

June 2020

Manuherekia River and Dunstan Creek Recreation Values Assessment

Prepared for the
Otago Regional Council



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Prepared for:

Otago Regional Council

By:

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Contents

1	Introduction.....	5
2	Executive summary.....	7
2.1	Manuherekia River below Falls Dam.....	7
2.2	Dunstan Creek.....	13
3	Manuherekia River Recreation Survey 2020.....	18
4	Angler and kayaker interviews summary.....	22
4.1	Manuherekia River.....	22
4.2	Dunstan Creek.....	31
5	Literature review.....	36
5.1	Angling.....	36
5.2	Swimming.....	44
5.3	Kayaking.....	48
5.4	Jet boating.....	49
5.5	Commercial activities.....	49
5.6	Water Safety New Zealand.....	50
5.7	Hunting.....	51
5.8	Public access and pedestrian and cycling activity.....	51
5.9	Otago Regional Council consultation for water quantity plan change.....	60
5.10	Central Otago Outdoor Recreation Strategy 2012 – 2022.....	61
5.11	Regional recreation participation.....	62
6	Significance of the waterbodies for recreation.....	63
6.1	What is 'outstanding' or significant?.....	63
6.2	Significance summary for Manuherekia River and Dunstan Creek.....	65
6.3	DoC Otago Conservation Management Strategy.....	67
6.4	Central Otago District Plan.....	67
6.5	Otago Regional Council Regional Water Plan for Otago.....	68
6.6	New Zealand Recreational River Use Study.....	68
6.7	Sustainable Water Programme of Action (MfE).....	69
6.8	National Angler Surveys.....	71
6.9	National inventory of wild and scenic rivers.....	72
6.10	A list of rivers and lakes deserving inclusion in a Schedule of Protected Waters.....	72
6.11	New Zealand Recreational River Survey.....	72
7	Conclusion.....	74
8	References.....	75

Figures

Figure 1: Study area key features..... 6

Figure 2: *E. coli* attribute states in the NPS-FM for Manuherekia River (Hudson and Shelley 2019) 9

Figure 4: Manuherekia River flow and water clarity (turbidity) summer 2019/20..... 10

Figure 3: Manuherekia River flow and water quality (*E.coli*) summer 2019/20 10

Figure 5: Activity flow bands by mean daily flows at Manuherekia ‘Campground’ for 2018..... 11

Figure 6: Activity flow bands by mean daily flows at Manuherekia ‘Campground’ for 2019..... 12

Figure 7: Activity flow bands by mean daily flows at Manuherekia ‘Campground’ for 2015..... 12

Figure 8: *E. coli* attribute states in the NPS-FM for Dunstan Creek (Hudson and Shelley 2019) 14

Figure 9: Dunstan Creek flow and water clarity (turbidity) 2019..... 15

Figure 10: Dunstan Creek flow and water quality (*E.coli*) 2019..... 15

Figure 11: Angling flow band by mean daily flows at Dunstan ‘Beattie Rd’ for 2018 16

Figure 12: Angling flow band by mean daily flows at Dunstan ‘Beattie Rd’ for 2019 16

Figure 13: Angling flow band by mean daily flows at Dunstan ‘Beattie Rd’ for 2015 17

Figure 14: Sections fished by interviewees, Manuherekia River 23

Figure 15: Sections fished, Dunstan Creek 31

Figure 16: Manuherekia River angler days by two-month period. NAS data..... 38

Figure 17: Dunstan Creek angler days by two-month period. NAS data..... 38

Figure 18: ORC 2018 swimming survey, number of responses by waterbody..... 45

Figure 19: ORC 2018 swimming survey, quality ratings by swimming site, Manuherekia River..... 45

Figure 20: Swimming record locations, lower Manuherekia catchment. ORC 2018 data 46

Figure 21: Swimming record locations, upper Manuherekia catchment. ORC 2018 data..... 47

Figure 22: LINZ property map for the lower Manuherekia 53

Figure 23: LINZ property map for the mid Manuherekia..... 54

Figure 24: LINZ property map for the upper Manuherekia 55

Figure 25: Strava heatmap for running near Alexandra..... 56

Figure 26: Strava heatmap for cycling near Alexandra..... 57

Figure 27: Strava heatmap for cycling in the Manuherekia Valley 58

Figure 28: Strava heatmap for running in the Manuherekia Valley 59

Figure 29: 2016 ORC consultation relative importance of values word cloud..... 60

Figure 30: Sport NZ 7-day participation data, Active NZ 2017 survey 62

Tables

Table 1: National angler survey data, NZ resident angler days by season 36

Table 2: Reasons for fishing the Manuherekia River and Dunstan Creek (Unwin 2013) 39

Table 3: DoC commercial recreation concessions by type and location 50

1 Introduction

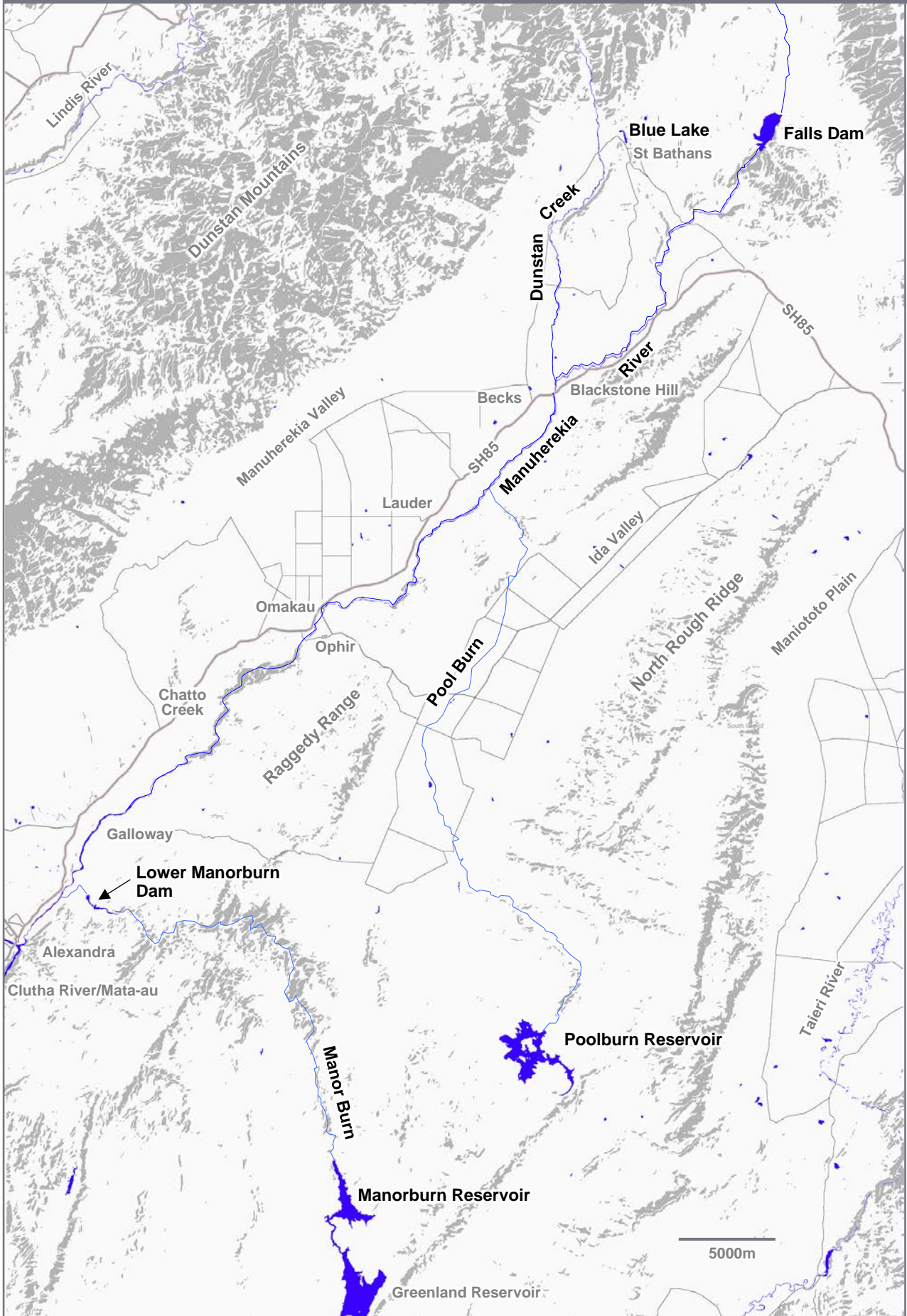
Section 30 of the Resource Management Act 1991 (RMA) requires regional councils to set levels and flows for water bodies. The National Policy Statement for Freshwater Management 2014 (NPSFM) requires every water management unit to have 'environmental flows and/or levels' and to phase out over-allocation and ensure efficient water use. The Otago Regional Council (ORC) began a programme of plan changes in 2004 to set minimum flows and levels for catchments throughout Otago.

The ORC is currently developing its Land and Water Regional Plan (LWRP) to set minimum waterway flows, lake levels and allocation limits, and which will seek to control the taking of surface and connected groundwater throughout the region and set objectives and limits for water quality. This report will advise the Manuherekia Rohe chapter of the LWRP and will be used in further consultation to identify a preferred water quantity regime, including limits to water abstraction and/or minimum flows. The preferred option will be notified as the LWRP progresses, with opportunities for submissions and input via a public hearing process.

This report refers to many of the waterbodies in the catchment as shown in Figure 1 (over-page), but directly assesses the recreation values and flow requirements for recreation for only Dunstan Creek and the Manuherekia River below Falls Dam.

This report is based on literature review, interviews with stakeholders, and an intercept survey of 540 recreational users of the Manuherekia River and Blue Lake and the Lower Manorburn Dam, carried out in early 2020. The Lake and Dam were included in the survey to canvas, in particular, swimmers who may have been displaced from the Manuherekia River for water quality or quantity reasons. The intercept survey is fully reported in a companion ORC document (*Manuherekia River Recreation Survey 2020*), with its main findings summarised in this document.

Figure 1: Study area key features



2 Executive summary

This report identifies and assesses the recreation values and uses of the Manuherekia River and Dunstan Creek. The main research tools were an intercept survey of users of the Manuherekia River, Blue Lake and Lower Manorburn Dam (Section 3), 22 in-depth interviews with, in the main, anglers and kayakers (Section 4), and literature review (Section 5 for literature describing specific recreation activities and Section 6 for literature which discusses the relative significance of waterbodies). Key findings are presented below for each waterway. Hydrological, water quality and periphyton data for the two waterways, as they relate to recreation values, are also described in this section.

2.1 Manuherekia River below Falls Dam

2.1.1 Main activities

The intercept survey found walking and swimming were the main activities encountered on the Manuherekia River downstream of Omakau during the survey period (15th of January and the 13th of February 2020), with 52% of respondents' main activity being walking when interviewed, and 71% walking near the River in the past. Sixty-seven percent of respondents had swum in the River in the past, and 26% were swimming when interviewed. Only 7% of respondents were cycling when interviewed, but 25% had cycled in the past. All other activities were undertaken by fewer than 3% of respondents (dog walking, paddling, fishing etc). Interviews indicated important whitewater kayaking values throughout the River, but particularly in the Ophir Gorge and for teaching in the lower part of the Gorge and downstream. Angling activity was dispersed throughout the River and areas local to where interviewees lived generally favoured.

National angler survey data indicate that the Manuherekia catchment contributed 5.5% of all angler days in Otago in the 2014/15 season (the most recent data available), and the Manuherekia River contributed 21% of the angler activity in the catchment (2,100 ± 830 angler days).

2.1.2 Significance

This review finds that the Manuherekia River is not nationally significant or outstanding for recreation, but it does have regionally significant values for angling and kayaking. The demographic profile for the intercept survey indicates that it has regional significance for other recreation values such as swimming and walking, relating mostly to visitors from the lower South Island (Otago and Southland). In sum, the Manuherekia River can be described as regionally significant for recreation below Falls Dam.

2.1.3 Quality of experience

In Unwin's 2013 review of national angling values, the Manuherekia River received a mean enjoyment score of 2.29 putting it in 41st position in Otago out of 57 rivers. However, interviewees for this study had a strong attachment to the River due its accessibility, relatively small size, general reliability for fishing and its scenic values – particularly in the reaches above Galloway. Conversely, interviewees and a majority of respondents to the intercept survey reported a decline in the quality of the fishery and water over time, and for many this was a significant decline. Notably 14% of respondents to the survey – with enough experience over time – felt the River was better than when they first visited, 53% felt it was worse and 33% thought it had not changed. Those with a longer period of experience were more likely to think that the River had changed for the worse (60% for those with between 21 and 40 years of experience, and 72% for those with more than 40 years). Swimmers generally were least likely to think it had improved (3%). Better tracks and paths were the main reasons for improvement. Low flows, poor water quality, muddy beaches and algae and slime were the main reasons for it being worse, and angler interviewees noted issues with willows. Improving water quality was the top issue for respondents by a wide margin, with 77% of all respondents deciding that this

was their first, second or third priority. Low flows and poor water quality were the main reasons respondents did not swim in the Manuhereikia River.

