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Environmental Health Intelligence New Zealand
Rapu Mātauranga Hauora mo te Taiao – Aotearoa

Related indicators

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Faecal indicator bacteria at recreational bathing sites

This factsheet presents an analysis of the suitability of recreational bathing sites for swimming, based on concentrations of faecal indicator bacteria. Data was recorded during the October-March summer bathing seasons from 2017 to 2022 and presented in Land, Air, Water Aotearoa's recreational bathing raw water quality dataset. The Auckland region has been excluded from the analyses for reasons outlined in the 'Data for this indicator' section.

The Gisborne, Taranaki, Nelson, and Southland regions had the highest proportion of unsafe freshwater bathing sites with 100% of sites having 'poor' grades. The Taranaki region had the highest rate of unsafe beaches, with 45% of all beaches being graded 'poor'.

Based on monitoring undertaken between 2017–22, 72.4% of freshwater bathing sites (rivers and lakes) and 20.4% of marine bathing sites (beaches) could be considered unsafe for swimming at any time.

Bathing sites in more urban areas were less likely to receive a 'good' or 'excellent' long-term grade than those in rural areas.

During the 2021/22 bathing season, 84.6% of monitored river swimming sites, 57.2% of beach sites and 25.9% of lake sites were unsafe to swim at on at least one occasion.

In the 2021/22 bathing season, 23.9% of monitored river swimming sites, 7.6% of beach sites and 1.7% of lake sites were frequently unsuitable for swimming, with 20.0% or more of routine monitoring results showing they were unsafe to swim.

Faecal Indicator Bacteria (FIB)

Concentrations of *E. coli* are assessed at freshwater sites and Enterococci at marine sites

Unsafe to swim if:

E.coli count is >550 per 100ml

Enterococci count is >280 per 100ml

Faecal indicator bacteria and health

Faecal indicator bacteria (FIB) occur in the gut of warm-blooded animals – including humans. They may be introduced to the environment through animal or bird excrement, stock effluent, wastewater discharge, and run-off from contaminated soil. The presence of FIB in recreational water may impact human health by causing gastrointestinal illnesses and infections of the ears, eyes, nasal cavity, skin, and upper respiratory tract (Land, Air, Water Aotearoa 2021).

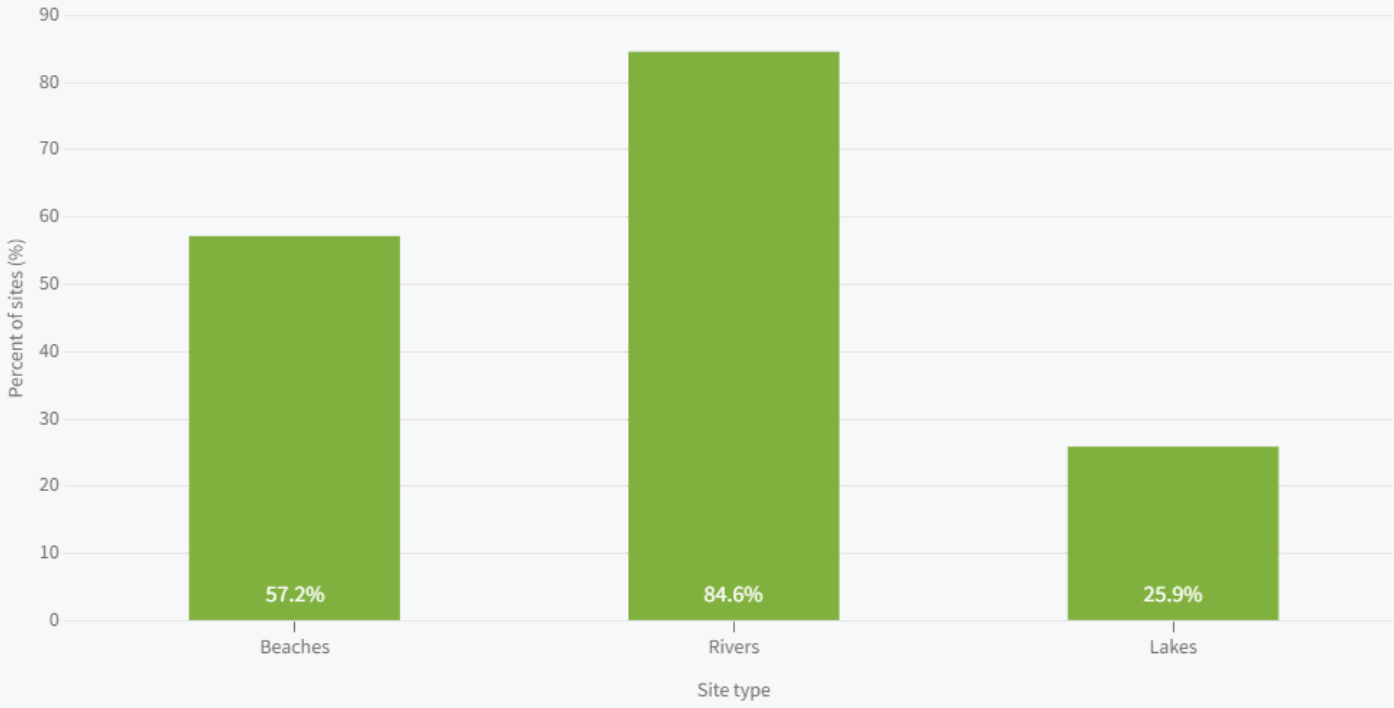
Testing for the presence of FIB as a measure of suitability for recreation is a common practice internationally. As it is difficult to test for the full range of pathogens that may be present in the water, bacteria like *E. coli* and Enterococci are used as indicators as their presence implies that other microorganisms such as Campylobacter, Cryptosporidium, or Giardia may also be present (McBride & Soller 2017).

While the presence of a small amount of FIB (typically measured in terms of the number of bacteria per 100ml of water) may pose little to no danger to swimmers, higher concentrations may pose a risk to children, the elderly, or people with compromised immune systems. Concentrations of FIB may, and often do, rise to levels where swimming is not recommended for anyone.

Many bathing sites were occasionally unsafe to swim

In the 2021/22 bathing season, 63.4% of all 536 tested sites were unsafe to swim at least once. Of these, 166 beaches (57.2% of those surveyed that season) were unsafe to swim at on at least one occasion, as were 159 (84.6%) rivers and 15 (25.9%) lakes (Figure 1).

