover
Wainuiomata River below Black Stream confluence	Deletion	Error in Table 16 – this river has >5% urban land use in catchment
Waingawa River	Addition	Increase in indigenous forest/scrub cover
Ruamahanga River above Kopuaranga River confluence	Deletion	Decrease in indigenous forest/scrub cover
Tauanui River	Deletion	Decrease in indigenous forest/scrub cover
Oterei River	Deletion	Decrease in indigenous forest/scrub cover

³ LCDBv4 was released in June 2014 but was not available at the time this assessment was carried out.

3. Indigenous fish habitat

This section provides a brief summary of the criteria relating to indigenous fish habitat and their application in Warr et al. (2009). Changes made to Table 16 of the RPS for its inclusion in Schedule F1 of the dNRP are also documented.

3.1 Criteria used in Warr et al. (2009)

Warr et al. (2009) developed and applied three criteria to identify indigenous freshwater fish habitats of significance. The criteria used were:

- Habitat for indigenous threatened fish species;
- Habitat for six or more migratory indigenous fish species; and
- Inanga spawning habitat.

Indigenous fish criteria (excluding inanga spawning habitat) were applied at the same catchment scale as the macroinvertebrate community health criterion (see Section 2 and Warr et al. 2009). Given that the majority of the indigenous fish present in the Wellington region are diadromous (McDowall 2000; ie, they typically need to migrate between freshwater environments and the ocean to complete their lifecycles), the entire downstream reach of any catchment (or sub-catchment) identified was also considered significant in order to protect the migratory pathways of these species.

3.1.1 Habitat for indigenous threatened fish species

In Warr et al. (2009) catchments supporting threatened fish species were identified based on data held within NIWA's New Zealand Freshwater Fish database (NZFFD) for the period 1960 to 2008. Threatened species were defined as those listed in Hitchmough et al. (2007) that occur in the Wellington region: giant kokopu, longfin eel, dwarf galaxias, brown mudfish (all classed as "chronically threatened – gradual decline"), lamprey and shortjaw kokopu (both classed as "at risk – sparse"). However, two of these threatened species were excluded when applying this criterion to the region's rivers, streams and lakes for the following reasons:

- Brown mudfish are considered to be wetland specialists⁴ and are not commonly found in rivers, streams and lakes; and
- Longfin eel, despite being classified as threatened, are still the most widespread indigenous fish in the region (Perrie et al. 2012; Strickland & Quarterman 2001) and their inclusion would have resulted in the majority of rivers in the region being classified as ecologically significant.

3.1.2 Habitat for six or more migratory indigenous fish species

Catchments supporting six or more diadromous (migratory) species were identified based on data held within NIWA's NZFFD for the period 1960 to 2008. This approach was based on methodology used previously in the Wellington region by Strickland and Quarterman (2001).

⁴ An assessment of the aquatic values of wetlands was outside of the scope of Warr et al. (2009). Brown mudfish wetland habitat will be protected in the dNRP by giving effect to Policy 23 of the RPS.

The four non-diadromous (non-migratory) species found in the Wellington region (Cran's bully, upland bully, dwarf galaxias and brown mudfish) were excluded from this criterion. The two non-migratory bully species are distributed widely throughout the region and commonly co-occur with migratory species so it is considered that they will benefit from the protection of migratory species habitat. Dwarf galaxias were excluded as they are one of the species identified in the nationally threatened fish species criterion. Brown mudfish were not included as they are considered to be a wetland species³.

3.1.3 Inanga spawning habitat

Inanga spawning habitat listed in Warr et al. (2009) as ecologically significant was based on work documented in Taylor and Kelly (2001) and Taylor and Kelly (2002).

3.2 Changes made to Table 16 of the RPS for its inclusion in Schedule F1

The list of rivers, streams and lakes that met the criteria outlined in Section 3.1 has not been revised in Schedule F1 of the dNRP (ie, no re-application of the criteria has been undertaken and no sites have been added or deleted). However, to provide greater transparency of the selection process and to increase the usability of the table included in Schedule F1, a list of the indigenous fish species recorded in each catchment identified as meeting either the indigenous threatened species or the six or more migratory species criteria has been added.

All fish species recorded within a catchment identified in Schedule F1 have been listed regardless of whether they were used in the original criteria applied in Warr et al. (2009) to identify significant sites. However, the species lists presented should not be considered exhaustive (ie, they are based on data currently available), and it is likely that other species are also present in these catchments. Furthermore, some species, such as brown mudfish, are more likely to be found in wetlands rather than rivers and streams, but have been included for completeness if they have been recorded in a catchment. Diadromous (migratory) species and those classified as threatened or "at risk" (see below) are also identified.

Lists of species were generated based on data held in the NZFFD accessed in 2013 and were based on records from 1960 to 2013. Threatened species were identified using the most recent classification in Goodman et al. (2014) and species considered "nationally vulnerable" and "at risk" have both been indicated. There are a number of differences in the species classified between Hitchmough et al. (2007), which was used in Warr et al. (2009), and those classified in Goodman et al. (2014); these differences are summarised in Table 3.1.

A map of river, stream and lakes catchments that meet the two indigenous fish habitat criteria listed in Schedule F1 is included in Appendix 2.

Table: 3.1: Comparison of the conservation status of freshwater fish presented in Warr et al. (2009), based on Hitchmough et al. (2007), and the revised classifications in Goodman et al. (2014). Species that occur in the Wellington region but are classed as “not threatened” in Goodman et al. (2014) are not shown

Species	Conservation status	
	Hitchmough et al. (2007) as used in Warr et al. (2009)	Goodman et al. (2014)
Longfin eel	“Chronically threatened – gradual decline”	“At risk”
Lamprey	“At risk – sparse”	“Nationally vulnerable”
Giant kokopu	“Chronically threatened – gradual decline”	“At risk”
Shortjaw kokopu	“At risk – sparse”	“Nationally vulnerable”
Koaro	No status	“At risk”
Inanga	No status	“At risk”
Dwarf galaxias	“Chronically threatened – gradual decline”	“At risk”
Brown mudfish	“Chronically threatened – gradual decline”	“At risk”
Redfin bully	No status	“At risk”
Bluegill bully	No status	“At risk”
Torrentfish	No status	“At risk”

4. Lakes with significant aquatic plant communities

This section summarises two methods, LakeSPI (Submerged Plant Index) and a desktop assessment, used to identify lakes in the Wellington region with significant aquatic plant communities. An assessment of aquatic plant communities in lakes in the Wellington region was not carried out in Warr et al. (2009) because there was limited information available at the time.

4.1 LakeSPI

LakeSPI, developed by Clayton and Edwards (2006), is an index of ecological condition based on key features of macrophyte community structure and composition. Application of the LakeSPI method involves scuba divers assessing 11 metrics over a 2 m wide transect from the shore to the deepest vegetation limit at several sites which are representative of the lake. Metrics include measures of diversity from the presence of key of plant communities, the depth of vegetation growth, and the extent that invasive weeds are represented.

