

## Introduction

The Otago Regional Council (ORC) is responsible for managing Otago's surface-water resources. ORC carries out regular water-quality monitoring as part of its State of Environment (SoE) programme. This report card is a summary of monitoring undertaken between July 2019 and June 2024.

## Water Quality Monitoring Limits and Targets

114 SoE sites were monitored every month, with three sites monitored monthly by NIWA (as part of the National River Water Quality Network). The parameters measured are;

- **Nutrients** - Nitrite-nitrate nitrogen (NNN) and dissolved reactive phosphorus (DRP) are the biologically available nutrients used for algae and plant growth. NNN is a form of nitrogen, mainly derived from land drainage, and DRP is a form of phosphorus, primarily sourced from effluent and fertiliser. Ammoniacal nitrogen (NH<sub>4</sub>-N) can indicate the presence of effluent in water. Total nitrogen (TN) and total phosphorus (TP) are the nutrients used when monitoring eutrophication potential in lakes.
- ***Escherichia coli* (E. coli)** - a bacterium used to indicate the presence of harmful micro-organisms in water (e.g., human or animal faeces). This indicator is used to gauge whether water is suitable for stock water, swimming, surfing or other recreational activities.
- **Turbidity** - a measure of the cloudiness of water and assesses how much light is scattered by suspended particles. Streams with 'high turbidity' often have high suspended sediment loads. High turbidity can reduce light penetration and affect photosynthesis. High sediment loading also can smother the streambed, which reduces macroinvertebrate and fish-spawning habitat.

Schedule 15 of the Regional Plan: Water for Otago sets out the numerical limits and targets for achieving acceptable water quality for all catchments in the Otago region. Based on the frequency of flushing flows rivers are categorised as Group 1 (more flushing flows) or Group 2 (fewer flushing flows) with Upper Clutha/Mata-Au sites in Group 3 based on the exceptional water quality in this area. Groups 4 and 5 represent small and large lakes respectively. Specific limits and targets are set for each group (outlined in Table 1) reflecting the influence of differences in rivers flows and land cover type on expected water quality.

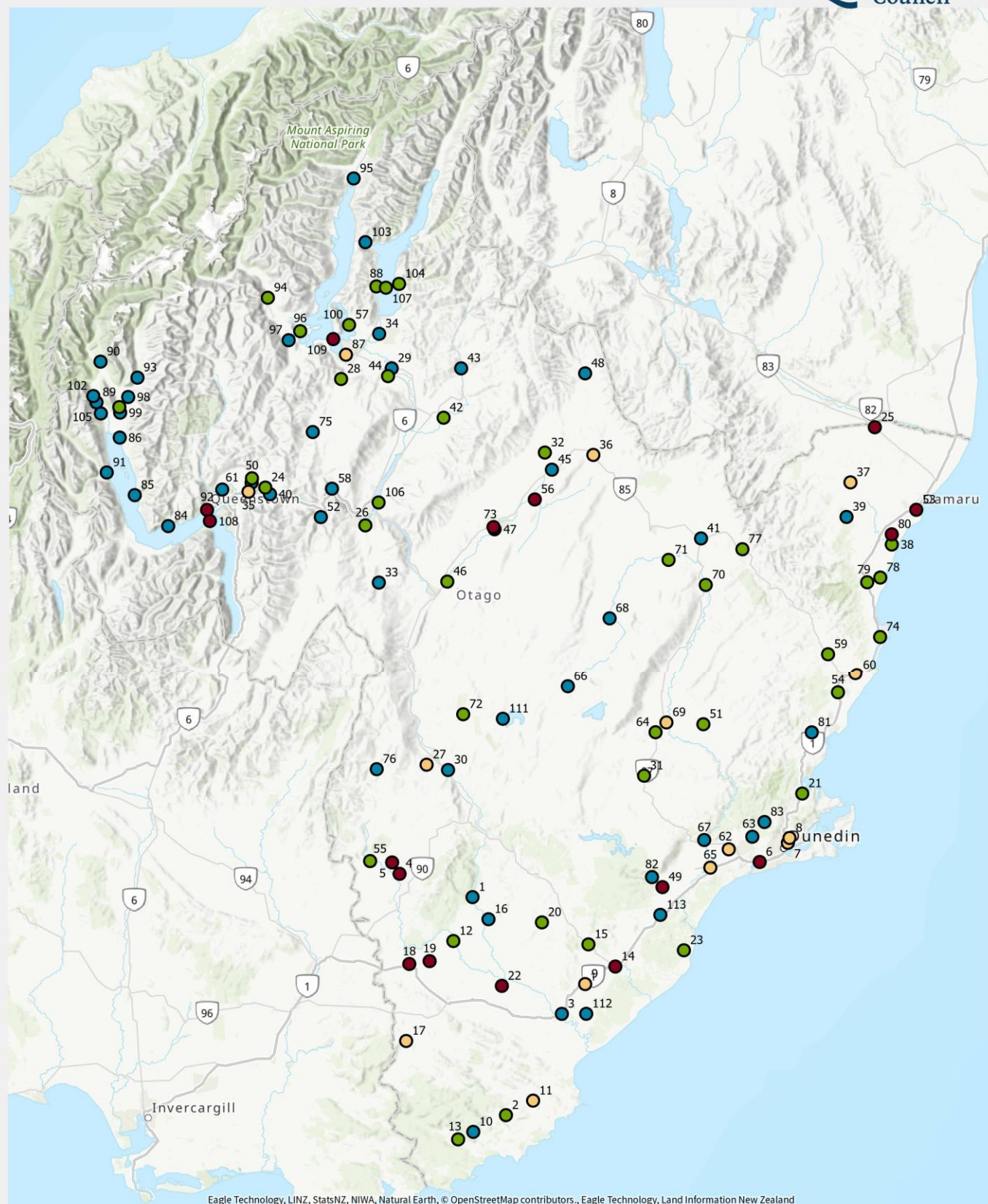
**Table 1. Water quality limits and targets (5-year 80th percentile, when flows are at or below median flow) \***