Kayaker interviewees reported a high quality experience since they tended to kayak only when flows were high and suitable, but several noted a reduction in water quality over time and more sediment and mud in the lower reaches where some kayak teaching occurs.

Notably, the River exceeded the *Regional Plan: Water for Otago* receiving water numerical limits for *E.coli* (260 cfu/100 ml at or below median flow) during much of the intercept survey period, while it complied with the receiving water numerical limits for turbidity (5 NTUs at or below median flow).

2.1.4 Flow preferences

In the intercept survey, respondents were asked if their water-based activities were ever not possible due to low or high flows during the summer season. The majority of respondents (60%) had always been able to carry out their activity when the River was low, but 26% were affected 'sometimes' or 'often'. Fewer respondents were 'never' affected by high flows (41%), but only one respondent stated that they were 'often' affected. These levels of effect were reasonably consistent regardless of the respondent's main activity on the day. Respondents were asked if they preferred lower, higher or the same river flow experienced at the time that they were interviewed. There was a preference for higher flows than those encountered when flows were below 4m³/s, and no respondents preferred the flows to be lower than 2m³/s – and few preferred it lower at any flow that they had encountered.¹

For interviewees, fishing guides were more likely to name a specific preferred flow for angling. Two described between 10 and 15m³/s at Ophir as ideal, one 6 to 15m³/s and another 8 to 15m³/s. One had lower flow preferences with 5 to 8m³/s in the mid-section of the River ("above that too hard to fish - 5 pretty good"), 3 to 4m³/s in the lower river and 5m³/s below Falls Dam. Casual anglers were mostly less specific, and only one named preferred flows: at least 2.5m³/s for fishing and ideally 3 to 3.5m³/s: "Once below 2m³/s the function of the Manuhereikia deteriorates with more slime and algae." Others referred to general depth and water temperature qualities (not too hot, not too shallow).

Keeling (2013) reported an assessment of low flows for angling in the Manuhereikia River using expert experience of flows at 0.9m³/s and 1.5m³/s at Keddell Rd approximately 4km downstream of the Ophir Gorge. The lower flow was considered poor for angling while 1.5m³/s was considered 'okay' with some participants reporting it appropriate for angling and others finding it still lower than ideal.

Kayaker interviewees offered a range of opinions but within similar bands and focused on Ophir Gorge:

- Minimum flows of 15, 16 or 20m³/s
- Preferred flows of at least 20m³/s and up to 25, 30, 40 or 50m³/s, and one reference to 80m³/s as a maximum.

2.1.5 Water quality and quantity

Hudson and Shelley (2019), in their review of water quality and ecological data for the Manuhereikia River catchment, indicate that *E.coli* concentrations appear to be increasing over time at testing sites at Ophir and Galloway, while turbidity levels have been decreasing. Only a short period of testing data was available for the River at Blackstone Hill (immediately upstream of the Dunstan Creek confluence). Figure 2 illustrates Hudson and Shelley's (2019) assessments by season for the three sites based on the 'human health for recreation' microbiological attribute state thresholds for *E.coli* as defined in the *National Objective Framework of the National Policy Statement for Freshwater Management 2017* (NPS-FM). A blue attribute state indicates a 1% infection risk (grade A), green a

¹ Almost all responses were for the River between Galloway and its confluence with the Clutha River/Mata-au, and flow measurements were taken from the flow recorder opposite the Alexandra Holiday Park.

2% risk, yellow a 3% risk, and orange a risk between 3% and 7%. A red attribute state (grade E), the maximum possible, indicates an illness risk of more than 7%. The predicted average infection risk is the overall average infection to swimmers based on a random exposure on a random day, ignoring any possibility of not swimming during high flows or when a surveillance advisory is in place. Figure 4 suggests that high *E.coli* measurements do not necessarily correlate with high flows on the Manuherekia River, so the infection risk assessment does not imply a conservative assessment in this case (that is, it does not assume that the assessment might overstate the true illness risk by including high *E.coli* measurements taken during high flows, which swimmers would normally avoid).

According to the NPS-FM, the attribute state should be determined by using a minimum of 60 samples over five-years, and so Figure 2 shows data for rolling periods ending in 2019. Sample sizes between 50 and 60 are underlined.

Figure 2: *E. coli* attribute states in the NPS-FM for Manuherekia River (Hudson and Shelley 2019)

Site	Period and grade						
	2009/13	2010/14	2011/15	2012/16	2013/17	2014/18	2015/19
Manuherekia at Blackstone Hill						Blue	Green
Manuherekia at Galloway	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Orange
Manuherekia at Ophir	Yellow	Orange		Orange	Yellow	Orange	Orange

Hudson and Shelley (2019) reviewed only two seasons of data for periphyton cover at six sites, and so no trend data are available. The extent of long (>2 cm) filamentous periphyton cover at each of the six sites were compared with a provisional national periphyton cover guideline for aesthetics/recreation and trout habitat and angling. Cover was found to be very low at four of the five sites (Downstream of Fork, Galloway, Loop Road, Omakau and Ophir) and did not come close to exceeding the filamentous periphyton cover guideline of 30%. At Blackstone Hill, long, filamentous periphyton cover was notably higher than at the other sites, and in April 2017 it exceeded the guideline (at 34%). Hudson and Shelley (2019) note that the periphyton surveys coincided with relatively high ‘atypical’ flow periods and may therefore understate the periphyton cover expected during warmer and drier conditions.

Figure 3 and Figure 4 show the flows in the lower Manuherekia River as measured at the Alexandra ‘Campground’ site (opposite the Alexandra Holiday Park), compared with water quality (*E.coli*) and water clarity measurements respectively during the summer of 2019/20 (which includes the period of the intercept survey) for Shaky Bridge. The water quality and clarity measurements were carried out by the ORC as part of their routine environmental monitoring at Galloway Bridge. Compliance with the receiving water numerical limits in the *Regional Plan: Water for Otago* for *E.coli* and turbidity requires the assessment of measurements taken over a rolling five-year period (as for the NPS-FM) with a requirement that 80% of measurements meet or are better than the stated limits when flows are at or below median flow. The two figures therefore do not indicate the degree of compliance with the receiving water numerical limits, but rather present a snapshot of river conditions.

Figure 3 shows that the River was below (better than) the receiving water numerical limits for turbidity (5 NTUs² at or below median flow) for most of the period, and that exceedance was not related to high flows. Figure 4 shows that the River exceeded the receiving water numerical limits for the bacteria *E.coli* (260 cfu/100 ml at or below median flow (8.01m³/s at Ophir)) during much of the period.

² Nephelometric Turbidity Units. A nephelometer is an instrument for measuring the concentration of suspended particulates in a liquid.

Figure 3: Manuherekia River flow and water clarity (turbidity) summer 2019/20

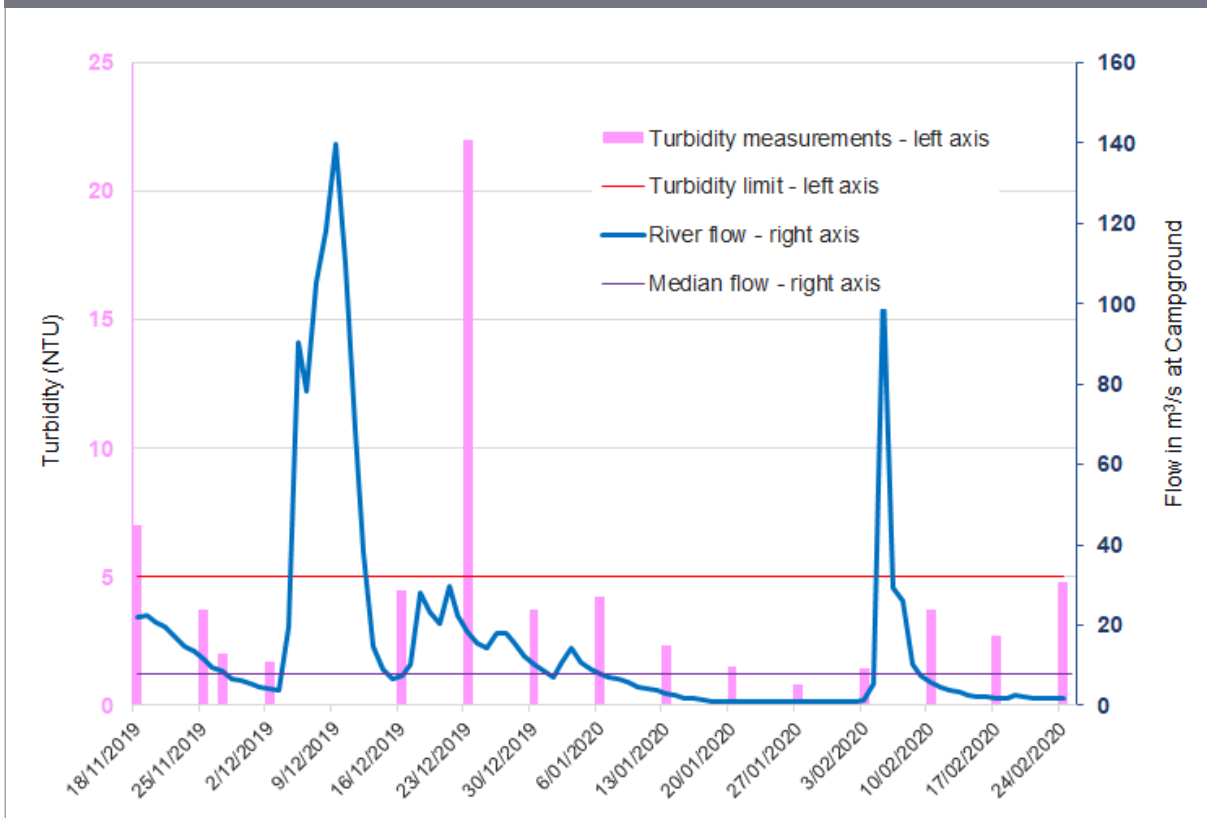


Figure 4: Manuherekia River flow and water quality (*E.coli*) summer 2019/20

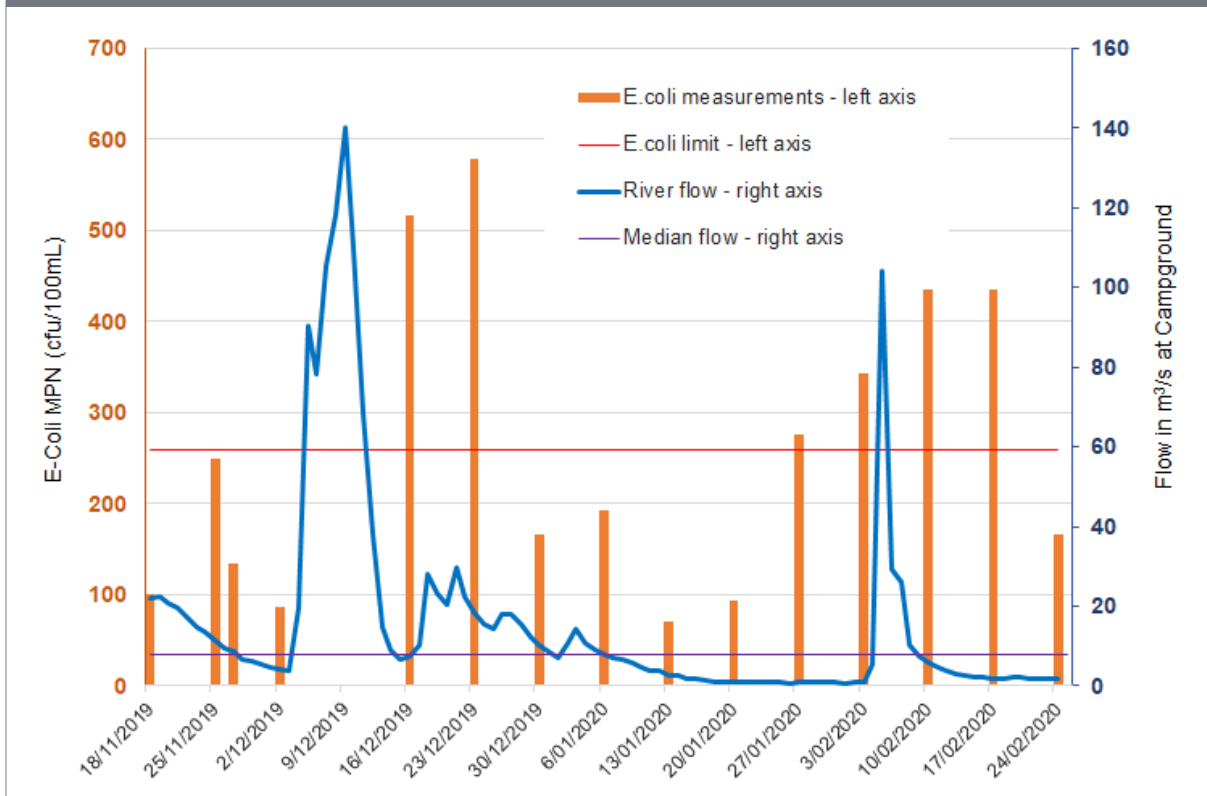


Figure 5 and Figure 6 show the availability of flows for 2018 and 2019 for the four main flow-dependent activities on the Manuherekia River according to mean daily flow measurements recorded at the 'Campground' site (opposite the Alexandra Holiday Park just upstream from Alexander). Flows for angling are only shown for the fishing season (1 October to 30 April). Figure 7 shows the same data for 2015, which was comparatively dry. The preferred flow bands are taken from the flow preferences described in Section 2.1.4:

- Kayaking in Ophir Gorge – 15m³/s to 50m³/s+
- Fishing – 1.5m³/s to 15m³/s
- Swimming – 2m³/s to 4m³/s
- Jet boating – 12m³/s+ (limited by ORC Navigation Safety Bylaw to between 10m³/s and 45m³/s in only August and September)

In the case of fishing, the minimum preferred flow of 1.5m³/s is taken from Keeling (2013), noting that this flow was considered only 'okay', and that water temperature has as much influence over fishing success as water quantity at low flows. The minimum flow for angling therefore only relates to one aspect of angling requirements. Similarly, for swimming, key determinants are also water quality and periphyton levels, and so water quantity in itself is only one factor determining activity suitability.