These metrics are condensed into three indices expressed as a percentage of expected pristine state:

- A native condition index (ie, the diversity and quality of the indigenous flora);
- An invasive condition index (ie, the degree of impact by invasive weed species); and
- An overall LakeSPI index that synthesises components of both the native condition and invasive condition indices to provide an overall indication of lake ecological condition.

LakeSPI assessments were undertaken in 2011 in Lakes Kohangapiripiri, Kohangatera and Pounui and again in 2013 in Lake Kohangatera (de Winton 2013; de Winton et al. 2011). Results from these assessments are summarised in Table 4.1.

Table 4.1: Summary of LakeSPI results for lakes Kohangapiripiri and Kohangatera and Pounui based on assessments reported in de Winton (2013) and de Winton et al. (2011). Results for Lake Kohangatera, the only lake surveyed in 2013, are presented in brackets. National ranks are based on LakeSPI assessments undertaken in over 200 lakes across New Zealand

Lake	Kohangapiripiri	Kohangatera	Pounui
LakeSPI index (%) & "ecological condition"	63: "High"	89: "Excellent" (87: "Excellent")	56: "High"
Native condition index (%)	73	83 (83)	65
Invasive impact index	38	5 (8.1)	44
National rank	47 th	10 th (9 th)	66 th

All six key native submerged plant community types recognised by LakeSPI were present in all three lakes and a diverse range of native vegetation was found extending across the lake beds in Lakes Kohangapiripiri and Kohangatera, and to depths of almost 5 m in Lake Pounui. Regionally rare

and/or nationally threatened plant species were also present in each lake (de Winton & Champion 2014; de Winton 2013; de Winton et al. 2011). The very high aquatic vegetation values recorded collectively for Lakes Kohangapiripiri and Kohangatera led de Winton et al. (2011) to conclude that these lakes were nationally outstanding examples of lowland lagoon systems.

4.2 Desktop assessment of aquatic plant values

In 2014 GWRC commissioned a desktop assessment of known submerged aquatic vegetation values for lakes in the Wellington region. This assessment, documented in full in de Winton and Champion (2014), included the establishment of scientifically robust and transparent assessment criteria and a ranking system to score each lake. Expert knowledge and a national overview were used by de Winton and Champion (2014) to identify seven assessment criteria (with a scoring system then developed for each):

- Habitat size – larger and deeper lakes tend to be more resilient
- Connectivity – linkages with other wetlands and lakes increase the effective habitat area
- Key species – eg, presence of freshwater mussels that assist with maintaining water quality
- Buffering – extent of shoreline vegetation and amount of native vegetation catchment cover
- Diversity – indicated by high native species richness and representation across a number of functional plant groups (eg, emergent, vascular, floating)
- Integrity – proportion of the submerged vegetated littoral (ie, near shore) zone occupied by native submerged plants
- Rarity – presence of endangered species (eg, nationally endangered, at risk, etc.)

To determine which lakes should be recognised as outstanding⁵ and regionally significant, de Winton and Champion (2014) drew on NIWA's Aquatic Plant Database which comprises information from over 915 submerged surveys encompassing 380 lakes across New Zealand. A score of >25 was deemed the cut-off for "outstanding". For determination of regionally significant lakes, de Winton and Champion (2014) recommended that this be based on the top ranking lakes (eg, top 10–20%) from an assessment of a range of lakes in the region.

Based on the application of the criteria outlined above for 11 lakes (one being the Upper Karori Reservoir, an artificial waterbody) where information was available to enable an assessment, the top three ranked lakes were (in order from highest to lowest and excluding provisional ranks⁶) Lake Kohangatera,

⁵ The National Policy Statement for Freshwater Management (NPS-FM, MfE 2014) requires the outstanding values of water bodies to be identified and protected.

⁶ The assessment undertaken in de Winton and Champion (2014) also provisionally identified two other water bodies (Lake Wairarapa and Matthews Lagoon) with higher ranks than Lake Pounui. However, given that these were provisional ranks and insufficient information currently exists to enable a robust assessment against all criteria (ie, some assumptions had to be made) these two water bodies have not been identified as significant in Schedule F1c.

Lake Kohangapiripiri and Lake Pounui. Lakes Kohangapiripiri and Kohangatera also scored above the threshold for “outstanding”⁷ aquatic vegetation values.

Based on the scoring and ranking system used in de Winton and Champion (2014), Lake Pounui was only rated as having “moderate” aquatic vegetation values. However, as this lake scored only just below the “high” rating threshold (and 3rd overall rank) and is the only lake in the region known to support a population of *Isoetes kirkii*⁸, Lake Pounui should still be classified as regionally significant for its aquatic vegetation values.

4.3 Lakes identified as having significant aquatic plant communities

Based on the LakeSPI assessments and the assessment undertaken to analyse and rank the relative aquatic plant values of lakes in region (as outlined above), Lakes Kohangapiripiri, Kohangatera and Pounui can all be considered to have (at minimum) regionally significant aquatic plant communities. As such, all three lakes are included in Schedule F1c of the dNRP. A map of lakes that meet the aquatic plant criteria listed in Schedule F1c is included in Appendix 2.

It is worth noting that all three of the lakes identified in Schedule F1c as having regionally significant aquatic plant communities were already identified in Table 16 of the RPS (and hence Schedule F1 of the dNRP) based on criteria relating to indigenous fish habitat.

⁷ Lakes with outstanding aquatic vegetation values are listed in Schedule A2 of the dNRP.

⁸ Other regional populations of *Isoetes kirkii*, which is classified as “at risk: declining” (de Lange et al. 2013), have gone extinct (de Winton & Champion 2014).