Schedule 15	NH <sub>4</sub> -N mg/l	<i>E. coli</i> cfu/100ml	Turbidity NTU	DRP mg/l	NNN mg/l	TP mg/l	TN mg/l
Group 1	0.10	260	5	0.026	0.444		
Group 2	0.10	260	5	0.010	0.075		
Group 3	0.01	50	3	0.005	0.075		
Group 4	0.10	126	5			0.033	0.55
Group 5	0.01	10	3			0.005	0.10

**\*5-year 80<sup>th</sup> percentile** – Results are based on five consecutive years of monthly monitoring data. A percentile indicates the value below which a percentage of observations fall. The 5-year 80th percentile is the value below which 80 % of all samples taken over the 5-year period will lie (and 20 % of samples will exceed).

**\*when flows are at or below median flow** – The median flow is the value in the 'middle' of the flow record. For our analysis samples taken at higher flows (above median) are removed from the data set. This excludes the effects of flood events on water quality when contaminant levels often peak, so results are more reflective of 'normal' conditions, and of water quality at flows when recreational use is most popular.

# Schedule 15 Water Quality 2019 - 2024



● Excellent ● Good ● Fair ● Poor



Information on this map may not be used for the purposes of any legal disputes. The user should independently verify the accuracy of any information before taking action in reliance upon it. This map was generated for A4 printing on 18/02/2025 at the scale of 1:1,250,000.

**Figure 1. SoE water-quality monitoring results 2017-2022. Site numbers (and parameter values) are shown in Tables 3-7.**

**Table 2. ORC Water Quality Reporting Index**

Grade	Number of parameters complying with Schedule 15 limits and targets
Excellent	All five parameters comply
Good	Four (of the five) values comply
Fair	Three (of the five) values comply
Poor	Two or fewer (of the five) values comply

Monitoring results for each parameter are assessed against the Schedule 15 limits. ORC uses a water quality index to classify each site into one of four groups based on the number of parameters which comply with the limits (Table 2). A summary of results for the Otago Region is shown in Figure 1.