The River appears to have been more suitable for swimming and fishing in 2018 and 2019 only near the beginning of each year. Kayaking options arose throughout 2018 and 2019, but were largely absent through the start of 2019, and were available only through winter and early spring in 2015. The River was frequently above preferred flows for much of the end of 2018, but in 2015 was marginal – if at all suitable – for angling for much of the start and finish of the year, and appears low for swimming for the same period.

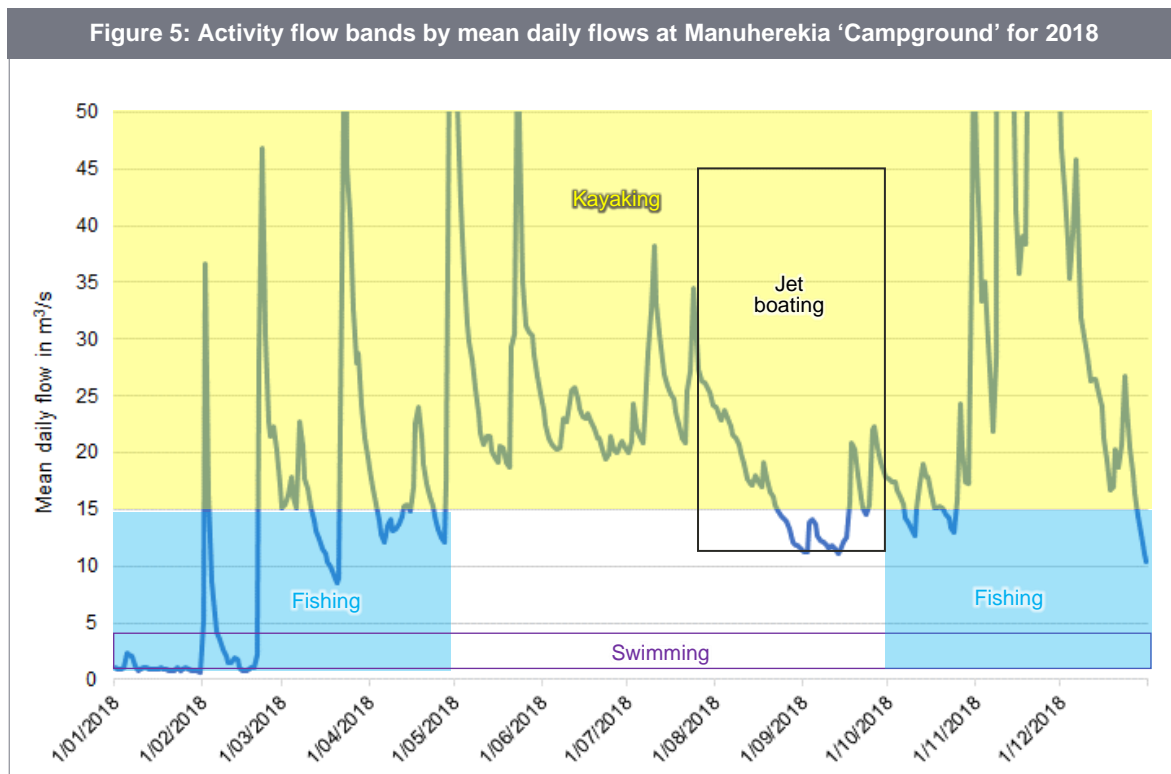


Figure 6: Activity flow bands by mean daily flows at Manuherekia 'Campground' for 2019

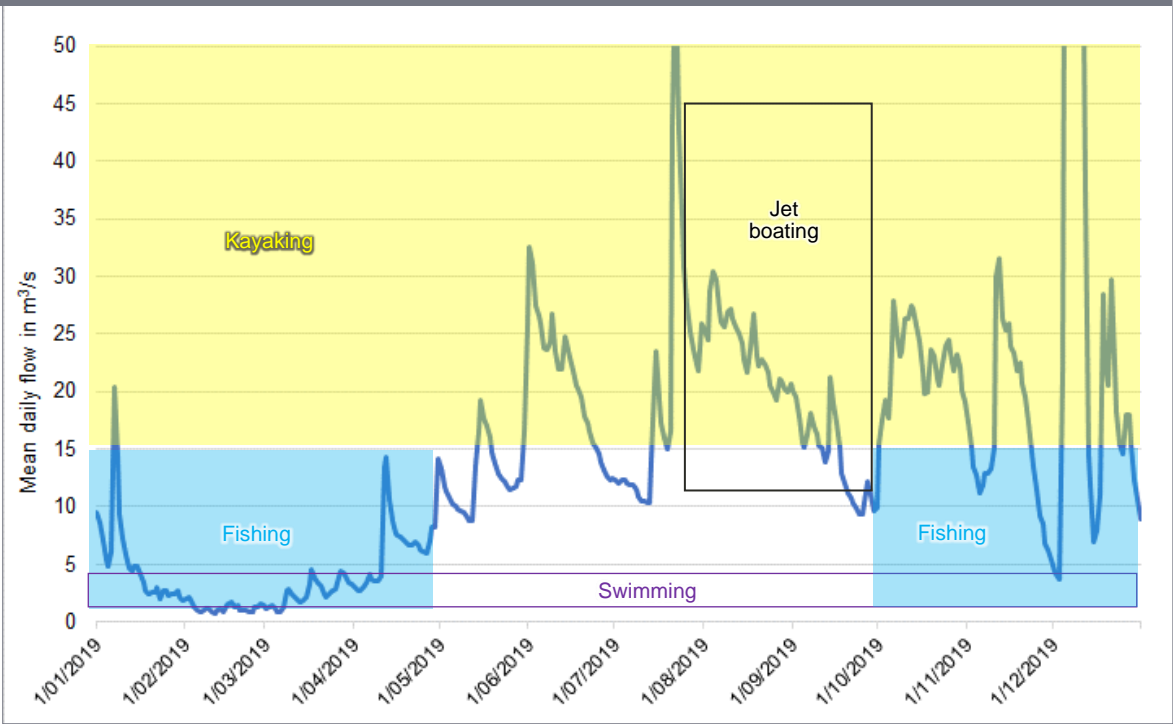
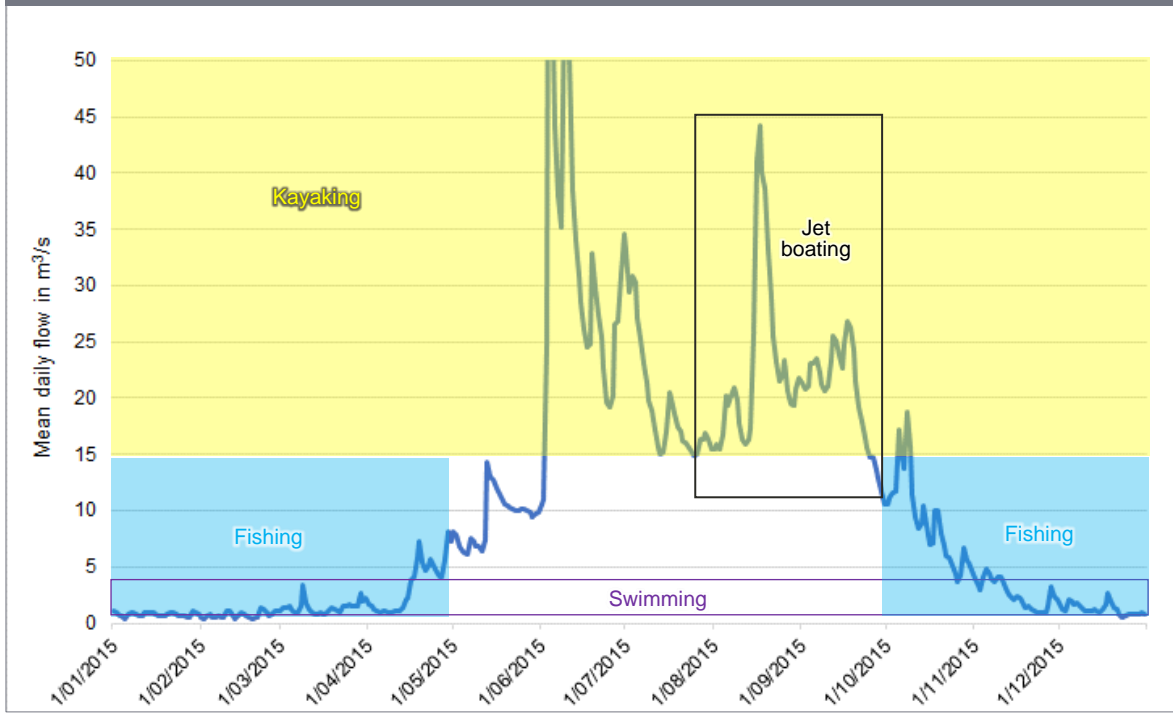


Figure 7: Activity flow bands by mean daily flows at Manuherekia 'Campground' for 2015



2.2 Dunstan Creek

2.2.1 Main activities

National angler survey data indicate that the Manuhereikia catchment contributed 5.5% of all angler days in Otago in the 2014/15 season, and Dunstan Creek contributed 2% of the activity in the catchment (210 ± 150 angler days). Interviewees indicated that angling is the main use of the Creek with some local swimming and walking where access allows, particularly around Cambrians. There is no kayaking on the Creek.

The Creek presents two quite different angling opportunities, with accessible fishing in the Creek downstream of St Bathans amongst willows, and upstream in a more natural and remote setting. While it is possible to walk the Creek upstream of St Bathans, most access is via private land by permission only. Those without permission or who do not wish to drive rely on helicopter access, which is preferred by professional guides. Anglers tend to visit the upper Creek as an occasional treat rather than a regular activity.

2.2.2 Significance

Significant recreation values on Dunstan Creek are confined to angling, and these do not appear to be regionally significant in the reach below St Bathans, considering its low level of use and good accessibility (noting the increasing influence of willow and other weeds impeding access). The reaches above St Bathans have poor accessibility, but commercial guides and regional visitors are willing to invest effort to experience the remote setting with its high quality scenic and natural values, angling challenge, clear water and the chance of catching a trophy fish. This upper section of Dunstan Creek is of at least regional significance for angling.

2.2.3 Quality of experience

Dunstan Creek received a mean enjoyment score of 2.29 putting it in 25th position in Otago out of 57 rivers in Unwin's 2013 review of national angling values (compared with the Manuhereikia River at 41st position). Anglers reported a very high quality remote fishing experience in the upper catchment and a good experience in the lower. However, for the lower Creek, most interviewees noted declining water quality and the increasing effects of willows on access and casting, and other weed species such as broom and briar as impeding access.

2.2.4 Flow preferences

Anglers reported a small range of flow preferences for the lower Creek:

- 5m³/s too high because of broom and willow, but 2m³/s is ideal,
- 4 to 5m³/s at ORC gauge for 'Dunstan Creek at Beattie Road',
- Around 2 – 3m³/s.

2.2.5 Water quality and quantity

Hudson and Shelley (2019) indicate that median *E.coli* concentrations in Dunstan Creek at the Beattie Rd site increased from 23.5 *E.coli*/100 mL before 2013 to 40.5 *E.coli*/100 mL after 2015. Figure 8 shows the assessments by season for Dunstan Creek based on the 'human health for recreation' microbiological attribute state thresholds for *E.coli* as defined in the National Objective Framework of the National Policy Statement for Freshwater Management 2017 (NPS-FM), relying on the same provisos and definitions described for Figure 2 on page 9 in reference to the Manuhereikia River. This indicates the lower reach of the Creek shifting from a low (blue) to a relatively high (orange) infection risk (one attribute state short of the maximum risk state). However, all but the 2014/18 period has the

necessary number of samples (60) to meet the grading assessment criteria for confidence, and are therefore otherwise indicative.