References

- Clayton J and Edwards T. 2006. *LakeSPI – A method for monitoring ecological condition in New Zealand lakes*. Technical report, version two. Ministry for the Environment, Wellington.
- de Lange P, Rolfe J, Champion P, Courtney S, Heenan P, Barkla J, Cameron E, Norton D and Hitchmough R. 2013. *Conservation status of New Zealand indigenous vascular plants, 2012*. New Zealand Threat Classification Series 3. Department of Conservation, Wellington. 70 p.
- de Winton M and Champion P. 2014. *Submerged vegetation-based criteria for lakes in the Wellington region*. Report No. HAM2014-058 prepared for Greater Wellington Regional Council by NIWA, Hamilton.
- de Winton M, Champion P and Wells R. 2011. *LakeSPI assessment of the Parangarau Lakes and Lake Pounui with reference to management of ecological values*. Report No. HAM2011-038 prepared for Greater Wellington Regional Council by NIWA, Hamilton.
- de Winton M. 2013. *LakeSPI survey of Lake Kohangatera – 2013*. Report No. HAM2013-052 prepared for Greater Wellington Regional Council by NIWA, Hamilton.
- Goodman J, Dunn N, Ravenscroft P, Allibone R, Boubee J, David B, Griffiths M, Ling N, Hitchmough R and Rolfe J. 2014. *New Zealand Threat Classification Series 7*. Department of Conservation, Wellington.
- GWRC. 2013. *Regional Policy Statement for the Wellington region*. Greater Wellington Regional Council Publication No. GW/EP-G-13/21, Wellington.
- GWRC. 2014. *Draft Natural Resources Plan for the Wellington region – Te Tikanga Taiao o Te Upoko o Te Ika a Maui*. Greater Wellington Regional Council, Publication No. GW/EP-G-14/87, Wellington.
- Hitchmough R, Bull L and Cromarty P. 2007. *New Zealand threat classification system lists – 2005*. Threatened Species Occasional Publication 24.
- LCDB. 2014. *About LCDB*. Retrieved from <http://www.lcdb.scinfo.org.nz/about-lcdb> (accessed September 2014).
- McDowall R. 2000. *The Reed field guide to New Zealand freshwater fishes*. Reed publishing, Auckland.
- Ministry for the Environment. 2014. *National Policy Statement for Freshwater Management 2014*. Publication No. ME1155, Ministry for the Environment, Wellington.
- Perrie A. 2014. *Indigenous fish spawning and migration calendar for the Wellington region: Background documentation for Schedule F1a of the draft Natural Resources Plan*. Unpublished internal memorandum (Document #1237184), Greater Wellington Regional Council, Wellington.

Perrie A, Morar S, Milne JR and Greenfield S. 2012. *River and stream water quality and ecology in the Wellington region: State and trends*. Greater Wellington Regional Council, Publication No. GW/EMI-T-12/143, Wellington.

Stark JD. 1985. *A macroinvertebrate community index of water quality for stony streams*. Water & Soil Miscellaneous Publication, 87. National Water and Soil Conservation Authority, Wellington.

Strickland R and Quarterman A. 2001. *Review of freshwater fish in the Wellington region*. Prepared for Wellington Regional Council.

Taylor M and Kelly G. 2001. *Inanga spawning habitats in the Wellington region. Part 1*. NIWA Client Report CHC01/67.

Taylor M and Kelly G. 2002. *Inanga spawning habitats in the Wellington region. Part 2*. NIWA Client Report CHC01/67.

Walsh C, Roy A, Feminella J, Cottingham P, Groffman P and Morgan R. 2005. The urban stream syndrome: current knowledge and the search for a cure. *Journal of the North American Benthological Society*, 24(3): 706-723.

Warr S, Perrie A and McLea M. 2009. *Selection of rivers and lakes with significant indigenous ecosystems*. Greater Wellington Regional Council, Publication No. GW/EP-G-09/29, Wellington.

Wells R, Taumoepeau A and de Winton M. 2011. *Delimitation of weed incursions in Lake Kohangatera*. Report prepared for Greater Wellington Regional Council by NIWA, Hamilton.

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Appendix 1: Schedule F of the draft Natural Resources Plan