Figure 1 Percentage of sites that tested unsafe for swimming on at least one occasion, 2021/22

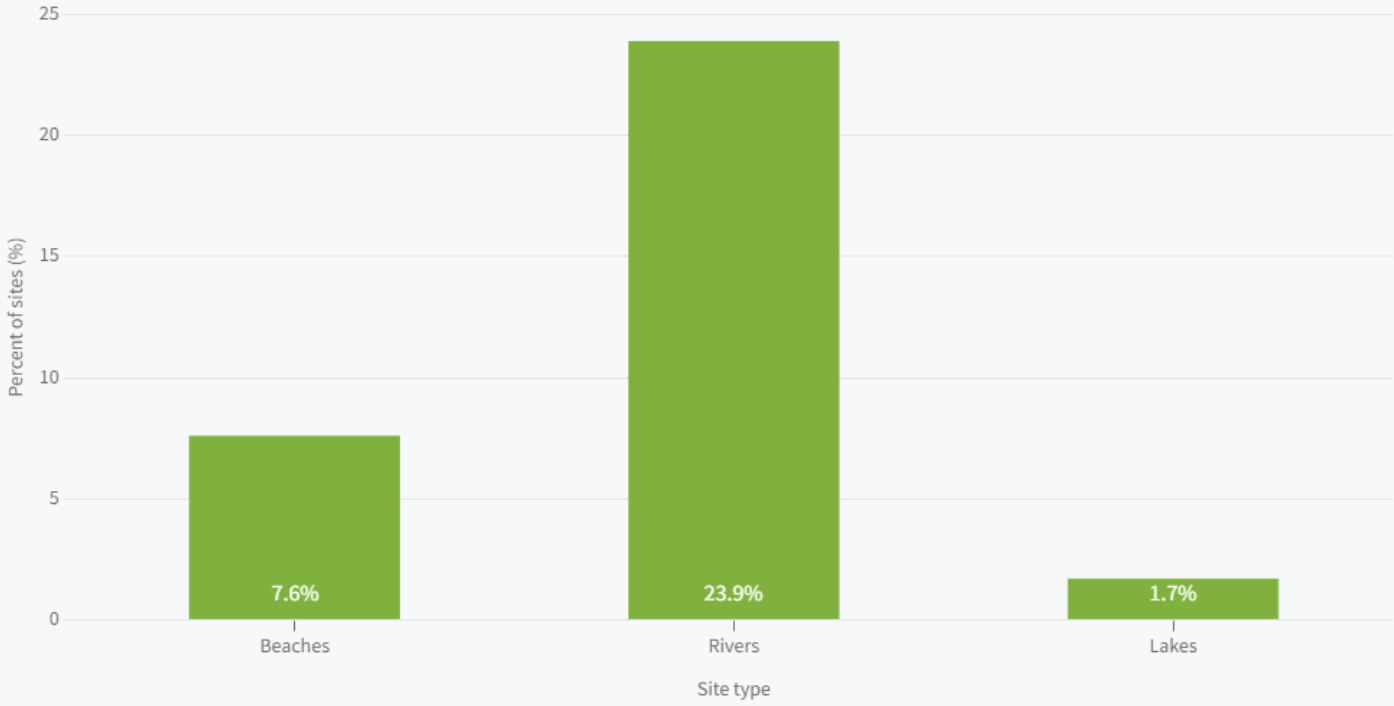


Source: Land, Air, Water Aotearoa 2022

Rivers are far more likely to be frequently unsafe to swim than other bathing sites

In the 2021/22 bathing season at the national level, 45 river sites (23.9% of all those monitored) were found to be unsuitable for swimming on 20.0% or more of the occasions they were surveyed, along with 22 beach sites (7.6%) and one freshwater lake (1.7%) (Figure 2).

Figure 2 Percentage of bathing sites that tested unsafe for swimming more than 20.0% of the time, 2021/22



Source: Land, Air, Water Aotearoa 2022

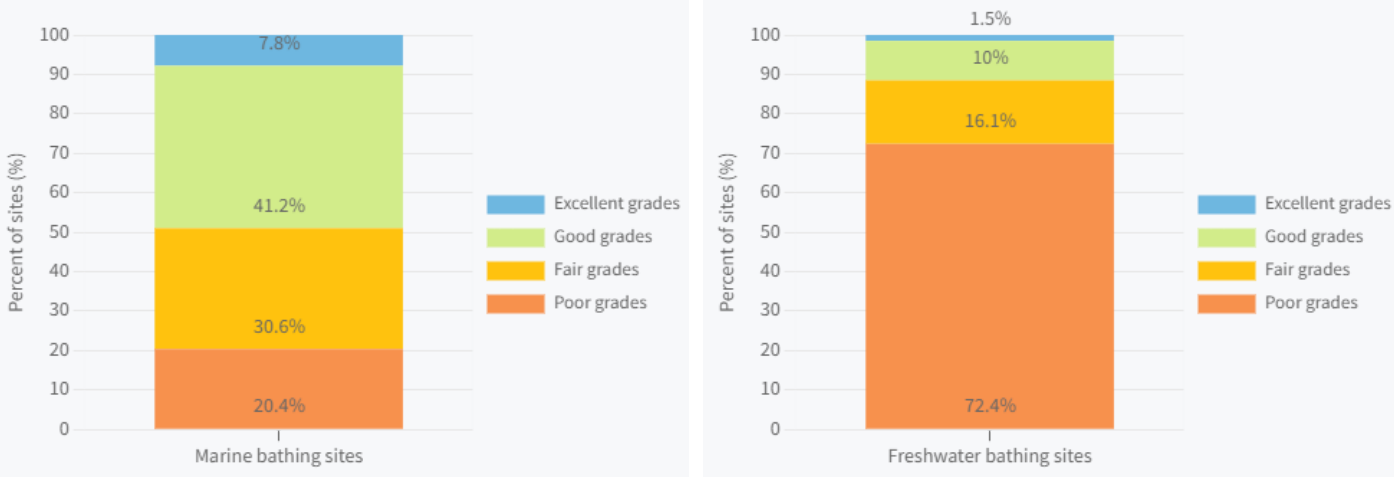
Long-term bacterial risk is generally high at freshwater bathing sites and low at coastal beach sites

Between 2017–22, 20.4% of the 294 monitored marine bathing sites received a 'poor grade', indicating that the risk of bacterial infection was high enough to make them unsuitable for swimming (Figures 3a & 4). Beaches tend to have lower concentrations of FIB as contaminants are more rapidly diluted by currents and the larger volume of water

In contrast to marine bathing sites, almost three quarters of all freshwater bathing sites were unsuitable for swimming, with 72.4% of all monitored river and lake sites receiving a 'poor' grade between 2017–22 (Figures 3b & 4).