## Water Quality Results – Group 1

- Excellent or Good water quality at 10 of 22 sites (45 %)
- Fair water quality at five sites
- Poor water quality at seven sites
- Sites with Poor water quality include tributaries of the Pomahaka, the Waiwera River, and Dunedin urban streams
- Schedule 15 limits were most often exceeded for *E. coli* and NNN

**Table 3. Water quality results for Group 1 (more flushing flows) sites,  = parameter non-compliant with Schedule 15 limit (5-year, 80<sup>th</sup> percentile below median flow exceeded Schedule 15 limits and targets); \* = sites monitoring < 5 years, grade is interim; N = site monitored by NIWA.**

Site #	Name	Grade	Schedule 15 limit or target				
			NH <sub>4</sub> -N mg/L	<i>E. coli</i> cfu/100ml	Turbidity NTU	DRP mg/L	NNN mg/L
			0.1	260	5	0.026	0.444
1	Blackcleugh Burn at Rongahere Rd	Excellent	0.006	106	1.8	0.021	0.116
2	Catlins River at Houipapa	Good	0.013	252	3.4	0.012	0.493
3	N Clutha River at Balclutha	Excellent	0.003	97	1.8	0.001	0.066
4	Crookston Burn at Kelso Rd	Poor	0.030	2003	5.6	0.054	1.248
5	Heriot Burn at Park Hill Rd	Poor	0.021	1311	5.0	0.040	1.457
6	Kaikorai Stream at Brighton Rd	Poor	0.017	2420	6.3	0.015	0.534
7	Leith at Dundas Street Bridge	Fair	0.012	1224	3.1	0.025	0.490
8	Lindsays Creek at North Rd Bridge	Fair	0.014	1120	3.4	0.020	0.685
9	Lovells Creek at Station Rd	Fair	0.017	524	3.0	0.015	1.050
10	MacLennan River at Kahuiku School Rd	Excellent	0.011	254	2.2	0.012	0.026
11	Owaka River at Katea Rd	Fair	0.014	411	3.4	0.020	0.968
12	Pomahaka River at Burkes Ford	Good	0.018	226	3.1	0.012	0.593
13	Tahakopa River at Tahakopa	Good	0.011	523	3.5	0.008	0.323
14	Tokomairiro River at Blackbridge	Poor	0.050	3570	9.1	0.028	0.534
15	Tokomairiro River at West Branch Bridge	Good	0.014	487	2.4	0.012	0.342
16	Tuapeka River at 700m u/s bridge	Excellent	0.010	245	2.4	0.026	0.163
17	Waipahi River at Cairns Peak	Fair	0.018	653	4.8	0.020	0.645
18	Waipahi River at Waipahi	Poor	0.012	318	2.4	0.027	1.186
19	Wairuna River at Millar Rd	Poor	0.084	2420	14.4	0.157	1.580
20	Waitahuna River at Tweeds Bridge	Good	0.011	365	2.9	0.014	0.184
21	Waitati River at Mt Cargill Rd	Good	0.003	271	0.9	0.003	0.038
22	Waiwera River at Maws Farm	Poor	0.019	387	3.2	0.047	0.876

## Water Quality Results – Group 2

- Excellent water quality at 21 of 61 sites, and Good water quality at a further 24 sites (74 % of sites graded Excellent or Good)
- Most sites with Excellent water quality were upper catchment sites spread across Otago, including the Taieri, Manuherekia, Pomahaka, Lindis and Waikouaiti and the Taieri and Clutha river catchments.
- Fair water quality at eight sites
- Poor water quality at seven sites
- Schedule 15 limit most frequently exceeded for NNN

**Table 4. Water quality results for Group 2 (fewer flushing flows) sites,   = parameter non-compliant with Schedule 15 limit (5-year, 80<sup>th</sup> percentile below median flow exceeded Schedule 15 limits and targets); \* = sites monitoring < 5 years, grade is interim; N = site monitored by NIWA.**