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
All rivers on Kapiti Island	All rivers				
Waitohu Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>black flounder</i> , <u><i>brown mudfish</i></u> , <i>common bully</i> , <i>common smelt</i> , <u><i>giant kokopu</i></u> , <u><i>inanga</i></u> , <u><i>koaro</i></u> , <u><i>lamprey</i></u> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> , <u><i>shortjaw kokopu</i></u> , <u><i>torrentfish</i></u> and upland bully
Otaki River	River and all tributaries	River and all tributaries	River and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>common bully</i> , <u><i>dwarf galaxias</i></u> , <u><i>giant kokopu</i></u> , <u><i>koaro</i></u> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> , <u><i>shortjaw kokopu</i></u> and <u><i>torrentfish</i></u>
Mangaone Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>common bully</i> , <u><i>inanga</i></u> , <u><i>koaro</i></u> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> , <u><i>shortjaw kokopu</i></u> and upland bully
Waimeha Stream (Ngarara Stream)		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>common bully</i> , Cran's bully, <i>giant bully</i> , <u><i>giant kokopu</i></u> , <u><i>inanga</i></u> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> and <u><i>shortfin eel</i></u>
Waikanae River	River and all tributaries above, and including the Ngatiawa Stream	River and all tributaries	River and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <u><i>bluegill bully</i></u> , <u><i>brown mudfish</i></u> , <i>common bully</i> , <i>common smelt</i> , <u><i>dwarf galaxias</i></u> , <u><i>giant bully</i></u> , <u><i>giant kokopu</i></u> , <u><i>inanga</i></u> , <u><i>koaro</i></u> , <u><i>lamprey</i></u> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> , <u><i>shortjaw kokopu</i></u> and <u><i>torrentfish</i></u>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Wharemauku Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> and <i>shortjaw kokopu</i>
Whareroa Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>common bully</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>koaro</i> , <i>lamprey</i> , <i>longfin eel</i> , <i>redfin bully</i> and <i>shortfin eel</i>
Wainui Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu</i> , <i>common bully</i> , <i>giant kokopu</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> and <i>torrentfish</i>
Taupō Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>longfin eel</i> , <i>redfin bully</i> and <i>shortfin eel</i>
Kākaho Stream			Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>common bully</i> , <i>common smelt</i> , <i>giant bully</i> , <i>grey mullet</i> , <i>inanga</i> , <i>longfin eel</i> , <i>redfin bully</i> and <i>shortfin eel</i>
Horokiri Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu</i> , <i>black flounder</i> , <i>common bully</i> , <i>common smelt</i> , <i>giant bully</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>koaro</i> , <i>lamprey</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> , <i>shortjaw kokopu</i> and <i>torrentfish</i>
Little Waitangi Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu</i> , <i>common bully</i> , <i>common smelt</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>lamprey</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> and <i>shortjaw kokopu</i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Pauatahanui Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu, common bully, common smelt, <u>giant kokopu, inanga, lamprey, longfin eel, redfin bully</u> and shortfin eel</i>
Duck Creek		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu, common bully, common smelt, <u>giant kokopu, inanga, koaro, lamprey, longfin eel, redfin bully</u> and shortfin eel</i>
Porirua Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu, common bully, common smelt, <u>giant kokopu, inanga, koaro, longfin eel, redfin bully, shortfin eel</u> and upland bully</i>
Makara Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu, black flounder, <u>bluegill bully, common smelt, giant kokopu, inanga, koaro lamprey, longfin eel, redfin bully, shortfin eel</u> and upland bully</i>
Un-named stream draining to the sea at easting 2649512, northing 5994279	Stream and all tributaries				
Un-named stream draining to the sea at easting 2645858 and northing 5992248	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Un-named stream draining to the sea at easting 2645291 and northing 5990776	Stream and all tributaries				
Oteranga Stream	Stream and all tributaries		Stream and all tributaries		<i>Banded kokopu, common smelt, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortfin eel</u></i>
Karori Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu, <u>inanga</u>, <u>koaro</u>, <u>lamprey</u>, <u>longfin eel</u>, <u>shortfin eel</u> and upland bully</i>
Ōwhiro Stream		Stream and all tributaries	Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu, common bully, <u>giant kokopu</u>, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u>, <u>shortfin eel</u> and <u>shortjaw kokopu</u></i>
Kaiwharawhara Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu, <u>bluegill bully</u>, common bully, giant bully, <u>giant kokopu</u>, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u>, <u>shortfin eel</u> and <u>shortjaw kokopu</u></i>
Korokoro Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu, <u>bluegill bully</u>, common bully, common smelt, <u>giant kokopu</u>, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortfin eel</u></i>
Hutt River	River and all tributaries above and including the Pakuratahi River	Hutt River	Hutt River	Reach of tidal influence	<i><u>Bluegill bully</u>, common bully, Cran's bully, <u>dwarf galaxias</u>, <u>giant bully</u>, <u>giant kokopu</u>, <u>inanga</u>, <u>koaro</u>, <u>lamprey</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortfin eel</u></i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributary of the Hutt River entering at easting 2674784 and northing 6002825	Stream and all tributaries				
Speedy's Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu, bluegill bully, common bully, giant bully, giant kokopu, lamprey, longfin eel, redfin bully and shortfin eel</i>
Moonshine Stream		Stream and all tributaries			<i>Giant kokopu, inanga, longfin eel, redfin bully and shortfin eel.</i>
Whakatikei River	River and all tributaries above the Wainui Stream				
Akatarawa River	River and all tributaries	River and all tributaries	River and all tributaries		<i>Banded kokopu, bluegill bully, Cran's bully, dwarf galaxias, koaro, lamprey, longfin eel, redfin bully and shortfin eel</i>
Unnamed tributary of the Hutt River entering at easting 2690210 and northing 6013188	Stream and all tributaries				
Kororipo stream	Stream and all tributaries				
Pakuratahi River	River and all tributaries	River and all tributaries			<i>Bluegill bully, Cran's bully, dwarf galaxias, koaro, longfin eel, redfin bully, shortfin eel and upland bully</i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributary of the Hutt River entering at easting 2691469 and northing 6013778	Stream and all tributaries				
Putaputa stream	Stream and all tributaries				
Unnamed tributary of the Hutt River entering at easting 2693097 and northing 6014646	Stream and all tributaries				
Unnamed tributary of the Hutt River entering at easting 2693768 and northing 6014080	Stream and all tributaries				
Unnamed tributary of the Hutt River entering at easting 2692117 and northing 6013637	Stream and all tributaries				
Stokes Valley Stream		Stream and all tributaries			<i>Banded kokopu, common bully, <u>giant kokopu</u>, <u>longfin eel</u> and <u>shortfin eel</u>.</i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributary of the Hutt River entering at easting 2690091 and northing 6011887	Stream and all tributaries upstream of Te Marua Lakes				
Days Bay Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu, bluegill bully, inanga, koaro, longfin eel, redfin bully, shortfin eel and shortjaw kokopu</i>
Unnamed stream draining to the sea at 2666404, northing 5984867	Stream and all tributaries				
Lake Kōhangapiripiri and Cameron Creek		Lake Kōhangapiripiri and tributaries			<i>Common bully, giant bully and giant kokopu</i>
Lake Kōhangatera and Gollans Stream	Gollans Stream	Lake Kōhangatera, Gollans Stream and all tributaries	Lake Kōhangatera, Gollans Stream and all tributaries		<i>Banded kokopu, common bully, giant bully, giant kokopu, inanga, lamprey, longfin eel and redfin bully and shortfin eel</i>
Paiaka stream	Stream and all tributaries				
Wainuiomata River	River and all tributaries above Black Creek	River and all tributaries excluding Black Creek	River and all tributaries excluding Black Creek	Reach of tidal influence	<i>Banded kokopu, bluegill bully, common bully, dwarf galaxias, giant bully, giant kokopu, inanga, koaro, lamprey, longfin eel, redfin bully, shortfin eel and shortjaw kokopu</i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributary of the Wainuiomata River entering at easting 2668685 and northing 5981853	Stream and all tributaries				
Unnamed tributaries of the Wainuiomata River entering between easting 2669728 and northing 5984761 and easting 2669736 and northing 5983420	Streams and all tributaries				
Unnamed tributaries of the Wainuiomata River entering between easting 2672166 and northing 5987830 and easting 2670659 and northing 5985726	Streams and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributaries of the Wainuiomata River entering between easting 2673042 and northing 5990552 and easting 2672867 and northing 5988579	Streams and all tributaries				
Unnamed tributaries of the Wainuiomata River entering between easting 2671942 and northing 5987120 and easting 2673216 and northing 5987766	Streams and all tributaries				
Unnamed tributary of the Wainuiomata River entering at easting 2671083 and northing 5985483	Stream and all tributaries				
Unnamed tributary of the Wainuiomata River entering at easting 2670271 and northing 5984975	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributaries of the Wainuiomata River entering between easting 2670171 and northing 5982830 and easting 2670163 and northing 5983286	Streams and all tributaries				
Unnamed tributary of the Wainuiomata River entering at easting 2668707 and northing 5980412	Stream and all tributaries				
Unnamed tributary of the Wainuiomata River entering at easting 2667356 and northing 5977421	Stream and all tributaries				
Orongorongo River	River and all tributaries	River and all tributaries	River and all tributaries		<i>Banded kokopu</i> , <i>bluegill bully</i> , <i>common smelt</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> and <i>shortfin eel</i>
Un-named stream draining to the sea at easting 2669723 and northing 5973340	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Waimarara Stream	Stream and all tributaries				
Un-named stream draining to the sea at easting 2671823 and northing 5974316	Stream and all tributaries				
Barney's Stream	Stream and all tributaries				
Un-named stream draining to the sea at easting 2672936 and northing 5975150	Stream and all tributaries				
Un-named stream draining to the sea at easting 2674460 and northing 5975740	Stream and all tributaries				
Un-named stream draining to the sea at easting 2674066 and northing 5975699	Stream and all tributaries				
Mukamukaiti Stream	Stream and all tributaries	Stream and all tributaries			<i>Banded kokopu, <u>inanga</u>, koaro, <u>longfin eel</u> and <u>shortjaw kokopu</u></i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed streams draining to the sea between easting 2677227 and northing 5977782 and easting 2676385 and northing 5977393	Streams and all tributaries				
Mukamuka Stream	Stream and all tributaries				
Unnamed streams draining to the sea between easting 2679406 and northing 5978442 and easting 2680553 and northing 5979372	Streams and all tributaries				
Corner Creek	Creek and all tributaries				
Un-named stream draining to the sea at easting 2681684 and northing 5979619	Stream and all tributaries				
Wharekauhau Stream	Stream and all tributaries				
Wharepapa River	River and all tributaries	River and all tributaries			<i><u>Bluegill bully</u></i> , <i><u>dwarf galaxias</u></i> , <i><u>koaro</u></i> , <i><u>longfin eel</u></i> <i><u>redfin bully</u></i> and <i><u>torrentfish</u></i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Pounui Stream and Lake Pounui	All tributaries above Lake Pounui	Stream and all tributaries, including Lake Pounui	Stream and all tributaries, including Lake Pounui		<i>Banded kokopu</i> , <u><i>brown mudfish</i></u> , <i>common bully</i> , <i>common smelt</i> , <u><i>giant kokopu</i></u> , <i>inanga</i> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> and <u><i>torrentfish</i></u>
Battery Stream	Stream and all tributaries	Stream and all tributaries			<u><i>Longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> , <u><i>shortjaw kokopu</i></u> and <u><i>torrentfish</i></u>
Unnamed tributary of Boundary Creek entering at easting 2688215 and northing 5984460	Stream and all tributaries				
Lake Wairarapa		Lake Wairarapa	Lake Wairarapa		<i>Banded kokopu</i> , <i>black flounder</i> , <i>common bully</i> , <i>common smelt</i> , <u><i>giant kokopu</i></u> , <i>grey mullet</i> , <u><i>inanga</i></u> , <u><i>lamprey</i></u> , <u><i>longfin eel</i></u> , <i>shortfin eel</i> and <u><i>torrentfish</i></u>
Waiorongomai River	River and all tributaries				
Burlings Stream		Stream and all tributaries	Stream and all tributaries		<u><i>bluegill bully</i></u> , <i>common bully</i> , <u><i>inanga</i></u> , <u><i>koaro</i></u> , <u><i>lamprey</i></u> , <u><i>longfin eel</i></u> , <u><i>redfin bully</i></u> , <u><i>shortfin eel</i></u> and <u><i>torrentfish</i></u>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed tributaries of Lake Wairarapa entering between easting 2692884, northing 5996151 and easting 2694063, northing 5996975	All rivers				
Brocketts Stream	Stream and all tributaries		Stream and all tributaries		<i>Banded kokopu, <u>bluegill bully</u>, common bully, <u>longfin eel</u>, <u>redfin bully</u>, <u>shortfin eel</u> and <u>torrentfish</u></i>
Unnamed tributary of Lake Wairarapa entering at easting 269233, northing 5998772	Stream and all tributaries				
Unnamed tributary of Lake Wairarapa entering at easting 2697398, northing 5999542	Stream and all tributaries				
Cross Creek	Creek and all tributaries				
Owhanga Stream	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Abbotts Creek	Creek and all tributaries	Creek and all tributaries			<i>Common bully, common smelt, Cran's bully, <u>giant kokopu, longfin eel</u> and shortfin eel.</i>
Tauherenikau River	River and all tributaries	River and all tributaries	River and all tributaries		<i>common bully, common smelt, <u>dwarf galaxias, giant bully, inanga, lamprey, longfin eel, redfin bully, shortfin eel</u> and <u>torrentfish</u></i>
Ruamahanga River		River and all tributaries above, but not including the Kopuaranga River	River and all tributaries above, but not including the Kopuaranga River	Reach of tidal influence	<i><u>Banded kokopu, bluegill bully, brown mudfish, common bully, common smelt, Cran's bully, giant kokopu, koaro, lamprey, longfin eel, redfin bully, shortfin eel, torrentfish</u> and upland bully</i>
Waiohine River up to, and including, the Mangatarere Stream		River and all tributaries	River and all tributaries		<i><u>Brown mudfish, common bully, Cran's bully, dwarf galaxias, giant kokopu, inanga, lamprey, longfin eel, redfin bully, shortfin eel, torrentfish</u> and upland bully</i>
Waiohine River above, but not including, the Mangatarere stream	River and all tributaries above the Mangatarere River	River and all tributaries	River and all tributaries		<i><u>Common bully, lamprey, longfin eel, redfin bully, shortfin eel, torrentfish</u> and upland bully</i>
Waingawa River	River and all tributaries				
Waipoua River		River and all tributaries	River and all tributaries		<i><u>Brown mudfish, common bully, common smelt, Cran's bully, dwarf galaxias, inanga, lamprey, longfin eel, redfin bully, shortfin eel, torrentfish</u> and upland bully</i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Ruakokopātuna River		River and all tributaries			<i>Common bully</i> , <i>giant kokopu</i> , <i>longfin eel</i> , <i>shortfin eel</i> , <i>torrentfish</i> and upland bully
Waihora Stream	Stream and all tributaries	Stream and all tributaries			<u>Dwarf galaxias</u> , <u>longfin eel</u> and upland bully
Parapara Stream		Stream and all tributaries			<u>Giant kokopu</u>
Whangaehu Stream		Stream and all tributaries			<i>Banded kokopu</i> , <i>giant kokopu</i> , <i>longfin eel</i> and upland bully
Tauanui Stream		Stream and all tributaries	Stream and all tributaries		<i>Common bully</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> , <i>torrentfish</i> and upland bully
Turanganui River		River and all tributaries	River and all tributaries		<i>Banded kokopu</i> , <i>common bully</i> , <i>common smelt</i> , <i>giant kokopu</i> , <i>inanga</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> , <i>torrentfish</i> and upland bully
Hurupi Stream	Stream and all tributaries				
Unnamed river draining at easting 2695430, northing 5970948	Stream and all tributaries				
Putangirua Stream	Stream and all tributaries		Stream and all tributaries		<i>Banded kokopu</i> , <i>common bully</i> , <i>inanga</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> and <i>torrentfish</i>
Te Ika Pakeke	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Whatarangi Stream	Stream and all tributaries				
Wakapirihika Stream	Stream and all tributaries				
Makatukutuku Stream	Stream and all tributaries	Stream and all tributaries			<i>Common bully, koaro, longfin eel, redfin bully, and shortjaw kokopu</i>
Pararaki Stream	Stream and all tributaries	Stream and all tributaries			<i>Giant kokopu, koaro, longfin eel, redfin bully, and shortjaw kokopu</i>
Otakaha Stream	Stream and all tributaries	Stream and all tributaries			<i>Banded kokopu, Cran's bully, koaro, longfin eel, redfin bully, shortjaw kokopu</i> and upland bully
Waiahero Stream	Stream and all tributaries				
Mangatoetoe Stream	Stream and all tributaries				
Little Mangatoetoe	Stream and all tributaries				
Unnamed stream draining to the sea at easting 2699931, northing 5952563	Stream and all tributaries				
Kirikiri Stream	Stream and all tributaries				
Te Roro Stream	Stream and all tributaries				
Waitetuna Stream	Stream and all tributaries	Stream and all tributaries			<i>Koaro, longfin eel, redfin bully and shortjaw kokopu</i>