Figure 8: *E. coli* attribute states in the NPS-FM for Dunstan Creek (Hudson and Shelley 2019)

Site	Period and grade						
	2009/13	2010/14	2011/15	2012/16	2013/17	2014/18	2015/19
Dunstan Cr at Beattie Rd				Blue	Blue	Green	Orange

Hudson and Shelley (2019) did not report on periphyton in Dunstan Creek. Turbidity levels were described as normally compliant with the ORC Water Plan limit of 5 NTU. Electric fishing surveys of a 150m section of Dunstan Creek were carried out annually between 2015 and 2018.³ Brown and rainbow trout were present ‘in modest numbers’ but the electric fishing method was noted as being poor at counting adult trout, as they tend to avoid capture.

Figure 9 and Figure 10 show the flows in Dunstan Creek as measured at Beattie Road, compared with water quality (*E.coli*) and water clarity measurements respectively during the 2019 year. As for the Manuherekia River, the water quality and clarity measurements were carried out by the ORC as part of their routine environmental monitoring at Beattie Road, with measurements taken monthly (less frequently than on the Manuherekia River). Compliance with the receiving water numerical limits in the *Regional Plan: Water for Otago* for *E.coli* and turbidity requires the assessment of measurements taken over a rolling five-year period (as for the NPS-FM) with a requirement that 80% of measurements meet or are better than the stated limits when flows are at or below median flow. The two figures therefore do not indicate the degree of compliance with the receiving water numerical limits, but rather present a snapshot of river conditions.

Figure 9 shows that the Creek was below (better than) the receiving water numerical limits for turbidity (5 NTUs at or below median flow (2.34m³/s at Beattie Road)) for 2019. Figure 10 shows that the Creek exceeded the receiving water numerical limits for the bacteria *E.coli* (260 cfu/100 ml at or below median flow) once by a small margin in March.

Figure 11 and Figure 12 shows the flow suitability for angling in 2018 and 2019 respectively for flows measured at Beattie Road. Figure 13 shows the same data for 2015, which was comparatively dry. Flow preferences are as described in Section 2.2.4: from 2 to 5m³/s. Year 2018 shows suitable flows available periodically for angling, but were often too high, while in 2019 they were only reliable at the end of the year, and in 2015 flows were rarely suitable during the fishing season.

³ Hudson and Shelley (2019) do not define the section surveyed.

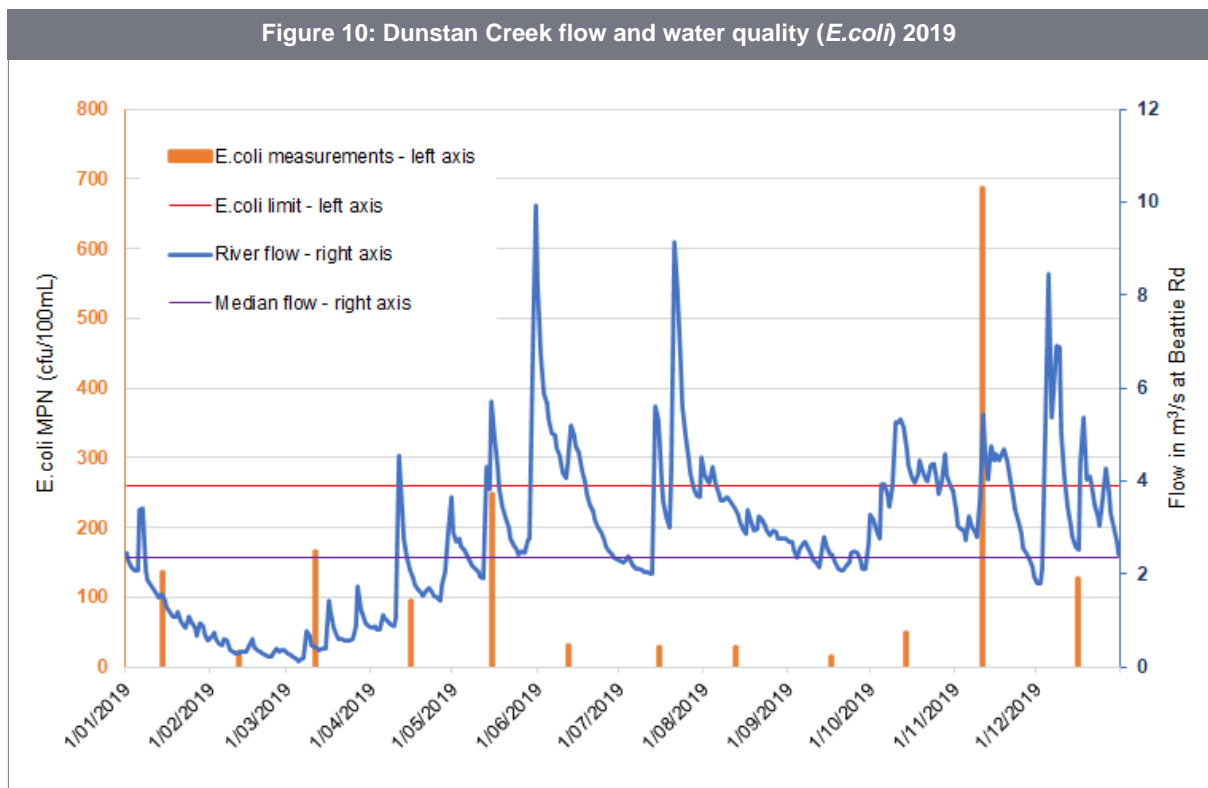
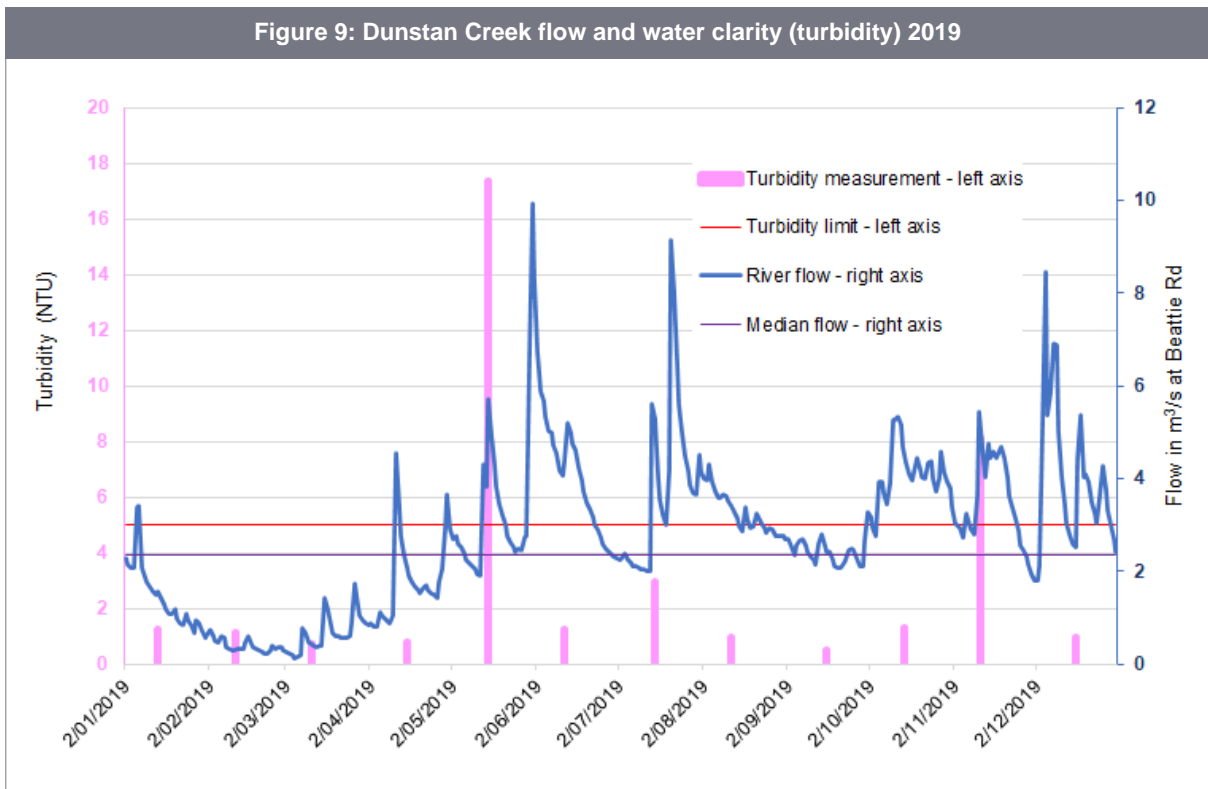


Figure 11: Angling flow band by mean daily flows at Dunstan 'Beattie Rd' for 2018

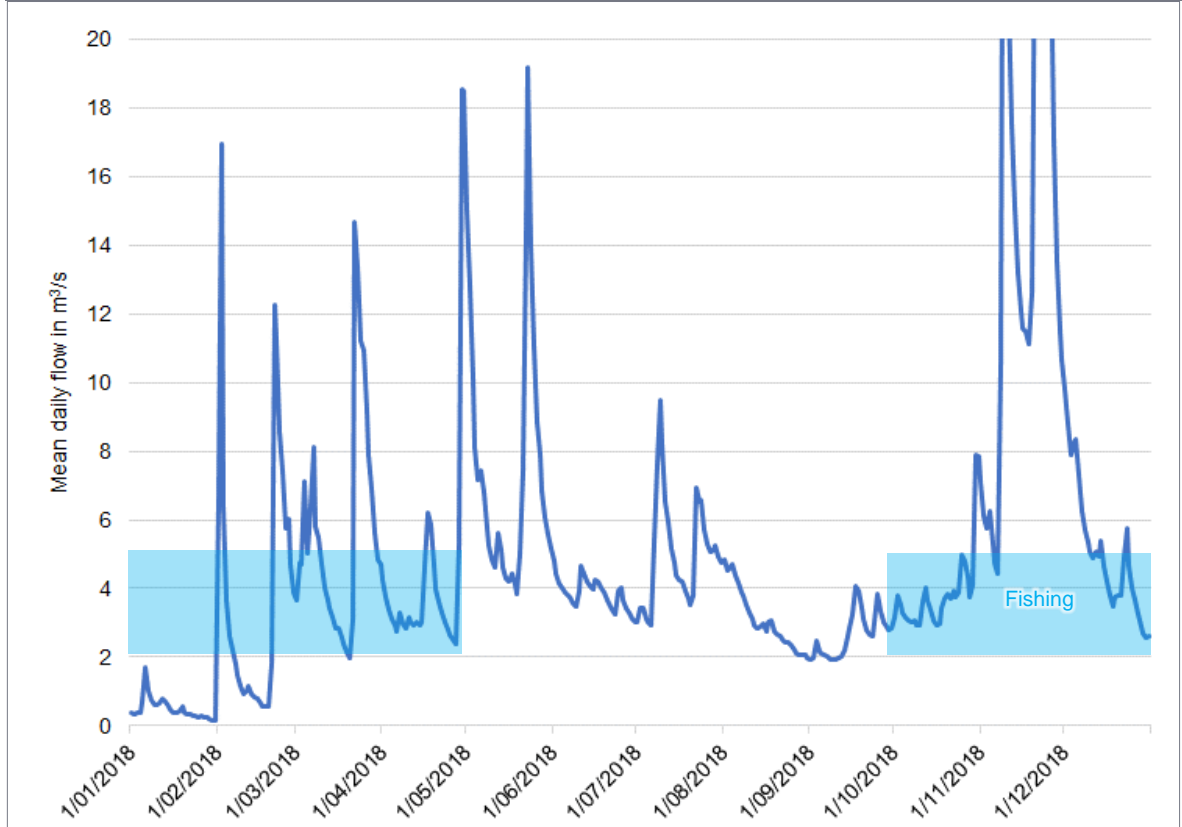


Figure 12: Angling flow band by mean daily flows at Dunstan 'Beattie Rd' for 2019