Site #		Name	Grade	Schedule 15 limit or target				
				NH <sub>4</sub> -N mg/L	<i>E. coli</i> cfu/100ml	Turbidity NTU	DRP mg/L	NNN mg/L
				0.1	260	5	0.01	0.075
23	*	Akatore Creek at Akatore Creek Rd	Good	0.011	164	1.2	0.006	0.911
24	*	Arrow at Morven Ferry Rd	Good	0.003	88	0.7	0.001	0.169
25		Awamoko at SH83	Poor	0.009	417	0.8	0.078	0.653
26		Bannockburn at Lake Dunstan	Good	0.004	120	5.0	0.004	0.001
27		Benger burn at Booths	Fair	0.010	758	1.4	0.014	0.066
28		Cardrona at Mt Barker	Good	0.005	140	1.1	0.001	0.113
29	N	Clutha at Luggate Bridge	Excellent	0.005	24	0.8	0.001	0.056
30		Clutha at Millers Flat	Excellent	0.003	29	1.4	0.001	0.042
31		Deep Stream at SH87	Good	0.005	304	0.8	0.002	0.002
32		Dunstan Creek at Beattie Rd	Good	0.004	160	0.9	0.003	0.105
33		Fraser River at Old Man Range	Excellent	0.003	27	0.2	0.002	0.020
34		Hawea River at Camphill Bridge	Excellent	0.003	11	0.6	0.002	0.028
35	*	Hayes Creek at SH 6	Fair	0.018	405	4.8	0.013	0.004
36		Hills Creek at SH85	Fair	0.003	409	0.9	0.004	0.250
37		Kakanui River at Clifton Falls Bridge	Fair	0.004	443	0.5	0.001	0.087
38		Kakanui River at McCones	Good	0.014	108	0.5	0.003	0.694
39		Kauru River at Ewings	Excellent	0.007	253	0.3	0.003	0.027
40		Kawarau River at Chards	Excellent	0.005	31	3.3	0.001	0.022
41		Kye Burn at SH85 Bridge	Excellent	0.004	155	1.1	0.004	0.064
42		Lindis River at Ardgour Rd	Good	0.005	189	0.8	0.001	0.188
43		Lindis River at Lindis Peak	Excellent	0.004	135	1.5	0.002	0.035
44		Luggate Creek at SH6 Bridge	Good	0.004	157	1.2	0.011	0.010
45		Manuherekia River at Blackstone Hill	Excellent	0.004	186	3.8	0.005	0.010
46		Manuherekia River at Galloway	Good	0.008	255	2.6	0.014	0.061
47		Manuherekia River at Ophir	Poor	0.019	470	2.8	0.028	0.135
48		Manuherekia River downstream of Forks	Excellent	0.003	23	0.3	0.004	0.003
49		Meggat Burn at Berwick Rd	Poor	0.013	414	2.3	0.012	0.107
50		Mill Creek at Fish Trap	Good	0.011	143	3.6	0.004	0.485
51		Nenthorn Stream at Mt Stoker Rd	Good	0.010	76	1.7	0.019	0.004
52	*	Nevis River at Wentworth Station	Excellent	0.002	58	0.9	0.003	0.005
53		Oamaru Creek at SH1	Poor	0.022	270	2.7	0.353	0.643

## Water Quality Results – Group 2 (continued)

**Table 4 (continued). Water quality results for Group 2 (fewer flushing flows) sites, █ = parameter non-compliant with Schedule 15 limit (5-year, 80<sup>th</sup> percentile below median flow exceeded Schedule 15 limits and targets); \* = sites monitoring < 5 years, grade is interim; N = site monitored by NIWA; + = site exempt from Turbidity limit.**