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed streams draining to the sea between easting 2706907, northing 5956382 and easting 2704414, northing 5953691	Streams and all tributaries				
Waiarakeke Stream	Stream and all tributaries				
Unnamed stream draining to the sea at easting 2630771, northing 5970382	Stream and all tributaries				
Whawanui River	River and all tributaries	River and all tributaries	River and all tributaries		<i>Banded kokopu, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortjaw kokopu</u></i>
Opouawe River	River and all tributaries	River and all tributaries			<i><u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortjaw kokopu</u></i>
Oroi Stream	Stream and all tributaries				
Pukemuri Stream	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Awhea River	Unnamed tributaries of the Awhea River entering between easting 2720619, northing 5969714 and easting 2720420, northing 5967801		River and all tributaries		<i>Common bully, common smelt, Cran's bully, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortfin eel</u></i>
Oterei River		River and all tributaries	River and all tributaries	Reach of tidal influence	<i>Banded kokopu, common bully, <u>giant kokopu</u>, <u>inanga</u>, <u>koaro</u>, <u>longfin eel</u>, <u>redfin bully</u> and <u>shortjaw kokopu</u></i>
Hapukura Stream	Stream and all tributaries				
Unnamed stream draining to the sea at easting 2730771, northing 5970382	Stream and all tributaries				
Okoropunga Stream	Stream and all tributaries				
Unnamed stream draining to the sea at easting 2732180, northing 5971870	Stream and all tributaries				
Unnamed stream draining to the sea at easting 2734914, northing 5974195	Stream and all tributaries				
Devils creek	All rivers				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Pahaoa River	Orepu Creek and all tributaries			Reach of tidal influence	
	Unnamed tributary of the Pahaoa River draining at easting 2736097, northing 5978693				
	Teneriffe Creek				
	Makahiki Stream				
	Unnamed tributary of the Pahaoa River draining at easting 2736920, northing 5989397				
	Mangatoi Creek				
	Unnamed tributary of the Pahaoa River draining at easting 2734370, northing 5981080				
	Unnamed tributary of the Pahaoa River draining at easting 2736018, northing 5980915				
	Moy Hill Creek				
	Unnamed tributary of the Pahaoa River draining at easting 2736747, northing 5978733				