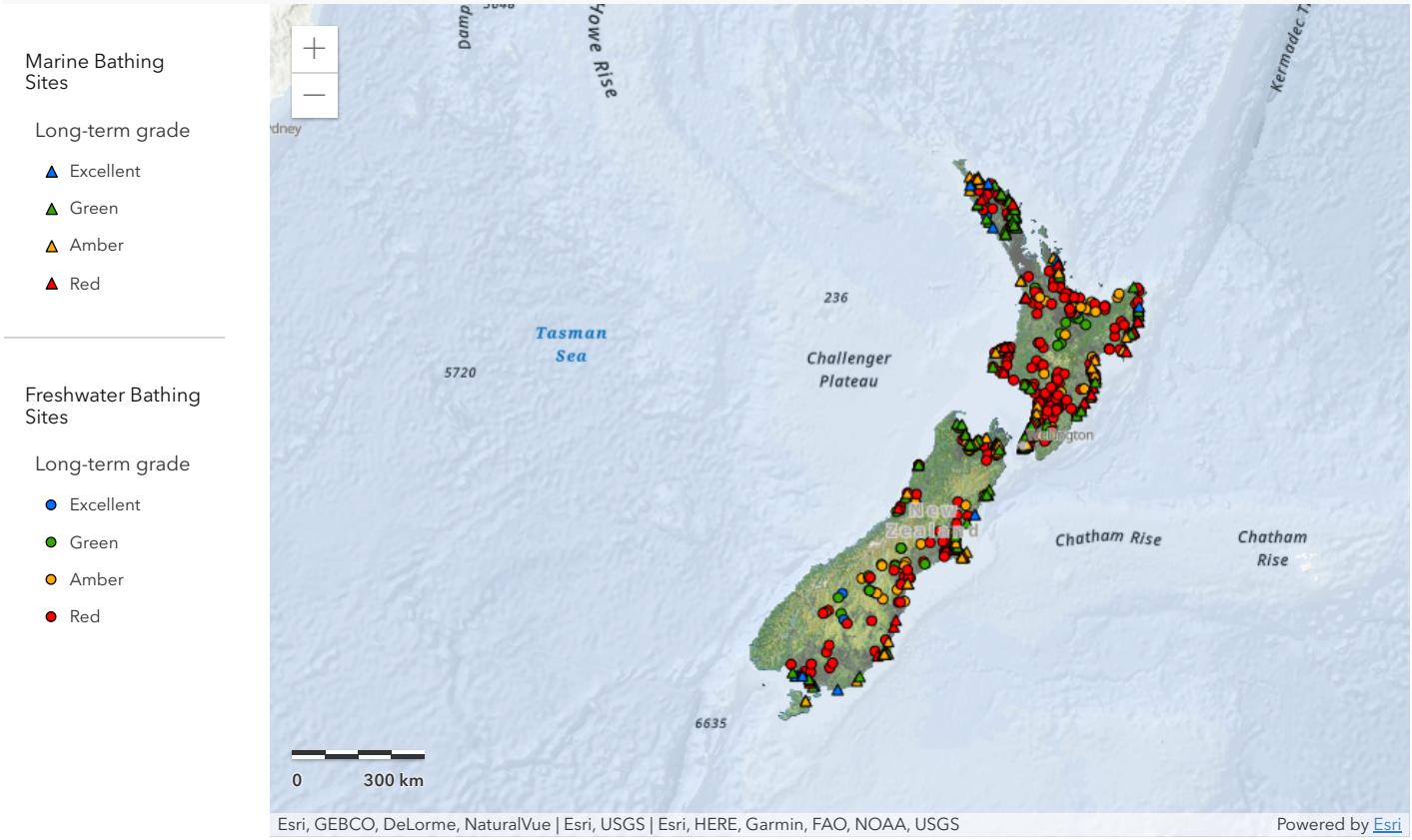
For more information about bacterial risk at the regional level, see the 'Regional Council' factsheet and Figure 4 below.

Figures 3a-b Bacterial risk for marine bathing sites (left) and freshwater bathing sites (right), 2017–22



Source: Land, Air, Water Aotearoa 2022

Figure 4 Long-term bacterial risk for freshwater and marine bathing sites, 2017–22