Site #	Name	Grade	Schedule 15 limit or target				
			NH4-N mg/L	<i>E. coli</i> cfu/100ml	Turbidity NTU	DRP mg/L	NNN mg/L
			0.1	260	5	0.01	0.075
54	Pleasant River at Patterson Rd Ford	Good	0.008	52	5.4	0.003	0.011
55	Pomahaka River at Glenken	Good	0.005	335	1.1	0.007	0.025
56	Pool Burn at Cob Cottage	Poor	0.012	309	1.8	0.060	0.151
57	Quartz Reef Creek at SH8	Good	0.003	307	1.6	0.003	0.012
58	Roaring Meg at SH6	Excellent	0.003	95	0.7	0.009	0.031
59	Shag River at Craig Rd	Good	0.005	111	0.5	0.003	0.118
60	Shag River at Goodwood Pump	Fair	0.014	261	0.6	0.006	0.255
61	N + Shotover River at Bowens Peak	Excellent	0.003	7.6	5.62 +	0.001	0.011
62	Silverstream at Taieri Depot	Fair	0.006	290	0.9	0.005	0.571
63	Silverstream at Three Mile Hill Rd	Excellent	0.003	115	0.7	0.002	0.006
64	Sutton Stream at SH87	Good	0.010	517	1.3	0.007	0.008
65	Taieri River at Allanton Bridge	Fair	0.015	399	4.0	0.009	0.075
66	Taieri River at Linnburn Runs Rd	Excellent	0.005	234	1.5	0.002	0.004
67	Taieri River at Outram	Excellent	0.006	97	2.8	0.008	0.030
68	Taieri River at Stonehenge	Excellent	0.007	90	1.6	0.006	0.015
69	Taieri River at Sutton	Fair	0.011	464	3.6	0.012	0.053
70	Taieri River at Tiroiti	Good	0.005	161	2.8	0.019	0.053
71	Taieri River at Waipiata	Good	0.013	233	2.8	0.029	0.060
72	Teviot at Bridge Huts Rd	Good	0.006	173	5.0	0.002	0.006
73	Thomsons Creek at SH85	Poor	0.033	1013	6.6	0.097	0.610
74	Trotters Creek at Mathesons	Good	0.039	190	2.7	0.008	0.481
75	Upper Cardrona at Tuohys Gully Rd	Excellent	0.003	115	1.4	0.001	0.015
76	Upper Pomahaka at Aitchison Runs Rd	Excellent	0.003	179	0.4	0.006	0.014
77	Upper Shag River at SH85 Culvert	Good	0.003	411	0.3	0.002	0.019
78	Waianakarua River at Browns	Good	0.005	152	0.3	0.002	0.528
79	Waianakarua River at South Branch SH1	Good	0.007	213	0.4	0.002	0.771
80	Waiareka Creek at Taipo Rd	Poor	0.015	418	1.5	0.265	0.575
81	Waikouaiti River at 200 m d/s DCC intake	Excellent	0.005	88	0.8	0.002	0.037
82	Waipori River at Waipori Falls Reserve	Excellent	0.007	70	3.4	0.006	0.022
83	Whare Creek at Whare Flat Rd	Excellent	0.004	50	1.4	0.003	0.039

## Water Quality Results – Group 3

- Excellent water quality at 14 sites and Good water quality at five sites (86 % of Group 3 sites)
- Fair water quality at two sites
- Poor water quality at one site – Horn Creek exceeds limits for multiple parameters, similar to urban sites elsewhere in Otago
- Horn Creek is the only site in to exceed the ammoniacal nitrogen limit
- Schedule 15 limits were most often exceeded for *E. coli* and NNN

**Table 5. Water quality results for Group 3 sites,   = parameter non-compliant with Schedule 15 limit (5-year, 80<sup>th</sup> percentile below median flow exceeded Schedule 15 limits and targets); \* = sites monitoring < 5 years, grade is interim; + = site is exempt from Turbidity limit.**


Site #	Name	Grade	Schedule 15 limit or target				
			NH4-N mg/L	<i>E. coli</i> cfu/100ml	Turbidity NTU	DRP mg/L	NNN mg/L
			0.01	50	3	0.005	0.075
84	12 Mile Creek at Glenorchy Queenstown Rd	Excellent	0.003	8	0.2	0.003	0.006
85	25 Mile Creek at Glenorchy Queenstown Rd	Excellent	0.003	15	0.6	0.004	0.009
86	Buckler Burn at Glenorchy Queenstown Rd	Excellent	0.001	6	1.9	0.002	0.044
87	Bullock Creek at Dunmore St Footbridge	Fair	0.003	815	0.5	0.002	0.800
88	* Craig Burn at SH6	Good	0.003	73	0.8	0.003	0.012
89	+ Dart River at The Hillocks	Excellent	0.004	12	19.5 +	0.002	0.031
90	Dundas Creek at Mill Flat	Excellent	0.003	3	0.4	0.003	0.048
91	Greenstone at Greenstone Station Rd	Excellent	0.003	21	0.4	0.002	0.021
92	Horn Creek at Queenstown Bay	Poor	0.017	428	1.6	0.010	0.217
93	Invincible Creek at Rees Valley Rd	Excellent	0.001	2	0.9	0.001	0.011
94	Leaping Burn at Wanaka Mt Aspiring Rd	Good	0.001	63	0.4	0.002	0.026
95	Makarora River at Makarora	Excellent	0.003	36	0.6	0.001	0.063
96	+ Matukituki River at West Wanaka	Good	0.008	33	2.0 +	0.003	0.087
97	Motatapu at Wanaka Mt Aspiring Rd	Excellent	0.003	31	0.8	0.001	0.049
98	Ox Burn at Rees Valley Rd	Excellent	0.003	9	1.6	0.002	0.024
99	Precipice Creek at Glenorchy Paradise Rd	Excellent	0.003	13	0.4	0.002	0.008
100	Quartz Creek at Maungawera Valley Rd	Fair	0.003	183	0.3	0.001	0.120
101	Rees River at Glenorchy Paradise Rd Bridge	Good	0.003	7	4.5	0.001	0.018
102	Scott Creek at Routeburn Rd	Excellent	0.003	11	0.6	0.001	0.034
103	The Neck Creek at Meads Rd	Excellent	0.003	12	0.2	0.002	0.004
104	Timaru Creek at Peter Muir Bridge	Good	0.001	10	24.3	0.005	0.013
105	Turner Creek at Kinloch Rd	Excellent	0.003	5	0.3	0.002	0.053