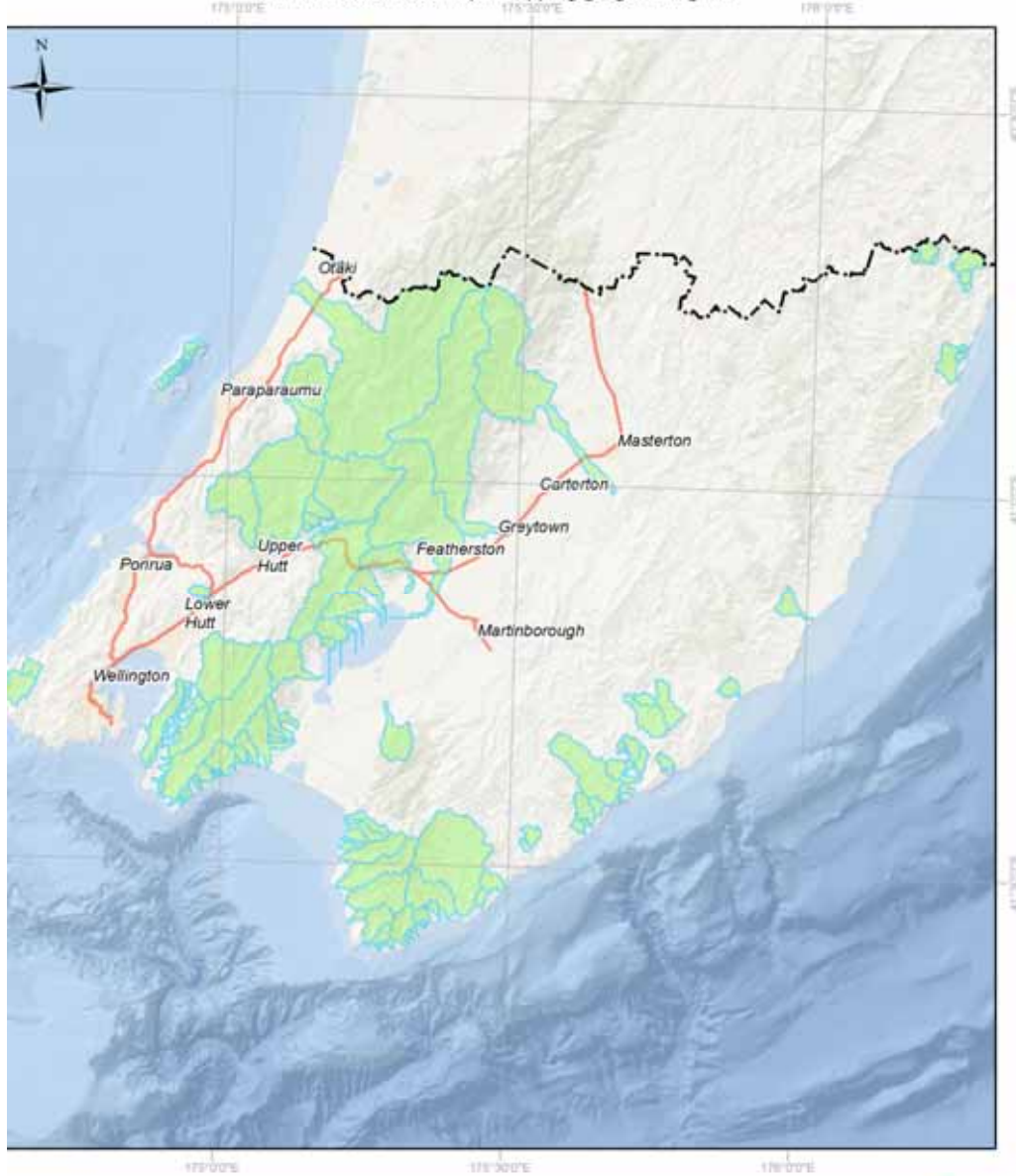
River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
	Unnamed tributary of the Pahaoa River draining at easting 2737610, northing 5977780				
Glendu Rocks Stream	Stream and all tributaries				
Waiuru Stream	Stream and all tributaries				
Huatokitoki Stream	Stream and all tributaries				
Kaimokopuna Stream	Stream and all tributaries				
Motuwaireka Stream			Stream and all tributaries	Reach of tidal influence	<i>Banded kokopu, inanga, koaro, longfin eel, redfin bully and shortfin eel</i>
Whareama River		River and all tributaries	River and all tributaries	Reach of tidal influence	<i>Common bully, Cran's bully, <u>giant kokopu</u>, inanga, lamprey, longfin eel and shortfin eel</i>
Castlepoint Stream		Stream and all tributaries	Stream and all tributaries		<i>Banded kokopu, black flounder, common bully, inanga, koaro, lamprey, longfin eel and redfin bully</i>
Whakataki River			River and all tributaries	Reach of tidal influence	<i>Black flounder, common bully, inanga, koaro, longfin eel, redfin bully, shortfin eel and torrentfish</i>
Okau Stream	Stream and all tributaries				