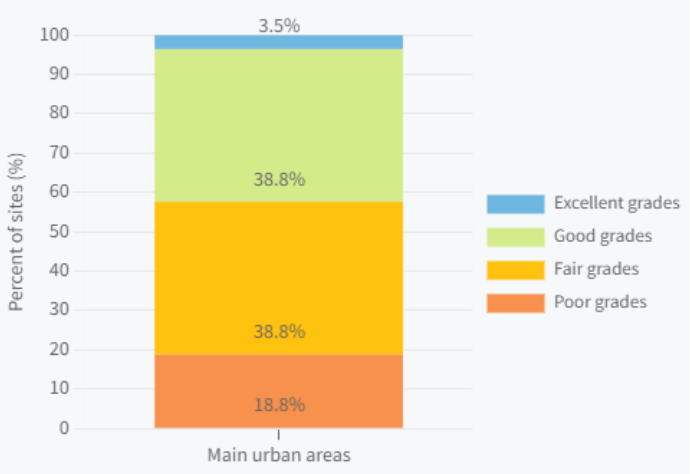


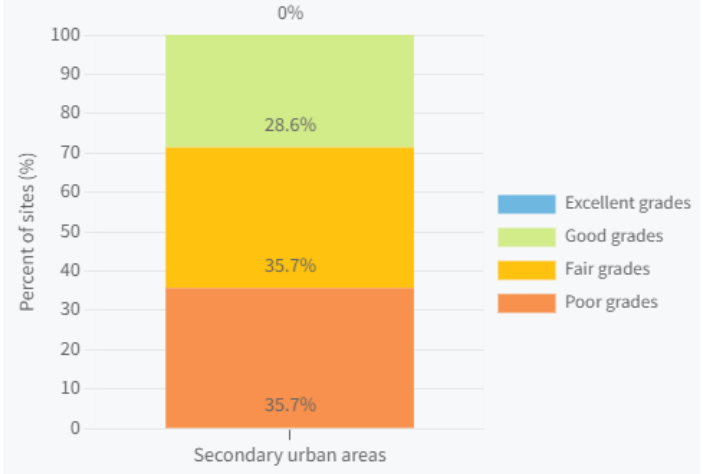
Source: Land, Air, Water Aotearoa 2022

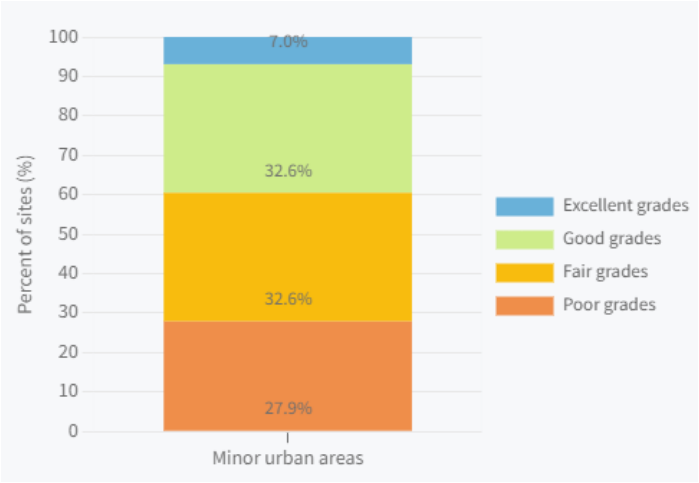
Bathing sites in urban areas are less likely to receive the best risk grades

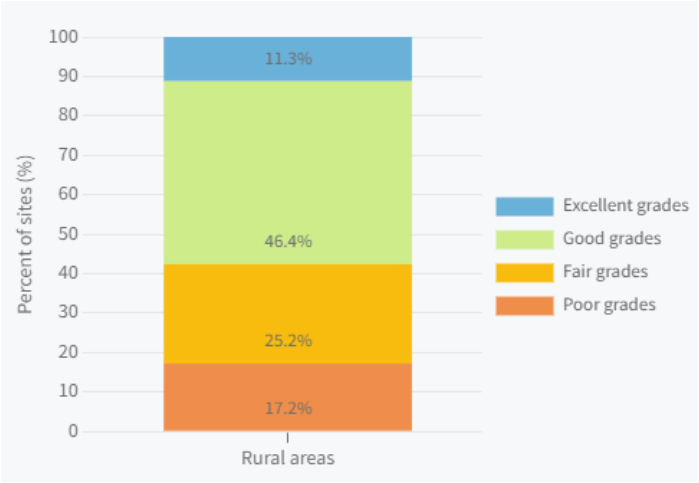
Only 3.5% of monitored marine swimming sites in main urban areas received 'excellent' grades (Figures 5a-d) and no 'excellent' grades were observed in secondary urban areas. Distribution of 'good', 'fair', and 'poor' grades varied by urban/rural areas, with rural marine swimming sites having the highest number of 'good' grades. Rural and minor urban areas had the highest proportion of excellent grades with 11.3% and 7.0% of sites being graded excellent respectively.

Figures 5a-d Bacterial risk at marine bathing sites, by urban/rural classification, 2017–22