## Water Quality Results – Group 4

- Lake Hayes and Lake Onslow had Good water quality based on Schedule 15, despite the nutrient enriched state of these sites - Trophic Level Index scores for Lake Hayes indicate the lake is eutrophic/poor water quality and Lake Onslow is mesotrophic/average water quality
- Lake Hayes did not meet the Schedule 15 limits for total phosphorus
- Lake Onslow did not meet the turbidity limit
- Lake Tuakitoto and Lake Waiholā had Poor water quality consistent with the respective supereutrophic/very poor water quality/ and eutrophic/poor water quality trophic status of these sites  
<https://www.lawa.org.nz/explore-data/otago-region/lakes>

**Trophic Level Index** is a commonly used measure of overall lake water quality.


The score is calculated using four water quality measures – nutrients (total nitrogen, total phosphorus), water clarity and chlorophyll-*a* (the pigment that causes the green colour of plants which indicates how much algae a lake has) For more information see <https://www.lawa.org.nz/learn/factsheets/lake-trophic-level-index/>

**Table 6. Water quality results for Group 4 (small lakes) sites,  = parameter non-compliant with Schedule 15 limit (5-year, 80<sup>th</sup> percentile below median flow exceeded Schedule 15 limits and targets).**

Site #	Name	Grade	Schedule 15 limit or target				
			NH <sub>4</sub> -N mg/L	<i>E. coli</i> cfu/100ml	Turbidity NTU	TP mg/L	TN mg/L
			0.1	126	5	0.033	0.55
106	Lake Hayes at Mid Lake 10m	Good	0.030	2	4.31	0.053	0.533
107	Lake Onslow at Boat Ramp	Good	0.007	21	10.17	0.040	0.320
108	Lake Tuakitoto at Outlet	Poor	0.077	187	10.58	0.150	1.521
109	Lake Waiholā at Waiholā Mid	Poor	0.007	99	16.49	0.058	0.617

## Water Quality Results – Group 5

- Water quality was Excellent at all the large lake sites (Group 5)
- For Lake Dunstan *E. coli* was close to the Schedule 15 limit, and was higher than for the other sites in this group
- These results reflect the trophic status of these lakes - microtrophic/very good water quality

**Table 7. Water quality results for Group 5 (large lakes) sites,  = parameter non-compliant with Schedule 15 limit (5-year, 80<sup>th</sup> percentile below median flow exceeded Schedule 15 limits and targets).**

Site #	Name	Grade	Schedule 15 limit or target				
			NH <sub>4</sub> -N mg/L	<i>E. coli</i> cfu/100ml	Turbidity NTU	TP mg/L	TN mg/L
			0.01	10	3	0.005	0.1
110	Lake Dunstan at Dead Mans Point	Excellent	0.004	9	1.03	0.003	0.086
111	Lake Hawea South Open Water 10m	Excellent	0.003	<1	0.75	0.002	0.046
112	Lake Wakatipu Open Water 10m	Excellent	0.003	<1	0.60	0.002	0.061
113	Lake Wanaka Open Water 10m	Excellent	0.001	<1	0.53	0.002	0.064