River or Lake	Criteria that identify rivers and lakes with significant indigenous ecosystems				Indigenous fish species recorded in catchment (Migratory species are indicated in italics and the conservation status of "At Risk" and "Nationally Vulnerable" species are underlined and in bold, respectively)
	High macroinvertebrate community health	Habitat for indigenous threatened/ at risk fish species	Habitat for six or more migratory indigenous fish species	Inanga spawning habitat	
Unnamed rivers draining to the coast between easting 2784666, northing 6038022 and easting 2784952, northing 6039543	All rivers				
Mataikona River	Unnamed tributaries of the Pakowai River between easting 2777622, northing 6051767 and easting 2779991, northing 6051457		Rivers and all tributaries	Reach of tidal influence	<i>Common bully</i> , <i>common smelt</i> , <i>inanga</i> , <i>koaro</i> , <i>longfin eel</i> , <i>redfin bully</i> , <i>shortfin eel</i> , <u><i>torrentfish</i></u> and upland bully
	Unnamed tributaries on the true left bank of the Mataikona River between easting 2782558, northing 6050863 and easting 2784470, northing 6047666				

Appendix 2: Maps of river, stream and lake catchments listed in Schedule F1 as well as lakes listed in Schedule F1c

Rivers and lakes with significant indigenous ecosystems: high macroinvertebrate community health (Schedule F1) Map 13a

For more details see <http://mapping.gw.govt.nz/gwrc/>



--- Region boundary line — State Highways

■ Catchments with high macroinvertebrate health



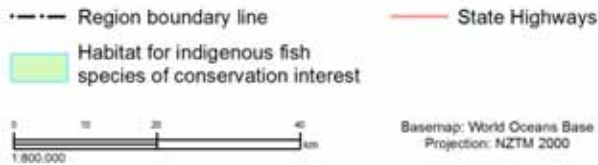
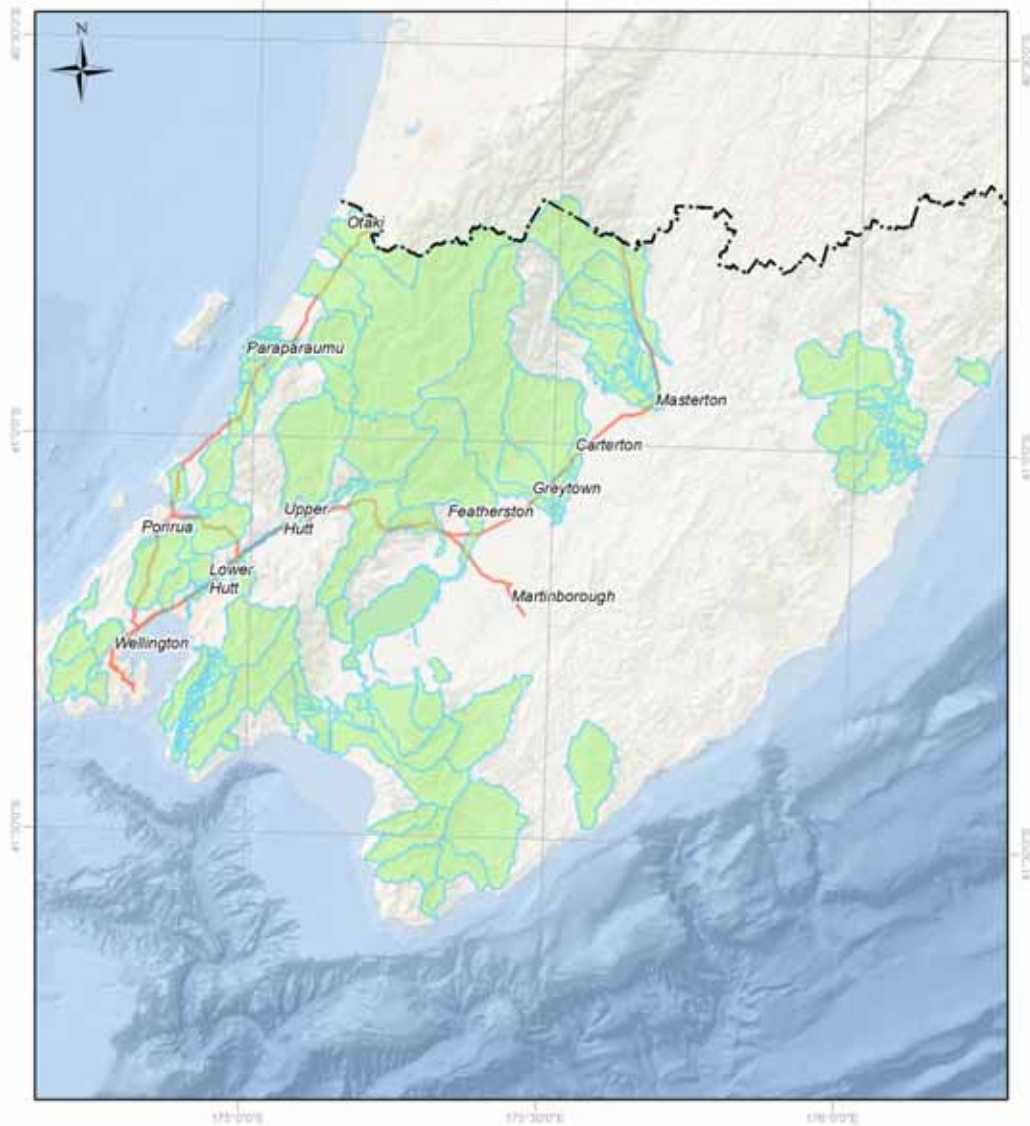
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Rivers and lakes with significant indigenous ecosystems: Habitat for indigenous fish species of conservation interest (Schedule F1) Map 13b