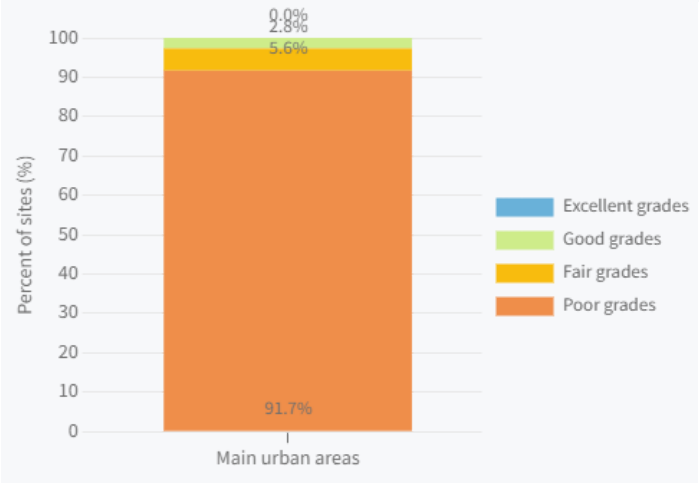


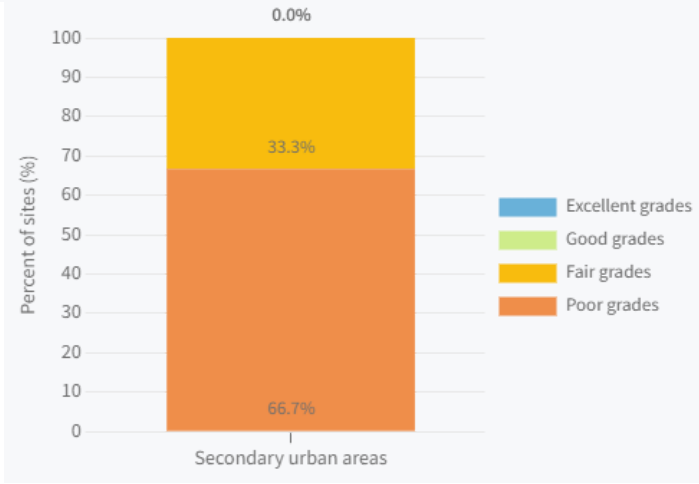


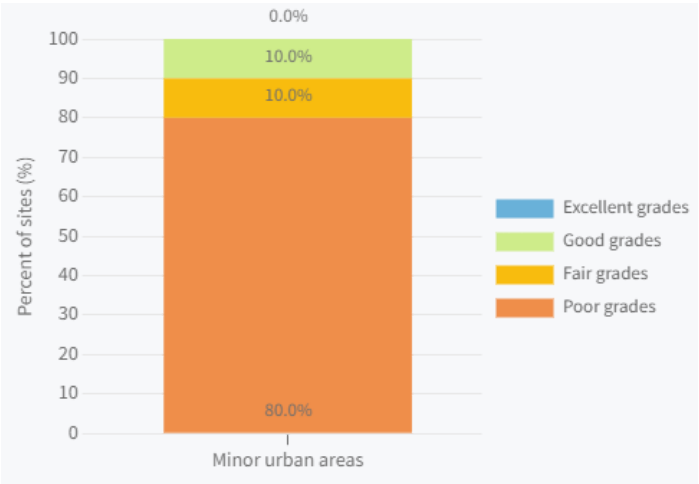
Source: Land, Air, Water Aotearoa 2022

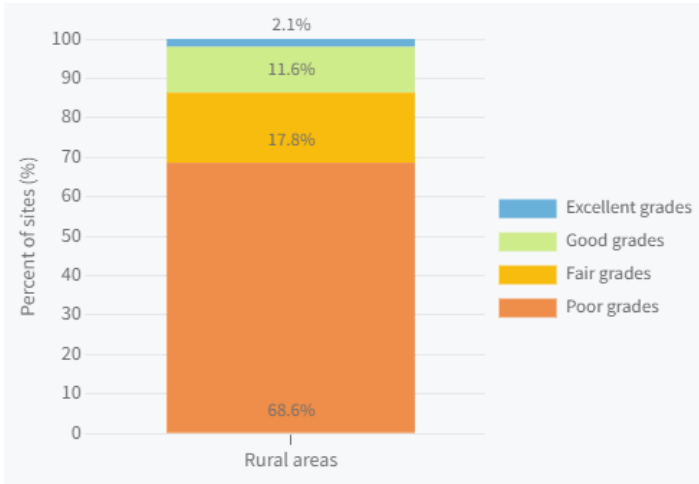
No freshwater bathing sites in the main, secondary, or minor urban areas received an 'excellent' grade. Overall, urban areas also had a greater share of 'poor' graded sites than rural areas (Figures 6a-d). Secondary urban areas had no freshwater bathing sites that met the ‘good’ or ‘excellent’ grade and contained the highest number of freshwater bathing sites with a ‘fair’ grade.

Figures 6a-d Bacterial risk at freshwater bathing sites, by urban/rural classification, 2017-22







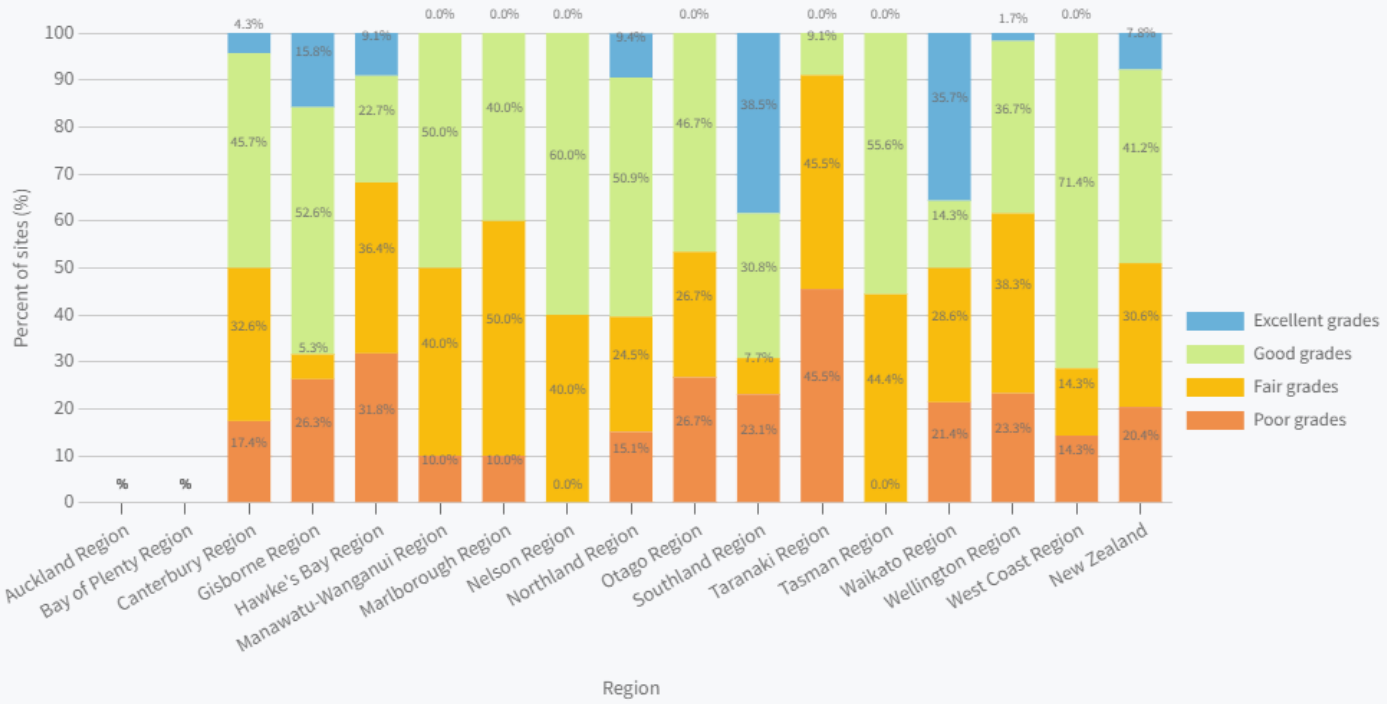


Source: Land, Air, Water Aotearoa 2022

Long-term bacterial risk was generally low at coastal beaches around New Zealand

Between 2017–22, the long-term bacterial risk at marine bathing sites was lower than freshwater sites across all regions, with just 20.4% of the 294 monitored sites receiving a 'poor' grade, making them unsuitable for swimming (Figures 7 & 8). Beaches tend to have lower concentrations of FIB as contaminants are more rapidly diluted by currents and the larger volume of water. The Taranaki region had the highest proportion of its coastal sites receiving a 'poor' grade (46%, followed by the Hawke's Bay region with 32% of beach sites being graded 'poor' over the 2017-22 period (Figure 7 and Table 1).