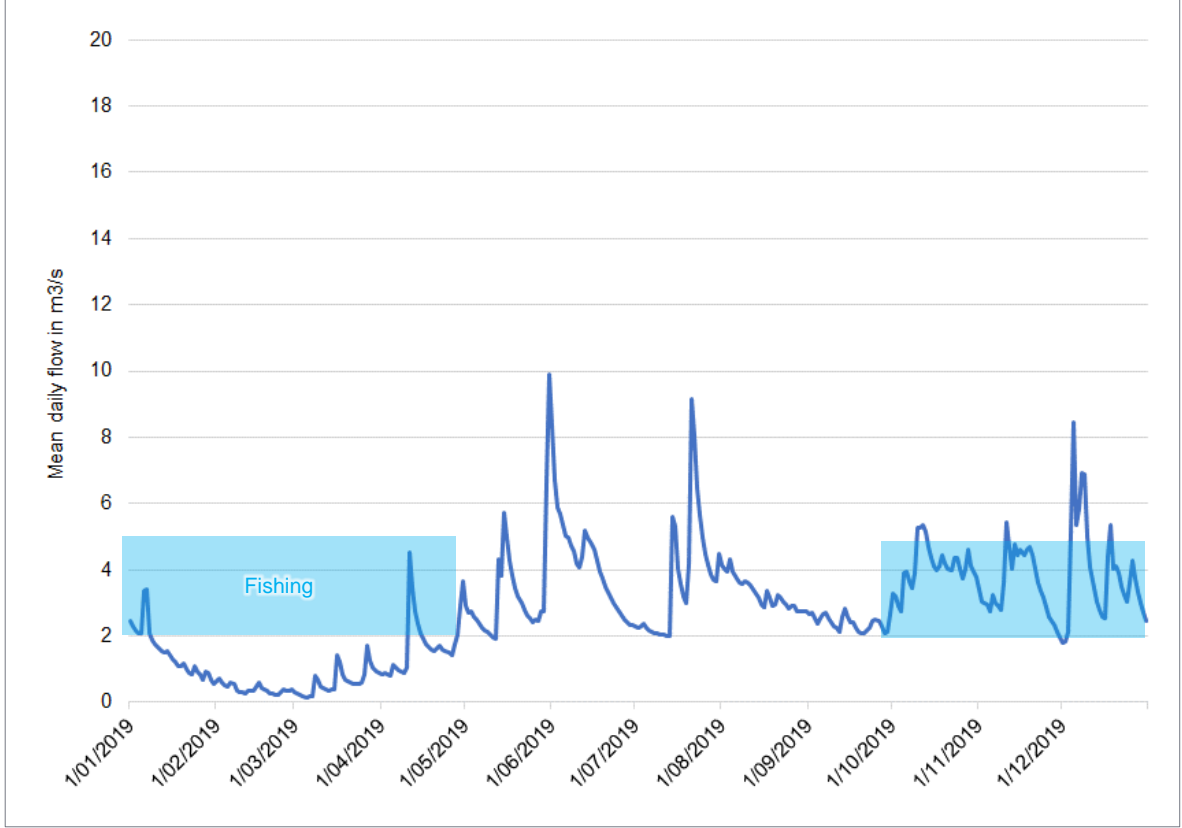
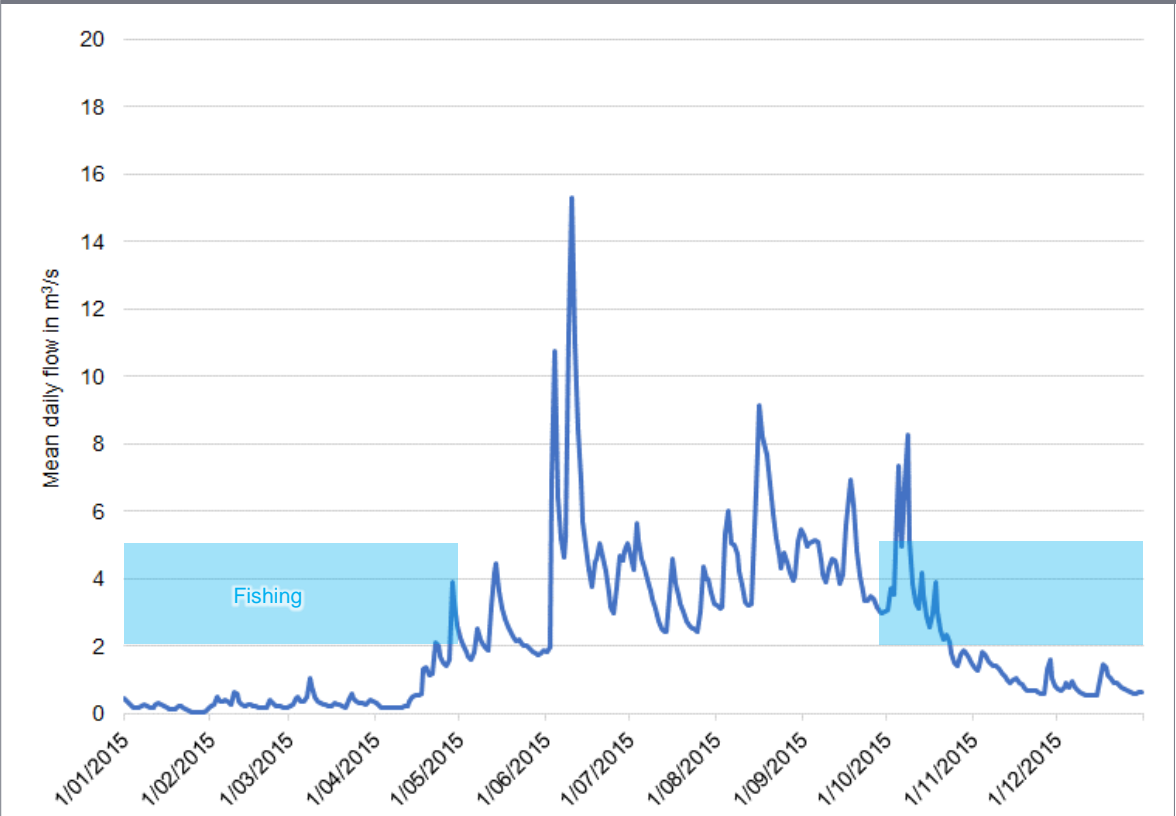


Figure 13: Angling flow band by mean daily flows at Dunstan 'Beattie Rd' for 2015



3 Manuherekia River Recreation Survey 2020

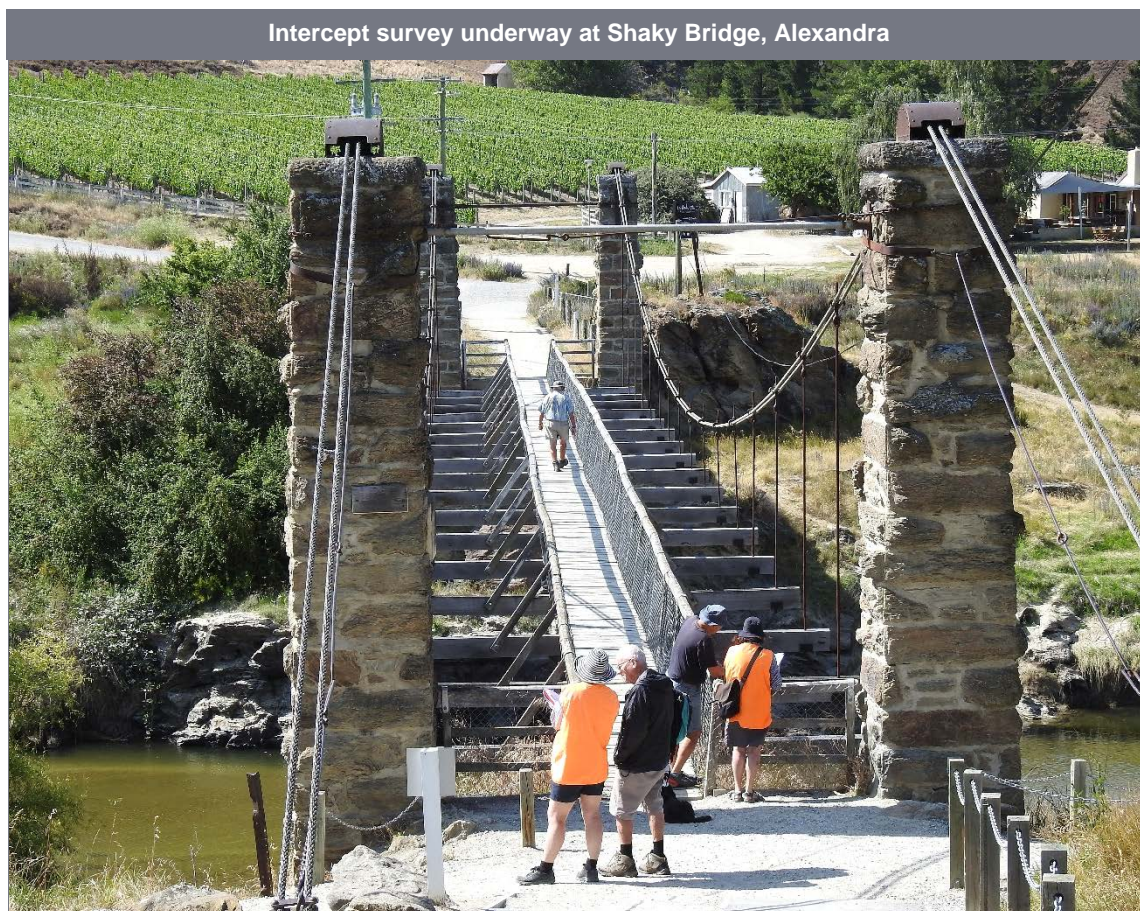
An intercept survey of recreational use of the Manuherekia River, Blue Lake and Lower Manorburn Dam was carried out over 23 days in early 2020 to support the analysis in this report and to provide baseline data for describing recreation values. A separate survey report has been prepared for the Otago Regional Council (*Manuherekia River Recreation Survey 2020*). Only a summary of the survey results is presented here.

A total of 540 survey respondents was gained: 402 on the River (almost all downstream of Galloway), 73 at Blue Lake and 65 at the Lower Manorburn Dam. The Lake and Dam were included to enable canvassing of people who might not have been able to use the Manuherekia River for any reason, such as high or low flows. The respondents, as expected, were mostly walking or swimming (78% of respondents) and additional primary research into angling and kayaking was therefore undertaken (reported in Section 4 of this report).

The intercept survey was carried out over 23 days between the 15th of January and the 13th of February 2020.

Key findings from the results include:

- Poor water quality and low flows were the key issues for respondents who were dissatisfied with the recreation values of the Manuherekia River. Water quality and toxic algae were considered the top management issues, while water quantity was afforded a much lower priority.
- Low flow did not appear a determinant of recreation value by itself. Many respondents considered low and gentle flows a reason to describe the Manuherekia River as ‘safe’ and ‘family friendly’, although there were also many respondents who wanted deeper



swimming holes. Concerns with flow may also be associated with the presence of algae and silt, which were frequently described as problems for recreational use.

- While most respondents (more than 80%) at the Blue Lake and the Lower Manorburn Dam thought the settings had improved or stayed the same over time, most respondents at the Manuherehia River thought the River had deteriorated (53%), and those with the longest experience of the River were more likely to consider it worse (72% for those with more than 41 years of experience). Low flows, poor water quality, mud and silt and algae were the main causes of a perceived deterioration.
- Respondents described the River's best aspects to be its scenic qualities, its safety for family swimming, the peace and tranquility and its accessibility.

The survey had six main focus areas:

1. **Demographics.** Age and gender profiles for respondents on the Manuherehia River generally matched the 2018 Census results for the local area. Respondents were more likely to be in the 25-49 age group (but more-so at the Lower Manorburn Dam than at Blue Lake or the River), and respondents from the older age groups (50+) were more common on the River than at the Lake or Dam. Just over 50% of respondents on the River were local to the Manuherehia River, including Alexandra (44% of the total), Clyde, Omakau, Galloway and other local settlements. South Islanders made up 83% of all respondents, and international visitors (12%) outnumbered North Islanders (5%). Blue Lake had more respondents from Dunedin than Central Otago, and the Dam had a high number of internationals – mostly itinerant fruit pickers. Those aged under 15 were not interviewed and were treated as non-responses.⁴
2. **Activity.** Walking and swimming were the main activities encountered on the Manuherehia River, with 52% of respondents' main activity being walking when interviewed, and 71% walking near the River in the past. Sixty-seven percent of respondents had swum in the River in the past, and 26% were swimming when interviewed. Only 7% of respondents were cycling when interviewed, but 25% had cycled in the past. All other activities were undertaken by fewer than 3% of respondents (dog walking, paddling, fishing etc). Swimming was by far the main activity at Blue Lake (75% on the day, with 89% in the past) and at the Lower Manorburn Dam (78% and 94%). At the Lake, 32% were on their first visit, compared with 46% at the Dam and 20% at the River.
3. **Change over time.** Respondents were asked if, in their opinion, the Manuherehia River was better, worse or the same as the first time they had visited it. They were also asked how many years they had been visiting the River. Overall, 14% of respondents with enough experience over time felt the River was better, 53% felt it was worse and 33% thought it had not changed. Those with a longer period of experience were more likely to think that the River had changed for the worse (60% for those with between 21 and 40 years of experience, and 72% for those with more than 40 years). Swimmers generally were least likely to think it had improved (3%). Better tracks and paths were the main reasons for improvement. Low flows, poor water quality, muddy beaches and algae and slime were the main reasons for it being worse. Respondents at the Lake and Dam were more likely to think that the settings were the same or better.
4. **Best and worst aspects.** Respondents were asked to name their best and worst aspects of the River via an unprompted open question. There was almost two times the number of best aspects compared with worst. Best aspects included the quality of the scenery, the family-friendly nature of the River and its safety for swimming, its peacefulness and accessibility, and the cycle and walking tracks. The main worst aspects were poor water quality, mud and silt, algae and slime, and low water flows.

⁴ Standard survey etiquette requires permission from a guardian or parent for potential respondents aged under 15.