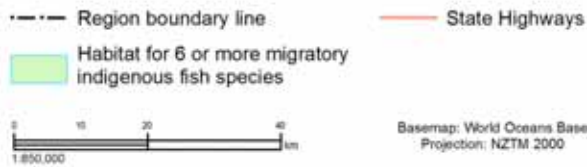
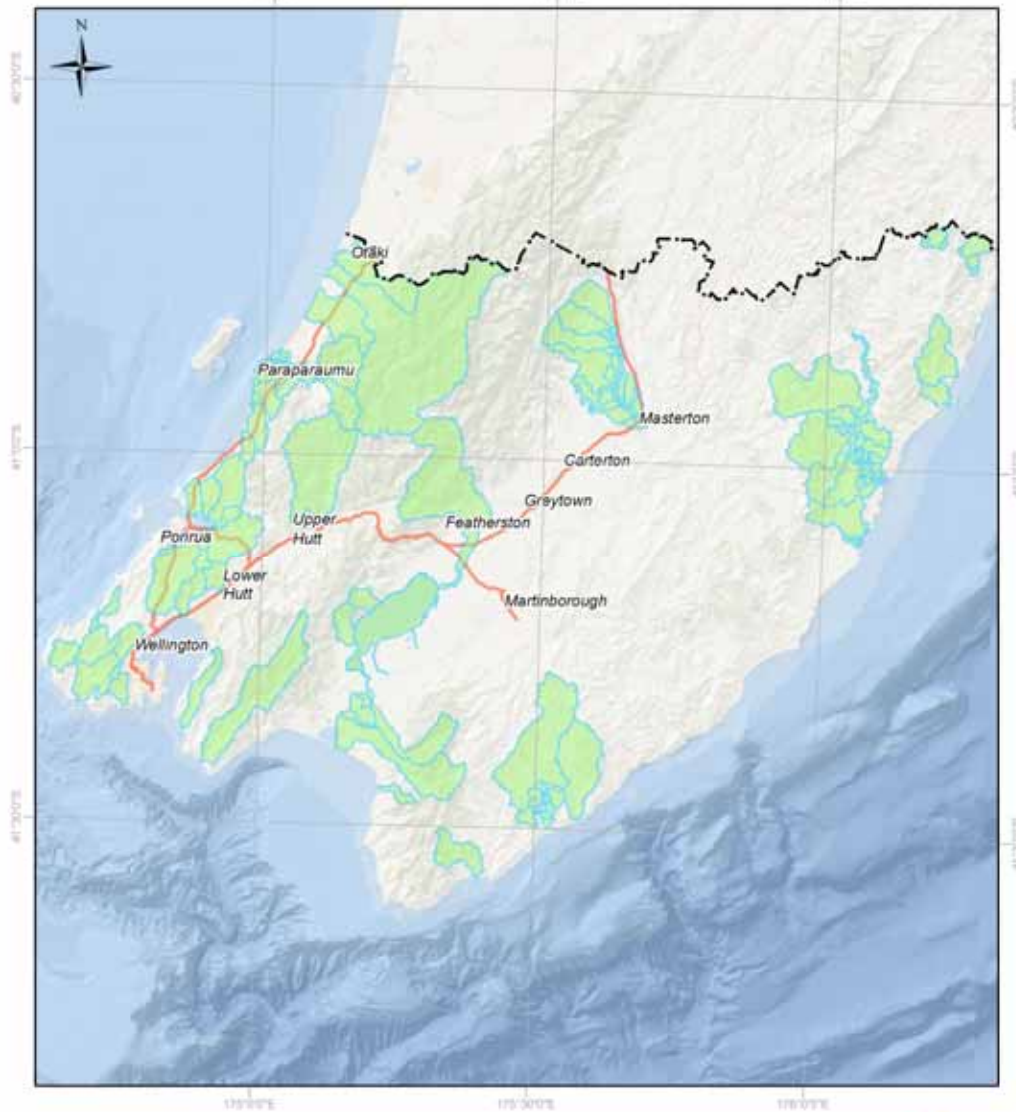
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Rivers and lakes with significant indigenous ecosystems: Habitat for six or more migratory indigenous fish species (Schedule F1) Map 13c

For more details see <http://mapping.gw.govt.nz/gwrc/>



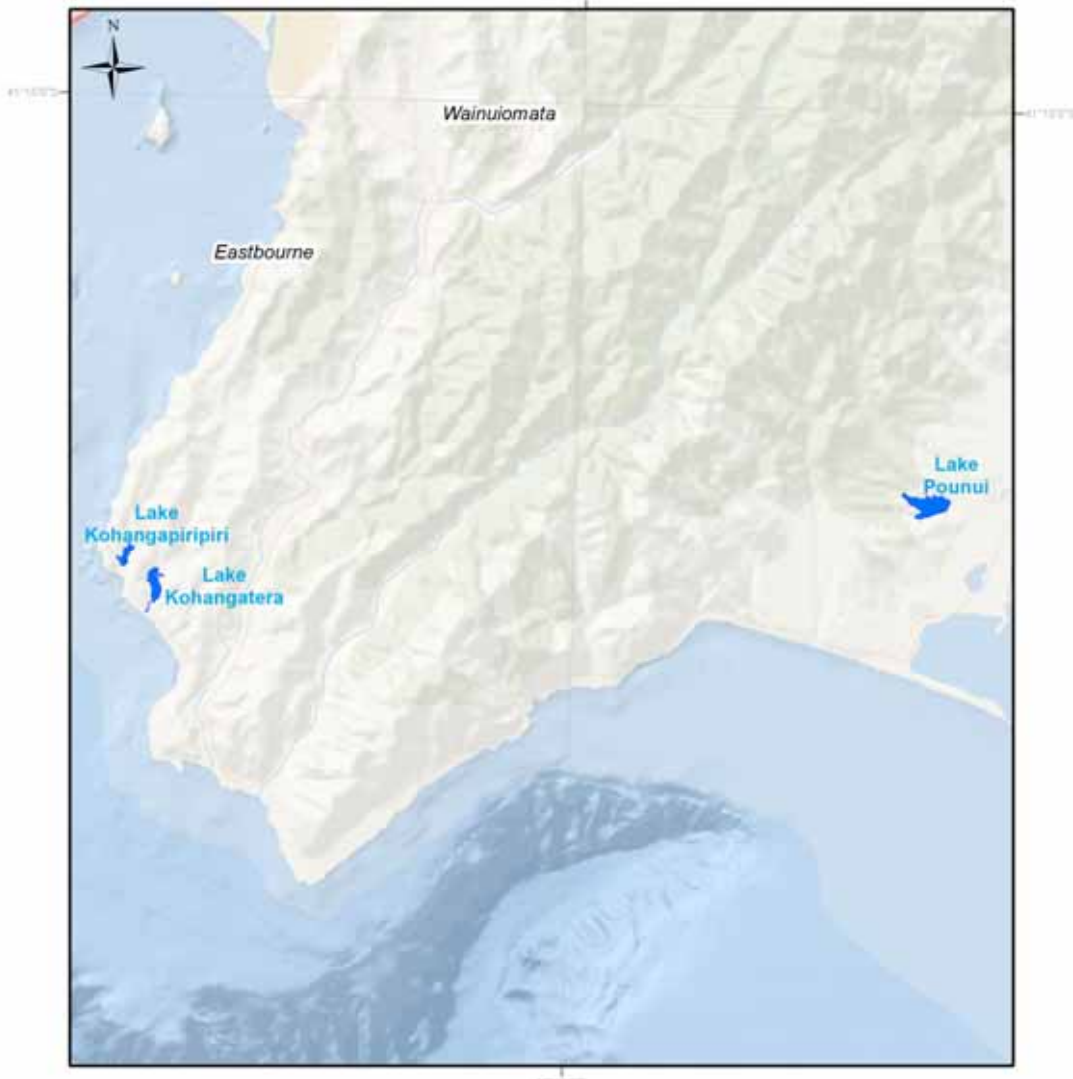
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Lakes with significant aquatic plant communities (Schedule F1c)

Map 15

For more details see <http://mapping.gw.govt.nz/gwrc/>



 Lakes with significant aquatic plant communities

 State Highways



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