Figure 7 Bacterial risk for marine bathing sites, by regional council area, 2017–22



Note: Proportions may not total 100% due to rounding.

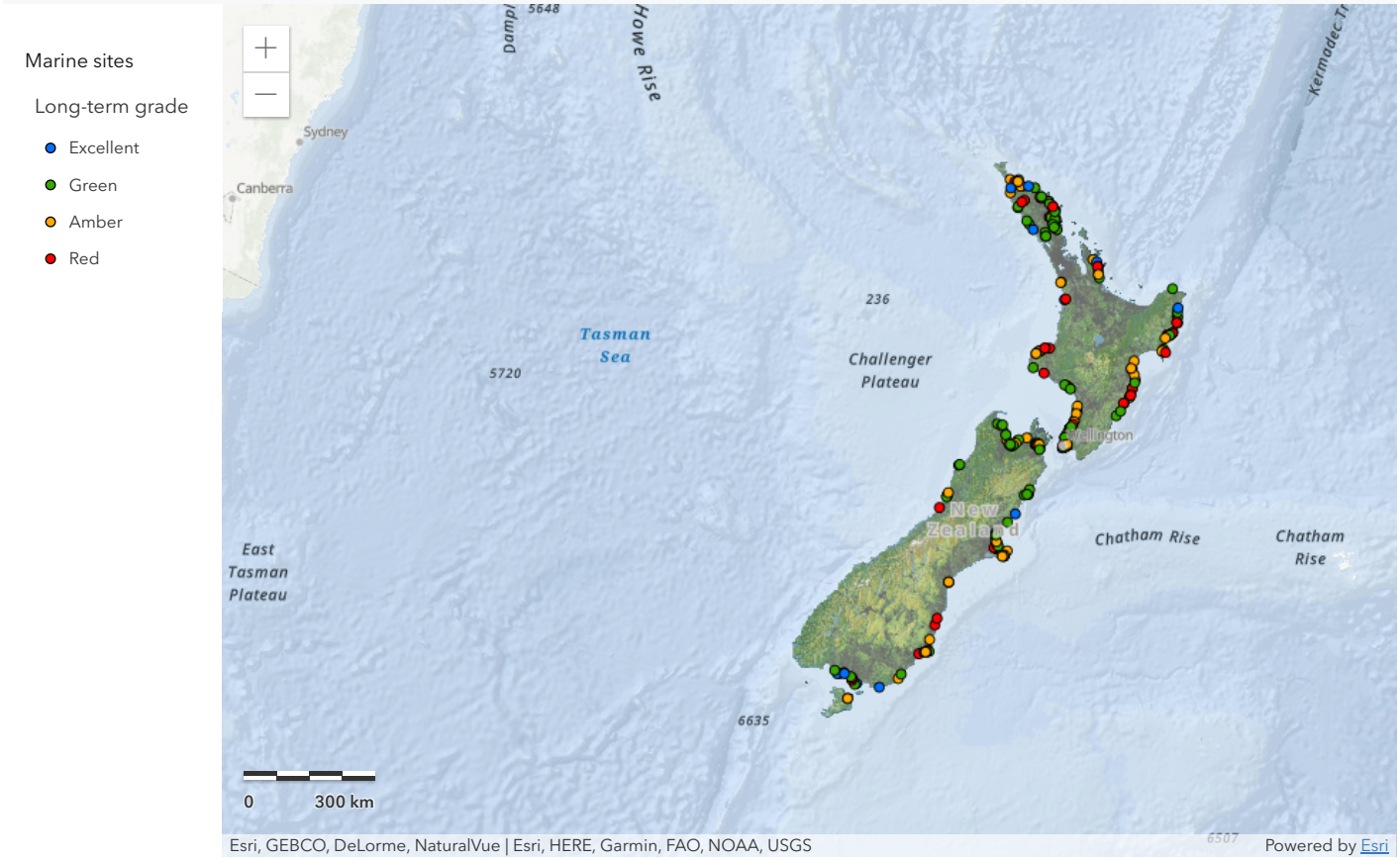
Source: Land, Air, Water Aotearoa 2022

Table 1 Number of grades for marine bathing sites, by regional council area, 2017–22

Grade:	Insufficient data	Excellent	Good	Fair	Poor	Marine sites monitored
Northland Region	0	5	27	13	8	53
Auckland Region	excluded	excluded	excluded	excluded	excluded	excluded
Waikato Region	0	5	2	4	3	14
Bay of Plenty Region	excluded	excluded	excluded	excluded	excluded	excluded
Gisborne Region	0	3	10	1	5	19
Hawke's Bay Region	0	2	5	8	7	22
Taranaki Region	0	0	1	5	5	11
Manawatu-Wanganui Region	0	0	5	4	1	10
Wellington Region	0	1	22	23	14	60
West Coast Region	0	0	5	1	1	7
Canterbury Region	0	2	21	15	8	46
Otago Region	0	0	7	4	4	15
Southland Region	0	5	4	1	3	13
Tasman Region	0	0	5	4	0	9
Nelson Region	0	0	3	2	0	5
Marlborough Region	0	0	4	5	1	10
New Zealand	0	23	121	90	60	294