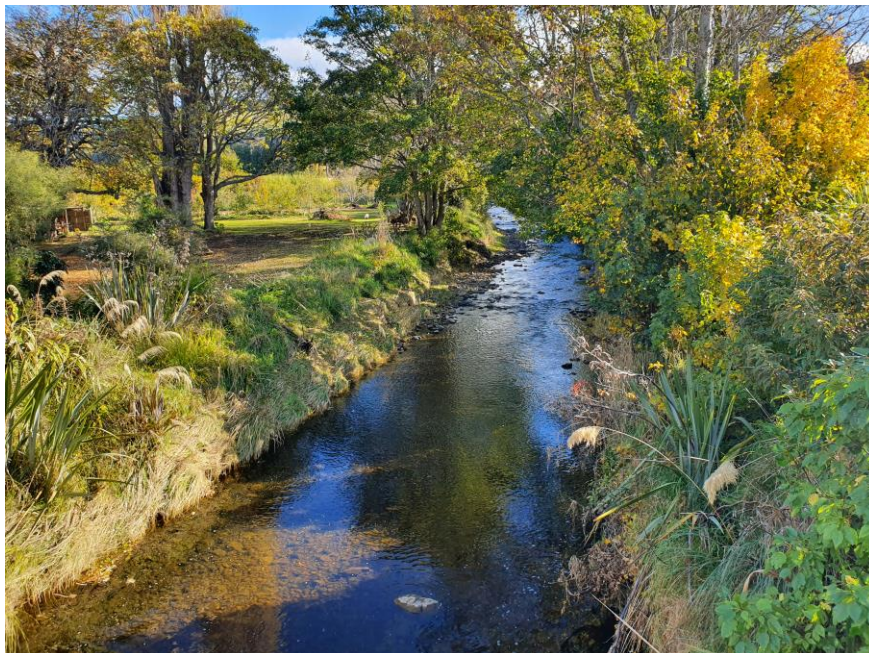
## Summary

Table 8 shows the variation in water quality grades over the past four years. For 2019-2024 71 % of the SoE river sites are classified as having 'excellent' or 'good' water quality. Most of the sites with 'excellent' river water quality were in Central Otago and the Upper Clutha Mata-Au catchments. In these areas, land-use tends to be low-intensity sheep farming and/or dominated by tussock lands. Poorer water quality was found in river catchments with higher-intensity farming or in streams draining urban environments.

**Table 8. Summary of Schedule 15 water quality index results for Otago rivers and lakes for the last five reporting periods (2019-2024)**

Grade	2014-19		2015-20		2016-21		2017-22		2018-23		2019-24	
	Rivers	Lakes	Rivers	Lakes	Rivers	Lakes	Rivers	Lakes	Rivers	Lakes	Rivers	Lakes
Excellent	37	3	37	3	41	4	41	4	39	4	40	4
Good	32	2	34	3	32	2	31	2	34	2	35	2
Fair	18	0	19	0	17	0	17	0	16	0	15	0
Poor	19	3	16	2	17	2	17	2	17	2	15	2
Total	106	8	106	8	107	8	106	8	106	8	105	8

Compared to 2018-2023 water quality results, 99 sites retained the same grade, 7 sites moved up one grade and 7 sites moved down one grade. One site (Mill Creek) moved up two grades. Two sites graded poor (Contour Channel, Kakaho Creek) were removed from the programme and one site graded fair (Hayes Creek) was added to the reporting schedule. Most grade changes involved small changes in median values that were close to the limit value and therefore do not generally indicate any significant change (improvement or degradation in water quality). The most recent analysis of long trends in Otago Region water quality were reported in the [2023 state and trends report](#).



*Waitati River at Mt Cargill Road*

The data reported here were current as of October 2024.

For more information about the State of Environment monitoring and reporting or the data presented here contact [science.enquiries@orc.govt.nz](mailto:science.enquiries@orc.govt.nz) or see our website - [Reports and Publications – water quality](#)

Water quality information for the Otago Region is also available at [LAWA Land Air Water Aotearoa](#) and on the [ORC Environmental Data Portal](#)