5. **River flow.** Respondents were asked if their water-based activities were ever not possible due to low or high flows during the summer season. The majority of respondents (60%) had always been able to carry out their activity when the River was low, but 26% were affected 'sometimes' or 'often'. Fewer respondents were 'never' affected by high flows (41%), but only one respondent stated that they were 'often' affected. These levels of effect were reasonably consistent regardless of the respondent's main activity on the day. Very few respondents (5%) checked the water quality or quantity before visiting. Respondents were asked if they preferred lower, higher or the same river flow experienced at the time that they were interviewed. There was a preference for higher flows than those encountered when flows were below 4m³/s, and no respondents preferred the flows to be lower than 2m³/s – and few preferred it lower at any flow. Almost all responses were for the River between Galloway and its confluence with the Clutha River/Mata-au, and flow measurements were taken from the flow recorder opposite the Alexandra Holiday Park.
6. **Improvements.** A closed question was provided with the options of ordering three top priorities from the following list:
- Making the river more fish-friendly
 - More native riparian or riverside planting
 - Improving water quality so it is safe and healthy for swimming
 - Minimising periods of low flow
 - Managing toxic algae
 - Managing slippery algae
 - Managing sediment inflows to the river
 - Improved flood protection works

Improving water quality was the top issue by a wide margin, with 310 (77%) of all respondents deciding that this was their first, second or third priority; and with it being identified as priority 1 by over 46% of all respondents. Compared with managing toxic algae, which was the second-rated activity, more than double the number of respondents considered water quality to be a priority 1 issue. The priorities in descending order were: water quality, toxic algae, fish-friendly, sediment, planting, low flows, slippery algae and flood protection. Respondent's origin (where they normally lived) did not appear to influence these choices.

7. **Swimming and paddling.** Respondents who were not swimming or paddling in the River on the day of the survey were asked about their past and intended swimming and paddling experiences. Those swimming or paddling on the day of the survey, were excluded from this set of questions, leaving 226 relevant respondents. Those were first asked if they had ever been swimming or paddling in the Manuherekiā River in the past, and 70% had. The remaining 30% were asked why they had never swum or paddled in the River. Twenty-one percent referred to poor water quality and algae as the reason. Those that swum were asked what conditions were required. Good weather and good water quality were equally important (46% and 44% of relevant respondents respectively), followed by higher flows (36%) and safer slow flows (13%). Having no mud on beaches was referred to by only 3% of these respondents.

A similar set of questions was asked at Blue Lake and the Lower Manorburn Dam to gauge if swimmers there had been displaced from the River for any reason. Many respondents at each setting had used the River in the past (Lake 58% and Dam 66%). The reasons why respondents were not intending to swim in the River 'this season' came from 30 respondents at Blue Lake and 22 respondents at the Dam (52 in total). General preference and convenience

were important (such as, 'prefer the Lake', or 'the Lake is closer to home'), but 47% of this subgroup named water quality issues as a reason for not swimming in the River. The 36 respondents planning on swimming or paddling in the Manuherekia River 'this season' were asked what conditions would be necessary. The main conditions related to water quality and quantity. The majority of respondents who had never swum or paddled in the River stated that they had never heard of it, and there were no specific water quality issues raised.



4 Angler and kayaker interviews summary

During March and April 2020, 22 in-depth telephone interviews were conducted with recreational users of Manuherekia River and Dunstan Creek, including six kayakers, 14 anglers, one jet boater (summarised in Section 5.4), and one local generalist. Angling respondents were recommended by the Otago Fish & Game Council or by other interviewees, while others were selected as representatives or active members of known recreation groups. Interviews were conducted by two researchers using a script with 20 questions (repeated for each waterbody where relevant), and ranged in length from 15 minutes to well over an hour. Interviewees were sent a summary of their responses to confirm their inputs, and almost all were comfortable with having their names associated with their responses. All responses by interviewee are available separately (~60 pages). A summary is presented here.

Interviewees were members of one or more of the following agencies:

- Fish & Game New Zealand
- Central Otago Environmental Society
- Wakatipu Anglers Club
- NZ Professional Fishing Guides Association
- Central Otago Whitewater Club
- Upper Clutha Angling Club
- Teviot Angling Club
- Otago Anglers Fishing Association
- Southern Lakes Multi-sport Club
- Otago Canoe and Kayak Club
- Clutha Fisheries Trust

Quotations from interviews used in this section have been edited to improve grammar and legibility.

4.1 Manuherekia River

All but one of the 20 interviewees had experience on the Manuherekia River. One kayaker represented a club which held its activities on other local waterways but had not kayaked the Manuherekia River personally. Recreational activities undertaken by interviewees included angling (guiding and personal), kayaking (including teaching), swimming, dog walking and walking. Fourteen interviewees were primarily anglers, six were kayakers and one was a regular general recreational user.

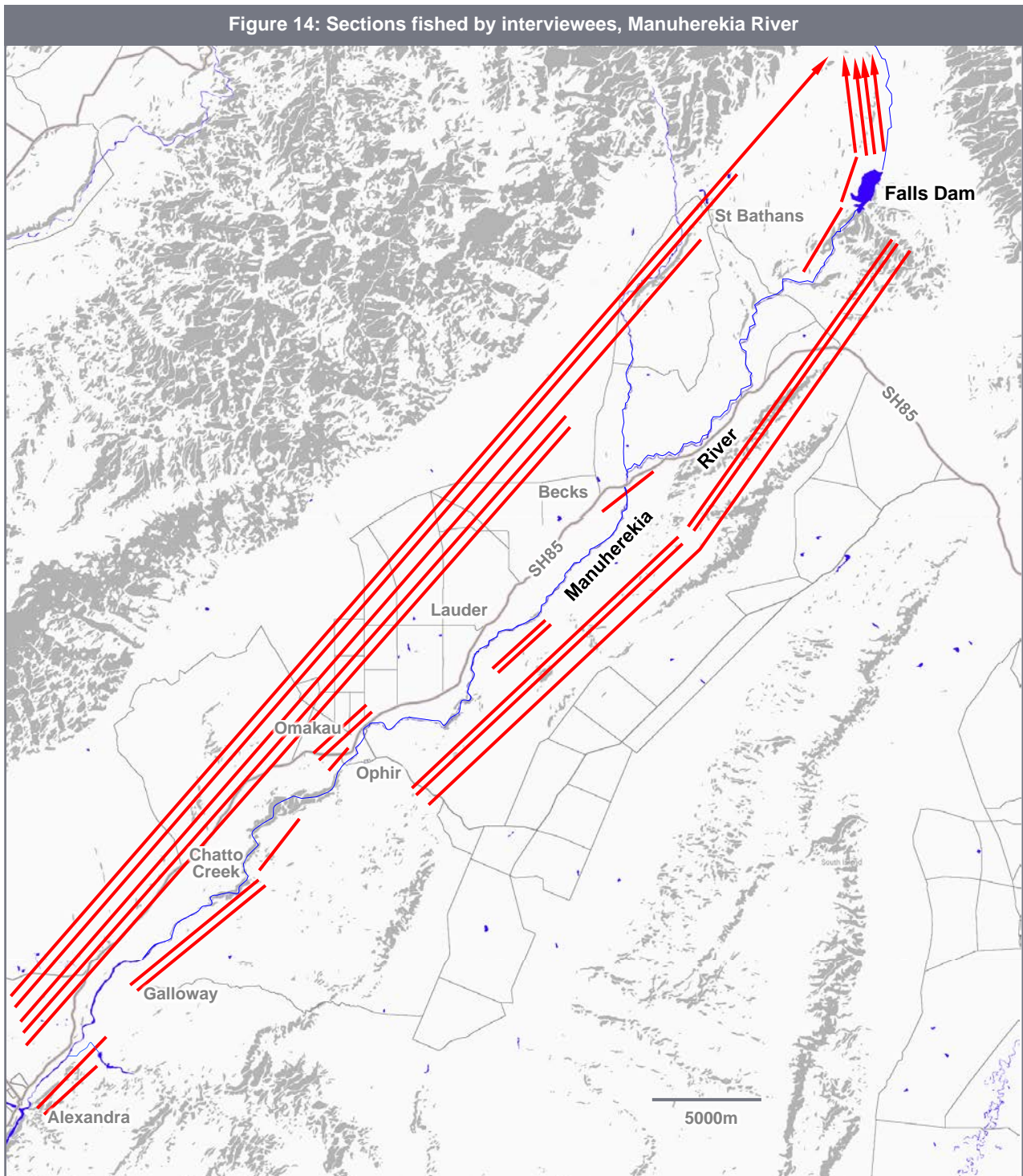
Interviewees were generally local and from: Wanaka/Hawea (6), Alexandra (4), Dunedin/Mosgiel (3), Queenstown (2), Chatto Creek, Galloway, Cromwell, Oturehua, Gore, and Cambrian Valley.

The number of years participating in their chosen recreation activity on the Manuherekia River ranged from 5 to 70 years. Anglers were most likely to have used the river for the longest period – five had been fishing for more than 40 years, one respondent had been guiding for more than 40 years and only two had less than 10 years' experience. All but one of the kayakers had at least 20 years' experience. All interviewees bar one had visited the Manuherekia River at least once in the past five years. Nine anglers had visited the River in the 2019/20 season for fishing, and two kayakers.

Interviewees fished on the Manuherekia River during the period October to April; and kayaked during September to January when flows were suitable.

Anglers gave a mix of responses about the quality of their latest angling experience, with four describing it as good, four as OK or average, and eight giving a negative response due to one or more of: fewer fish, warm water, a lack of water, discoloured water, didymo and/or 'tough' fishing conditions generally. Kayakers reported that since their activity was flow dependent, the experience was always good (they would not kayak in poor conditions). One kayaker reported that water quality had deteriorated over time.

Figure 14 shows the sections of the Manuherekia River described as preferred fishing reaches by anglers. Several referenced the entire River, or large sections of it, while others preferred particular reaches, and often those close to home. Kayaking on the Manuherekia River was reported in several reaches: Ophir Gorge, Falls Dam Gorge, Williamsons Creek (above Becks) to Ophir, and in the lower



river from Galloway to Alexandra or at Shaky Bridge for junior kayak training. Only one angler mentioned fishing in Falls Dam.

Angling on the Manuherekia River was often a solo activity or with one other for company. When guiding, again this was in groups of one or two. Those who had been fishing for a long time – and who were not guiding – had good memories of it being a family activity with large groups. Kayaking tended to be with one or two others and mostly for private recreation purposes, though clubs offered organised trips and junior training programmes are held on the lower river.

Six of the anglers also guided and reported a range of 70% to 100% international clientele, with five reporting more than 95% international. Australians and visitors from the UK dominated. Kayakers tended to be domestic, but one kayaker noted that when instructing an outdoor teaching programme, up to 20% of students could be internationals.

Anglers reported many reasons why the Manuherekia River was special to them and why they visited it. One reported, “The whole catchment feels like my place and is of immense importance to me, my wellbeing, my life.” Convenience (close to home), scenic qualities and the quality of the fishery dominated the responses, with statements including:

The River is close-by to home, Oturehua. It is a manageable river for anglers and has good variety. An angler can cover most of its pools. Wade a lot of it. Mixtures of curves and bends, deepish pools and nice babbly running water between pools.

Fishes well at certain times of the year – holds solid fish of 5 or 6 pounds. At certain times of year there can be a lot of fish too – as the fish move upstream from Clutha River. In the heat of summer the river gets too warm and too low. Fish go deeper – like they are in hibernation. As soon as it rains the fish will come out again.

Solitude is the key reason. The river is a good size - when it is at a reasonable flow - a more intimate setting than Clutha River. Fish quality is very good with larger size fish. Predominantly brown trout and some rainbow trout.

Smaller river, which I enjoy. Has some beautiful stretches below Falls Dam – the Gorge and nice pools. Also like the stretch around Ophir – open and willows – pretty with clear water. In Wanaka there are big rivers like Clutha and Matukituki. The Cardrona River is the only smaller river near Wanaka.

Kayakers referenced the technical nature of the gorge runs, its accessibility and the quality of the scenery. One opined:

The Ophir Gorge is one of best white water runs in this region and probably in the country. It is a favourite and unique because it is so easily accessible with many grade 3 and 4 whitewater rapids in the heart of Central Otago. A scenic gorge. Very few local people know the Ophir Gorge. It would be a great site for a walking/biking trail. Can take younger kayakers down the lower third of the Ophir Gorge starting below the major rapids at Chinky Gully accessed through Pete and June Scharp’s property. The other good accessible local white water is the Kawarau which is very different because of its big volume. It has water for kayaking all the time. Other runs similar to the Ophir Gorge are in remote parts of Otago and are much harder to access.

While one noted:

The River never seems to have enough flow. It is a technical paddling river, so need an experienced team. If knew it was up then I would go and paddle it.

When asked to compare the Manuherekia to other rivers in Otago, and what is special about the Manuherekia River, a range of opinions was offered. One fishing guide noted:

The River is quite unique in its size and fishing attributes. When based in Wanaka the Manuherekia River is essential to business as it is quite sheltered from weather. Has a different climate. Wanaka and Queenstown guides find that the Manuherekia is a good place to get out of weather during adverse conditions.

One casual angler summarised a common opinion:

The Manuherekia has arid vegetation; shrubs rather than bush or forest that other Otago rivers have. Four seasons is the thing that makes the Manuherekia: hot dry summers, lovely colourful sharp autumn, changeable spring and the colder winter the better. Other Otago locations include Lakes Wanaka and Hawea and their tributaries. Forested mountainous landscapes are quite different to arid Manuherekia landscapes.