Source: Land, Air, Water Aotearoa 2022

Figure 8 Bacterial risk for marine bathing sites, 2017-22

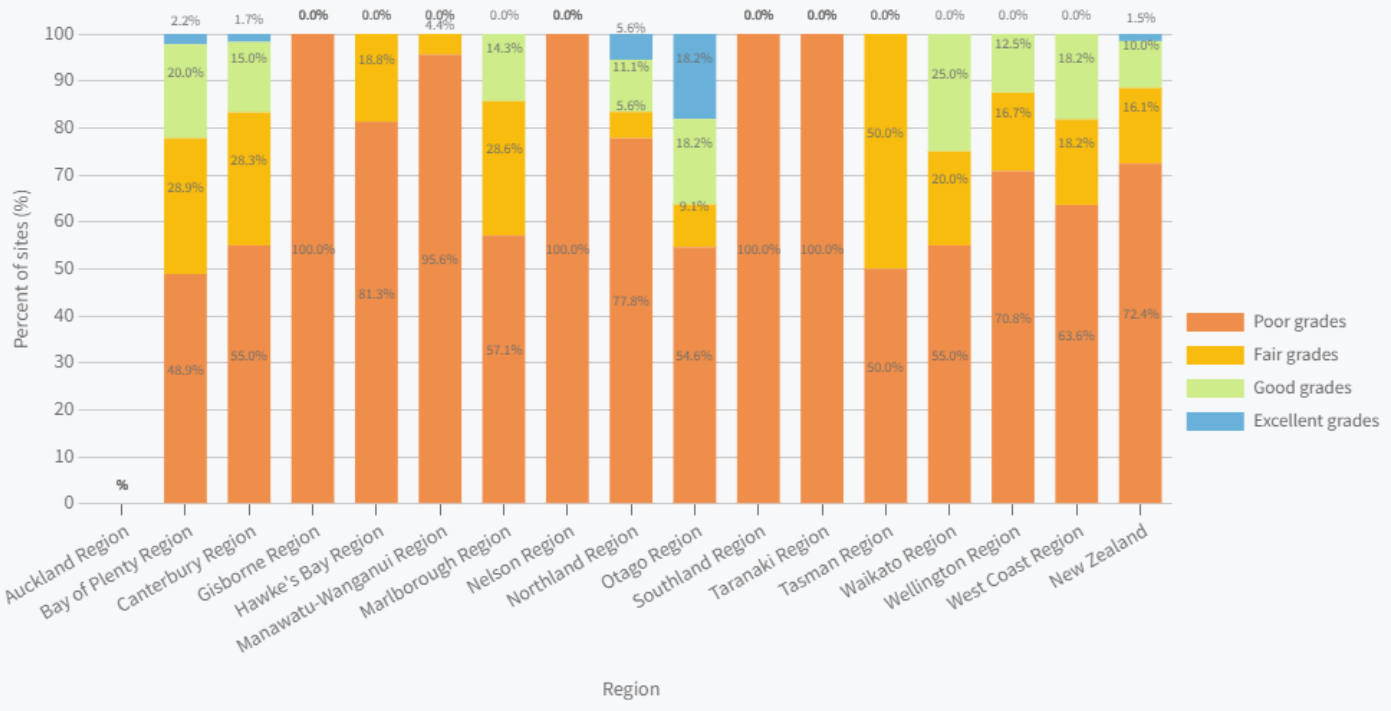


Source: Land, Air, Water Aotearoa 2022

Long-term bacterial risk was generally high at freshwater bathing sites

In contrast to marine bathing sites, almost three quarters of all freshwater bathing sites were unsuitable for swimming, with 72.4% of all monitored river and lake sites receiving a 'poor' grade between 2017–22 (Figures 9 & 10). The Gisborne, Taranaki, Nelson, and Southland regions had the greatest proportion of unsafe sites, with all of their freshwater bathing sites being graded 'poor'. Due to increased levels of testing, the Manawatu-Whanganui and Canterbury regions hadd the highest number of 'poor' grades at 65 and 33 respectively, however, overall they had a lower proportion of their sites being grades 'poor' (96% and 55% repectively) (Table 2 and Figure 9).

Figure 9 Bacterial risk for freshwater bathing sites, by regional council area, 2017–22



Note: Proportions may not total 100% due to rounding.

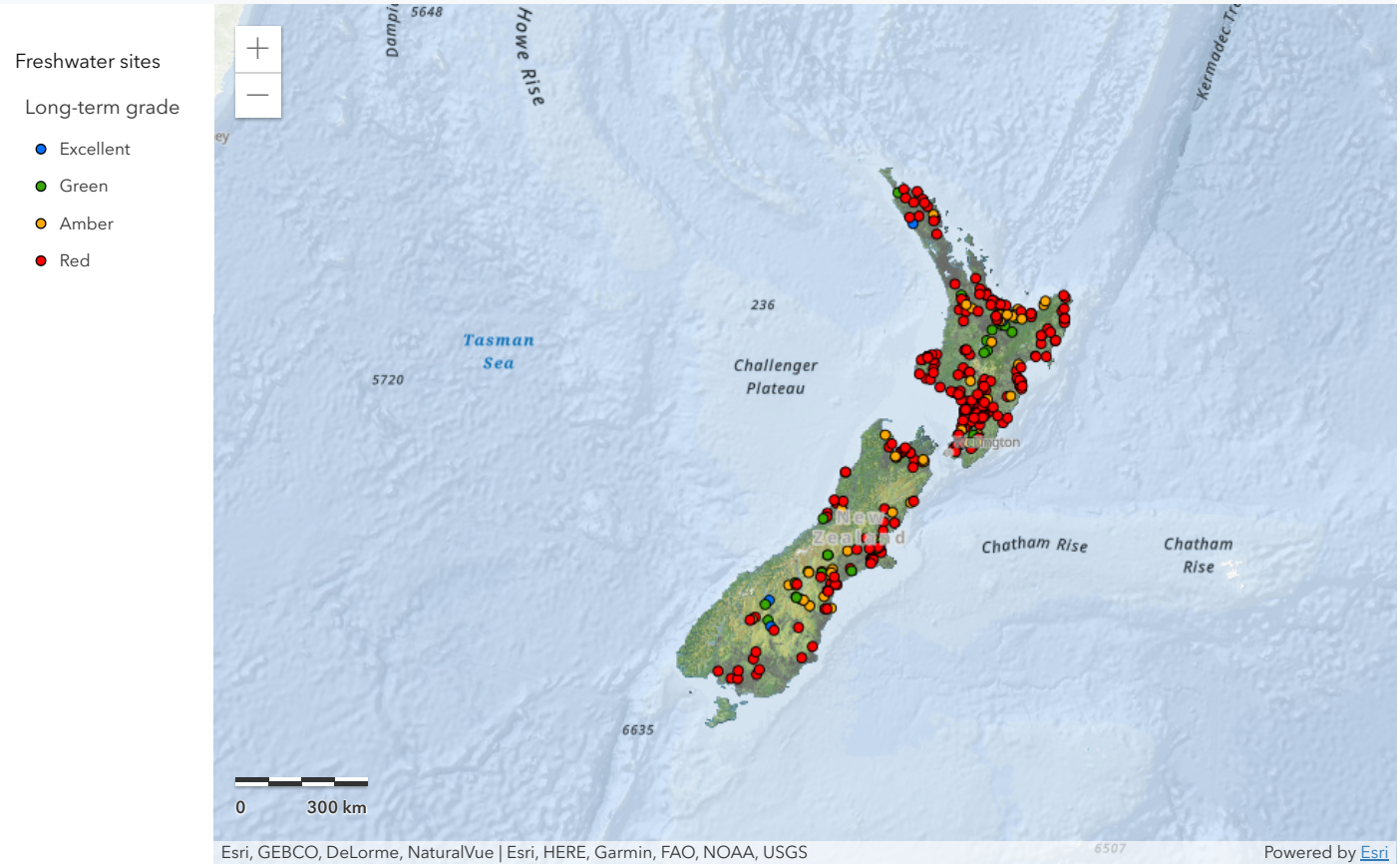
Source: Land, Air, Water Aotearoa 2022

Table 2 Number of grades for freshwater sites, by regional council area, 2017–22

Grade:	Insufficient data	Excellent	Good	Fair	Poor	Freshwater sites monitored
Northland Region	0	1	2	1	14	18
Auckland Region	excluded	excluded	excluded	excluded	excluded	excluded
Waikato Region	0	0	5	4	11	20
Bay of Plenty Region	0	1	9	13	22	45
Gisborne Region	0	0	0	0	14	14
Hawke's Bay Region	0	0	0	3	13	16
Taranaki Region	0	0	0	0	16	16
Manawatu-Wanganui Region	0	0	0	3	65	68
Wellington Region	0	0	3	4	17	24
West Coast Region	0	0	2	2	7	11
Canterbury Region	0	1	9	17	33	60
Otago Region	0	2	2	1	6	11
Southland Region	0	0	0	0	8	8
Tasman Region	0	0	0	3	3	6
Nelson Region	0	0	0	0	6	6
Marlborough Region	0	0	1	2	4	7
New Zealand	0	5	33	53	239	**330**

Source: Land, Air, Water Aotearoa 2022

Figure 10 Bacterial risk for freshwater bathing sites, 2017–22



Source: Land, Air, Water Aotearoa 2022

Data for this indicator

This indicator analyses the most recent data available from Land, Air Water Aotearoa (LAWA)'s recreational bathing dataset, published online in October 2022. Retrieved from https://www.lawa.org.nz/learn/factsheets/coastal-and-freshwater-recreation-monitoring/ on 11/07/2022

Data availability

As the Auckland region does not supply water quality sampling results to LAWA, the region has been excluded from the recreational bathing data set and, consequently, from all analyses in this factsheet, as field measurements and predicted data are not comparable. Coastal data from the Bay of Plenty region was not made available to LAWA for the 2021/22 monitoring period and as such has been excluded from the analyses for this factsheet.

Grading of sites

Two measurements of swim site quality are presented in this fact sheet. Firstly, the regular monitoring results, which are passed to LAWA by regional councils and are based on regular field sampling at each site. A grade is assigned to every measurement based on the concentration of FIB at the time of measurement. Concentrations of *E. Coli* are assessed at freshwater sites and Enterococci at marine sites, though some estuarine sites are tested for both.

Sampling is usually conducted at least once per week during the summer bathing season (the last week in October to the end of March). Grades are assigned to each measurement as below:

Grade	Criteria (*E. coli*)	Criteria (Enterococci)
Green	The site was safe to swim at the time of measurement.	
	Equal to or less than 260 *E. coli* per 100ml	Equal to or less than 140 Enterococci per 100ml
Amber	The site was generally safe at the time of measurement, but caution would be advised for children, the elderly, or those with compromised health	
	More than 260 *E. coli* per 100ml	More than 140 Enterococci per 100ml
Red	The site was not safe to swim at the time of measurement.	
	More than 550 *E. coli* per 100ml	More than 280 Enterococci per 100ml

Secondly, 'long-term bacterial risk' is calculated based on the value of all recorded FIB concentrations at a given swim site over the past five monitoring seasons. The overall risk is determined according to these criteria:

Grade	Criteria (*E. coli*)	Criteria (Enterococci)
Excellent	95th percentile value of *E.coli* /100ml: 0–130 *Estimated risk of Campylobacter infection is <0.1%, 95% of the time.*	95th percentile value of Enterococci /100ml: 0–40 *Estimated risk of contracting an illness is <1% during the summer bathing period*
Good	95th percentile value of *E.coli* /100ml: >130–260 *Estimated risk of Campylobacter infection is >0.1–1%, 95% of the time.*	95th percentile value of Enterococci /100ml: >40–200 *Estimated risk of contracting an illness is <5% during the summer bathing period*
Fair	95th percentile value of *E.coli* /100ml: >260–500 *Estimated risk of Campylobacter infection is 1%–5%, 95% of the time.*	95th percentile value of Enterococci /100ml: >200–500 *Estimated risk of contracting an illness is >5%–10% during the summer bathing period*
Poor	95th percentile value of *E.coli* /100ml: >500 *Estimated risk of Campylobacter infection is >5%, 95% of the time.*	95th percentile value of Enterococci /100ml: >500 *Estimated risk of contracting an illness is >5%–10% during the summer bathing period*

To receive a valid 'overall risk' grade, a site must have at least 50 sample results across the past five monitoring seasons (2017/18 – 2021/22) and must have been 'recently' monitored – i.e. it must have data recorded for the most recent two bathing seasons. Therefore, a site with more than 50 total measurements since 2017 but unmonitored in the 2021/22 swim season would be graded 'insufficient data'.

Samples taken as part of follow-up tests prompted by elevated FIB levels were excluded from the assessment. Where sites were monitored for both enterococci and *E.coli,* measurements of each FIB type were assessed separately, and the worse of the two resulting grades was assigned as the site's long-term grade.

For descriptive information about the data, see the Metadata Sheet

References

Land, Air, Water Aotearoa. 2022. Factsheet: Coastal and freshwater monitoring. Retrieved from https://www.lawa.org.nz/learn/factsheets/coastal-and-freshwater-recreation-monitoring/ on 11/07/2022

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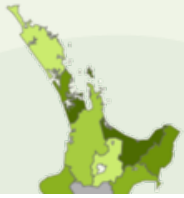
McBride G, Soller J. 2017. Technical Background for 2017 MfE' Clean Water' Swimmability Proposals for Rivers. NIWA

Dashboard - Water quality



Previous factsheet(s):

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Author

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