And another:

The Manuherekia is smaller river and therefore offers a different experience. Rivers that flow into lakes are mostly rainbow fisheries (with a few browns). In the Manuherekia, we are fishing for brown trout. The nearest equivalent river is the Mautaura, which is a long drive.

The upper river (above Falls Dam) was often contrasted with the lower river. The upper was considered comparable to the Nevis or Dunstan Creek with minimal apparent modification, while the lower river was more often described as degraded.

Alternative rivers in Otago for angling include Lakes Wanaka and Hawea and their tributaries, Lake Dunstan and the Nevis and the Upper Taieri Rivers. Alternative rivers in Otago for kayaking included the Shotover, Kawarau, Taieri, Hawera, Matukituki and Clutha/Mata-au. Kayakers described the Manuherekia as being an accessible and low volume river compared with the likes of the Shotover, Kawarau, Hawera and Matukituki. One noted:

Manuherekia River upstream of Omakau. Photo Ronan Creane



Manuherekia whitewater is like a grade 3-4 – and a nice river to kayak. It's a good introduction for paddlers to steep rocky whitewater. The Kawarau is bigger volume with rapids ranging from grade 3 to 6. The Manuherekia is harder than Hawea at grade 2 and 3 and with its playwave. The Nevis River is much steeper and harder at grade 5 to 6.

Interviewees were asked how the River has changed over time. Almost all anglers reported a deterioration in fish, algae and water quality, with such comments as:

From the 1960s to 90s, there were no changes. The River recovered after floods. During the 1980s my teenage boys would dive in the deep holes next to willow trees and count fish who were living there; 200 plus was the count in each hole. Clutha River and Lake Roxburgh brown trout were using the Manuherekia River up to and into Chatto Creek by the hundreds if not thousands for spawning up to the early 1990s. After the removal of the willows at Galloway the River changed. Today I cannot find any spawning activity in the River. On top of all this the Manuherekia Irrigation Company has been laying the River dry at their irrigation intake every season since 1990; giving Galloway a reduced flow. During Ministry of Work rules in my time – 1960 to 1980s – there was at all times an acceptable flow running through Galloway. Also there are fewer campers now between Galloway and Chatto Creek. Used to be over 900 people camping at Christmas in 1980s.

Broom and willow have choked up the river so not as accessible as it used to be. In early photos – over 40 years ago – there was hardly a tree and the river was very broad with extensive braided gravel reaches. Recreational use – used to swim regularly – 20 years ago. Don't swim now because there's less water and algal blooms. Used to be able to swim between pools – not possible now. In the past we camped, picnicked and meandered. The decline in water health, ability to drink, has resulted in my disengagement. Today I have a feeling that I'm walking down a lifeless water in the low flow states. Change has been accentuated in last 10-15 years. Not as many fish as 40 years ago and fish not as big. Not sure if this is because of more guided fishing (with trophy fish caught) and heavier use of the River. But note also that I'm not fishing as often.

Over 30 years ago could get four trout per day. The Manuherekia is now much lower, which means fewer fish. 2020 was the first time that have caught salmon in the Manuherekia – where did they come from? The River was a bit higher than normal – so more fish. Each grandchild caught a salmon – normally unheard of in the Manuherekia. Also in 2020 the swimming holes were 8-10ft deep, which is much better than the previous couple of years. 2020 was the best the Manuherekia has been for many years and this was due to the big flood in December. Willows fall down into the River – family sometimes take willow out. Others (like ORC) also take willows out of water. This then alters flow of the River. Changes therefore occur over time.

Over the last 5 years there seems to have been some big floods, which have cleaned out didymo. 2019/20 has been particularly challenging weather wise with large floods. However, when I went fishing in the lower river recently, I was aghast at how low the River was within 2 weeks of a flood - no evidence of any flood water storage. Last 10 years didymo has been an issue and has compromised the fishing. 20 years ago the fishing was better – that is, pre didymo, with better flow and higher water levels.

Kayakers had similar opinions:

The Manuherekia River hasn't changed much over past 40 years in terms of flow or whitewater features. It is an occasional kayak run when the river flow increases following rain. Water quality has deteriorated. First noticed this about 10 years ago and very noticeable in last 5 years. Can't believe that people swim in the Manuherekia.

Compared to 20 years ago, today there is more human impact, such as pollution, rubbish and run-off into water. Today the water looks more dirtier and muddier than it used to. However, this could be a subjective assessment.

Water quality – the bottom is not as clear. As with other Central Otago rivers, it has a brown look – so looks unhealthy. As you look down from Shaky Bridge it doesn't look as clean as used to with slime on the rocks. This is the same observation for all rivers in Otago.

In the last 5 years there has been change at Shaky Bridge and at the Clutha confluence with silting and the beach under Shaky Bridge has been smothered. Deterioration is mostly in the past year. When the Clutha is high the Manuherekia gets blocked at the confluence.

Interviewees were asked if any specific section of the River had improved or deteriorated more than others. The Ophir / Omakau area was a common demarcation point and anglers commonly described the River upstream as in better condition, although several considered that the entire River has deteriorated:

Below Omakau, water abstraction makes the River not worth fishing in high summer because of so little water. Gets warm and brown. I avoid the lower river from Chatto Creek to Alexandra in summer as the River gets so low and so warm and algae grows on rocks. I've seen trout with their heads out of the water gasping for oxygen. Death in some trout likely. Three weeks ago I saw heavy heavy algae at the railway bridge at Lauder. The river was clear above confluence of Poolburn Creek. Noticed more extreme weed growth in the Creek itself below a farm irrigation run off.

Around Omakau below Booth Rd a diversion takes half the water leaving only half volume in the Manuherekia. Water below Omakau is a trickle.

Some years one place is good for fishing and another year it will be a different place. I use a four-wheel motorbike to go and up down River to find good fishing spots. The River is never in the same track year by year – there is tremendous gravel movement. So hard to comment about improvements. Do know that if the Manuherekia gets too low, it becomes a stinking mess.

I avoid the whole River from mid-December to mid-March. Downstream of Omakau is very poor fishing throughout the summer months due to extremely low flows.

Tend to fish from Omakau and further up-river. Upstream is nicer, has better access and better water quality.

Most kayakers had no opinion about specific locations as they chose specific flows for their activity. One noted:

The Gorge is good. On trips into the headwaters on my mountainbike I am struck by how much better the River is at the top. Shaky Bridge experience is not so good now.

Interviewees were asked about what they thought had influenced the changes in river condition that they reported:

- Ten mentioned farming and intensification in relation to water quality,
- Nine referred to irrigation and water abstraction in terms of water quantity,
- Two referred to increased numbers of anglers,
- Two referred to natural events,
- Two referred to increased sedimentation, and
- One each referred to fewer willows, didymo and building houses too close to the River.

Typical comments included:

Could be a result of farming – today is dairy – used to be sheep. Don't see animals in the Manuherekia and farmers are responsible, so not sure why changes. As a child I used to swim in the Manuherekia. Now would only swim above Omakau.

Sedimentation in river has increased. Debate as to whether this is from gold mines or farm run-off. Change in the volume and flow as a result of irrigators taking water. They are taking water when river is already very low – 0.9 cumecs.

More anglers caused by more tourism demand. When I started there were two guides on the Manuherekia. Now there are 20+.

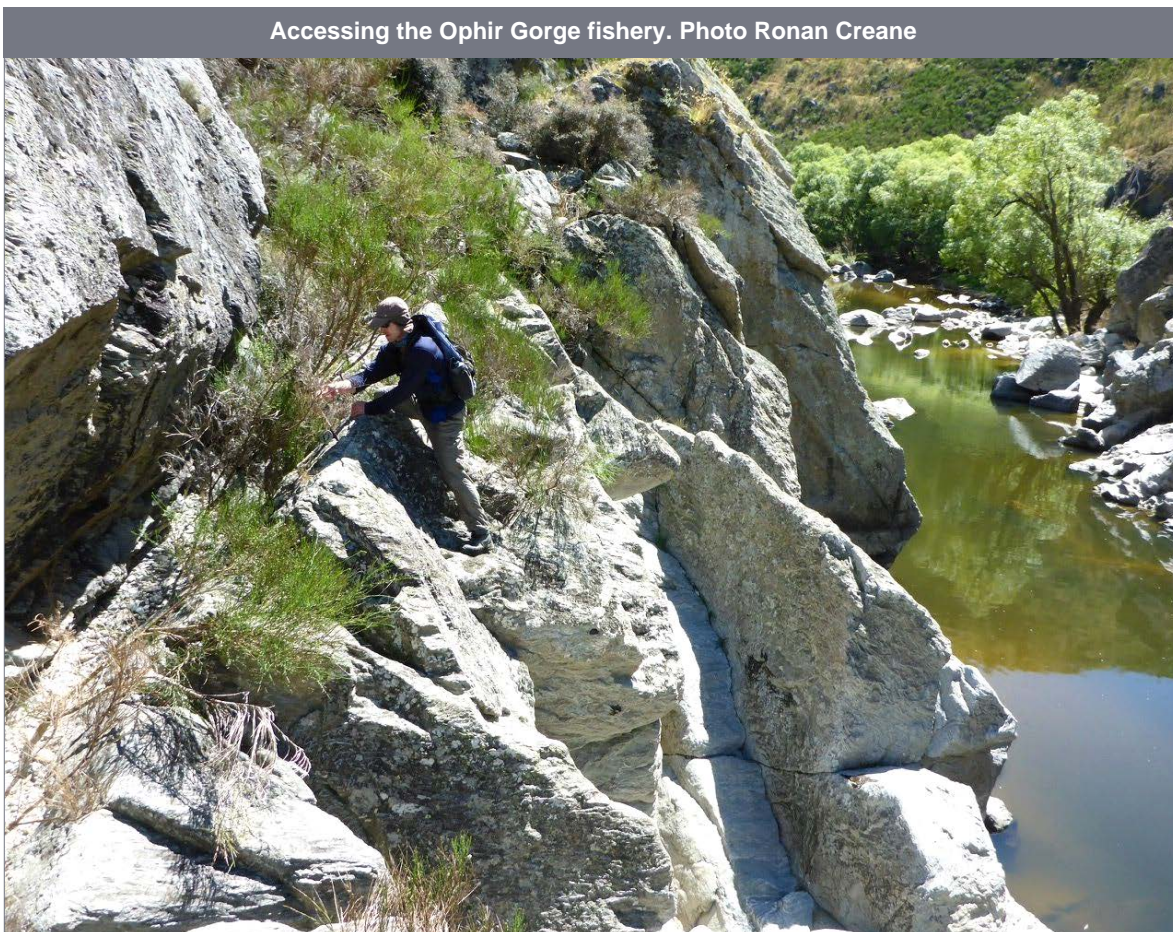
Intensive farming. Nitrate and phosphate runoff. Fencing 5m doesn't do enough. Doesn't protect instream values. Landscape is now green while it used to be far more native grasses and tussock. Farm conversions: fewer sheep and big increase in number of cattle.

Fishing guides were more likely to name a specific preferred flow for angling. Two described between 10 and 15m³/s at Ophir as ideal, one 6 to 15m³/s and another 8 to 15m³/s. One had lower flow preferences with 5 to 8m³/s in the mid-section of the River (“above that too hard to fish - 5 pretty good”), 3 to 4m³/s in the lower river and 5m³/s below Falls Dam. Casual anglers were mostly less specific, with such comments as:

Flows below falls Dam are reasonably consistent. But don't know in cumecs.

If you can walk across the Manuherekia River is sandals and not get wet feet it is too low as it was in 2018 and 2019. However, 2020 was running at a good level.

Not sure. Know that if there in November to December it will be a good level.



Flows will depend on the time of year. The River needs to have water – be cooler – for fish. Only in mid-summer is the River too warm for fish. Don't see dead fish so assume they are hibernating.

Would want at least 2.5m³/s for fishing; ideally want to be at 3-3.5m³/s. Once below 2m³/s the function of the Manuherekia deteriorates with more slime and algae. I monitored Daniel O'Connor Bridge for 10 weeks and noticed that while I could fish, you wouldn't want to swim or drink the water. Floods are a way to clean out the Manuherekia of sedimentation, algae and slime. These events are being disturbed as a result of irrigation and land use change.

Kayakers offered a range of opinions but within similar bands:

- Minimum flows of 15, 16 or 20m³/s
- Preferred flows of at least 20m³/s and up to 25, 30, 40 or 50m³/s and one reference to 80m³/s as a maximum.

A summary comment for kayakers would be:

Flow can vary and it is still possible to get down the River in low flows. Need 20-50m³/s for a good experience.

Interviewees were asked if there are any rules or regulations which limit how they do their activity, and which need changing. Five anglers stated they had no issues and two of these referred to the catch limit of one fish. Two considered that a bag of two fish would be better. Five referred to maintaining adequate minimum flows, such as:

As an angler I have a general interest in maintaining adequate flows in all rivers to sustain them and make them 'living'. Insect life that lives in streams is critical to birds and fish. Good flows mean better for aquatic life that fish rely on.

Cumulative water take needs to be addressed. Real concern is that while addressing flows now, we are seeing strong evidence of climate change. While looking at the Manuherekia River take, we should be looking at the future - what is happening later. Seems illogical to have an industry that demonstrates increasing usage of a natural community resource that is in extremely short supply and will become even more scarce with climatic change. Totally a community issue with both economic and social repercussions.

Other references were made to:

- Introducing a 'guides licence' to reduce guiding pressure (a comment by a guide), and
- Controlling four wheel drive vehicles in the riverbed, especially upstream from the Galloway Bridge.

Kayakers had no relevant comments about rules and regulations.

When interviewees were asked about recreational conflict on the Manuherekia River, most said they were happy to share with others and enjoyed seeing different users of the River. Two referred to irrigation takes. Motorbikes and four wheel drives were described by three anglers as issues in the lower river. Comments included:

Four-wheel drives in the lower river detracts from fishing. I avoid four-wheel drives where possible to avoid potential conflict. Also to avoid having the fishing ruined. Fishing behind 4x4s would be a waste of time!

No conflict with kayakers, fishers or mountainbikers. There is conflict on lower reaches in low flow with motorbikers. They have no understanding of gravel-nesting birds or anything. They would ride through spawning fish and endemic birds breeding. Motorbikers would say they are careful but they aren't.

Haven't run into direct conflicts. With a smaller river, the main conflict is with other anglers fly fishing on the same day. Brown trout can take a long time to relax after being disturbed. Less of an issue with spin fishing as stay in one spot.

Access to the Manuherekia River was considered to be generally adequate for recreational users, and the cooperation of private landowners was appreciated. There were opportunities for improved access around Chatto Creek (for anglers) and Keddell Road (for kayakers). One comment provides a good summary:

Cycle and walking trails have shown that there is potential to improve access. However the Manuherekia has parts with fixed and movable marginal strips that can be problematic with river change. High level of broom, briar and willow causes problems for access longitudinally. If you want to visit the river you are confined to where the road points intersect the river. Access along is limited within the valley. Some of the really nice parts of the River are in gorges and access is hard. But it would be a big effort to provide access.

Final general comments about the Manuherekia River focused on water quality and quantity management and the need to manage it for a variety of values, such as: (by a kayaker)

There are a lot of water users of the Manuherekia and strong views are held by some. A challenge to set a minimum flow that suits all and protects its ecology. Possibly the amount of water allowed to be taken from the river effects kayaking in the summer months. It's hard to know exactly, because with Falls Dam I really don't know what a 'natural flow' would look like. But certainly there are rules that allow a large amount of water to be taken from the river and this quite possibly detracts from the kayaking opportunities in the warmer months.

And by an angler:

The Manuherekia is a really beautiful river and community asset. The River should be protected with healthy minimum flows and how it should be used by four wheel drivers. Dairy farming on the river needs to be monitored so that swimmers and families can safely use the river.



4.2 Dunstan Creek

Eleven interviewees had fishing experience on Dunstan Creek. No kayakers used the Creek. Two interviewees had not fished, but had walked, mountain biked or swam in the lower section of the Creek (from St Bathans downstream). Three had guided anglers on the Creek.

Interviewees lived in Otago: Wanaka/Hawea (5), Alexandra (2), Chatto Creek, Queenstown, Hawea, Mosgiel and Oturehua.

Three anglers had only five years of experience on the Creek while three had been fishing for more than 40 years, and the remainder between eight and 40 years. Five had visited Dunstan Creek in the 2019/20 season and almost all had visited in the past three seasons. Three reported poor or OK experiences (poor fishing) on their last visit, while the remainder considered their experiences to have been 'good', 'phenomenal' or 'outstanding'.

Fishing was reported throughout the angling season October to April although several interviewees did not start fishing until November or December.

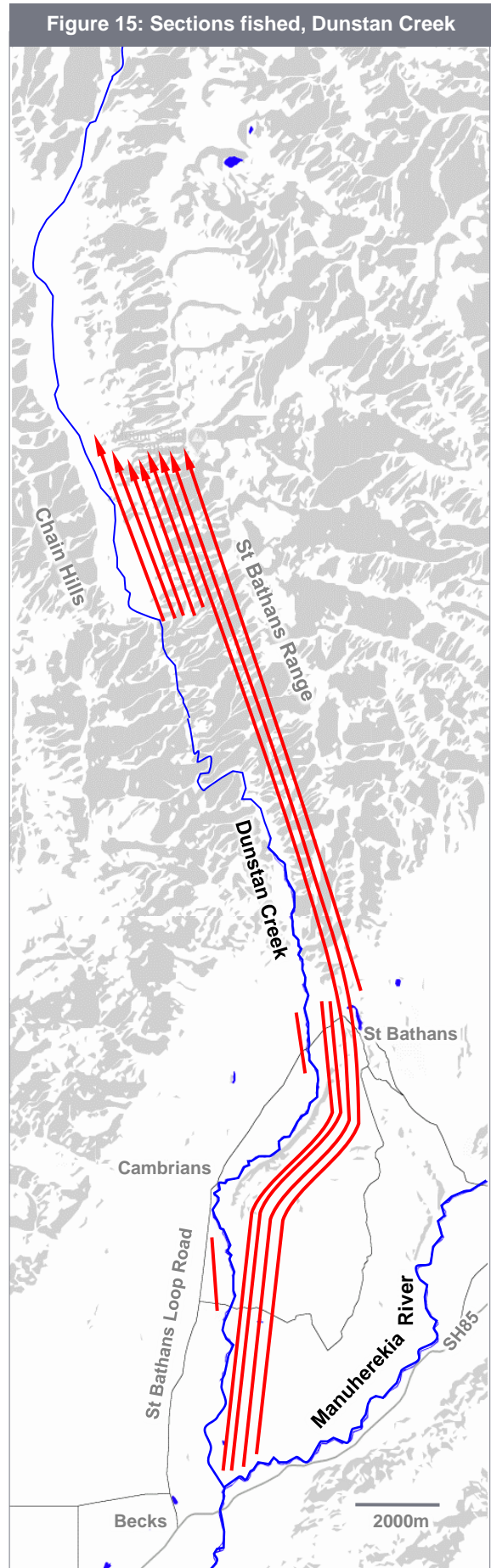
Figure 15 shows the sections of Dunstan Creek fished by angler interviewees. Eight reported fishing the upper river upstream of the gorge, requiring the permission of the owners of Dunstan Downs for vehicle access. Interviewees reported that the landowner does not permit vehicle access by fishing guides and they must rely on helicopters. Three anglers did not fish the Creek upstream of St Bathans. The two non-fishers visited the lower river particularly near Cambrians.

Casual fishing on Dunstan Creek River was often a solo activity, or with one other. When guiding, fishing was again only in groups of one or two.

The three fishing guides reported that their clients were almost all international in origin. Each noted that they used the Creek rarely, and one only took in four special clients.

Dunstan Creek was described as a special waterway with good sized fish. Comments included, in reference to the upper reaches:

True backcountry fishing. Some of most beautiful fish I've caught. The gorge runs between big burly Mt St Bathans and the northern end of Dunstan Range. Feel you've left the wide world behind. Used to be an out of the way place.



Sensational. The water quality at top end of Dunstan Creek is amazing. The most iconic place in Otago for fishing. Irony is that if access is improved, the experience would diminish as solitude would be compromised.

Relative isolation. It is hard to get access to a lot of Dunstan Creek, which limits the numbers fishing there. Meet very few people. And the quality of fishing – rainbow trout mostly (only a few brown trout). It's a special fishery.

And more generally:

Small river is enjoyable. A unique environment. In the early and late season, fish go there for spawning. Better river if Manuherekia is dirty or flooded. Dunstan Creek clears faster or isn't as susceptible to being dirty.

Fish are bigger. Quite scenic in upper reaches in mountains. The lower reaches are overgrown.

It's part of me – top to bottom 'my place' and it feels like I have a stake in it. Really iconic fishing place. Outstanding landscape and fishery.

The two non-fishers noted:

It feels like a private river because Dunstan Creek is not well known or popular. Access points are not well known.

Stunning catchment. Conservatively farmed and has rare and significant biodiversity.

Didymo in the upper Creek was noted by one angler.

When comparing Dunstan Creek to other rivers in Otago, references were made to a lack of other people, the size of the fish, the feeling of adventure and the small size of the Creek. Much was made of the quality of the landscape in the upper reaches. Few comparisons were offered, but included the Dingle Burn, Hunter River and Kye Burn.

With regard to changes over time, most interviewees considered the upper reaches to have changed little, while the lower reaches had deteriorated. Comments included:

No changes over time. Dunstan Creek is special. Any water takes are below the important fishery. It's pristine and not changed. Local farming practices are outstanding. You have to get access to the upper reaches from the farmer. There's a level of control on fishers which is missing compared to the upper Manuherekia River with open slather from uncaring fishers. There fisher behaviour has changed. They are more aggressive than they used to be and so the Manuherekia River is overfished.

Lower Dunstan Creek appears to have less water than 20 years ago. Upper Dunstan Creek - can't comment though I hear that there are still large rainbow trout, but not large browns in recent years by all accounts. In the lower Dunstan Creek there is not as many fish - or as big as they were 20 years ago.

The lower Dunstan Creek (near St Bathans) is more intensively farmed and this has changed the water. Land intensification has affected the water yield of the landscape. It doesn't capture and retain as much water as it used to. The upper Dunstan Creek has seen very little change. You need permission from private landowners and because of 4WD access and locked gates very few people go here. Removal of sheep and cattle grazing would allow woody shrubland to come away (as well as tussock).

Yes, some river straightening, and willows removed from the lower river. Some pools modified for water abstraction. Lately I've have been seeing lots of signs of machines in the

river - not sure why. I regularly see grey to milky water running into the creek from farm streams and abstraction returns.

Lower Dunstan Creek has deteriorated over the past 20 years with weed along banks more obvious (briar, willow, broom) and wilding pines a problem too. Poor water quality is also starting to impact the Creek.

Interviewees agreed that the upper Creek had changed the least and the lower Creek the most, noting, for example:

Happy to drink water in the upper Dunstan Creek, and swim, but not in the lower Creek. There is very clear water in the upper, but in the lower you can't see bottom and stones are slippery with slime.

Dunstan Creek is best at top – along foot of St Bathans – because there are no willows, nobody goes there and there are good swimming pools. [From a non-angler who predominantly uses the Creek below the gorge].

Dunstan Creek headwaters have resident fish and are better for fishing. The lower Creek is not so good for fishing but is easier to get to by road.

Interviewees were asked what they thought was causing change in the Creek, and most referred to the lack of change in the upper Creek (although two referred to more angling pressure and one to didymo), and several referred to more abstraction and farming in the lower reaches. Comments included:

No changes in 25 years (upper catchment).

No changes. Dunstan Creek (upper catchment) is pristine place - no water take, overstocking or bad fisher behaviour.



As a long-time trout fisherman I feel that the Dunstan Creek is not fishing as well as it used to. Those that fly in with helicopters are an issue. Are they taking the trophy trout? Or do they catch and release? If the latter is the case, then the large trout aren't there.

Water abstraction from the middle and lower sections? Excessive unchecked willow growth in lower reaches.

Intensification of farming and changed farming practices have led to the change in the lower Creek - more water take and fertiliser application.

Four anglers had not fished the Creek enough to offer an opinion about a preferred flow. One noted that it was not possible to fish the upper Creek when flows were high and the fords were flooded. Two noted that flows were generally consistent. Specific comments included:

5m³/s is too high in the lower Creek because of broom and willow. 2m³/s is ideal.

4 to 5m³/s at ORC gauge for 'Dunstan Creek at Beattie Road'. But I don't need to know as it's consistent.

Would think the lower river would benefit from flows around 2 – 3m³/s.

Low flows and warm water is not good. Fishing can be great if water is higher and not too discoloured. It takes time to recover after big floods.

Interviewees were asked if any rules or regulations affected their activity or which needed changing. Two referred to a preference for the Creek to be catch and release only. Two referred to better management of irrigation takes and one to better protection for grey shrublands.

There were no reported conflicts with other recreational users due to the low level of activity on Dunstan Creek, although two anglers referred to disliking guides using helicopters in the upper reaches.

The quality of access to the Creek was an interesting issue. One interviewee had been denied road access to the upper reaches by the landowner, while others commented that controlled access was good for managing the fishery. One guide relied on helicopters. Comments in reference to the lower reaches included:

The top end of Dunstan Creek has poor access. Some of the willow growth is excessive in lower reaches and while there is a need for cover for fish, some willows should be cleared.

Noxious weeds mean this access is getting harder. Today you have to fight way down to the Dunstan Creek through noxious weeds.



Upper Dunstan Creek. Photo Ronan Creane

One interviewee noted:

Risk of opening up access is that we could have accidental fire, more people, and it would also detract from wilderness experience. I suggest we don't improve access – leave it so that people have to walk or horse-ride in. Last 10 years it has got harder to get access to remote catchment. Lower Dunstan Creek access is OK. Some land has been bought by overseas persons who have different values to New Zealanders. In addition we have lost access over time via marginal strips and reserves that used to exist, but are no longer there.

Several interviewees offered some final comments:

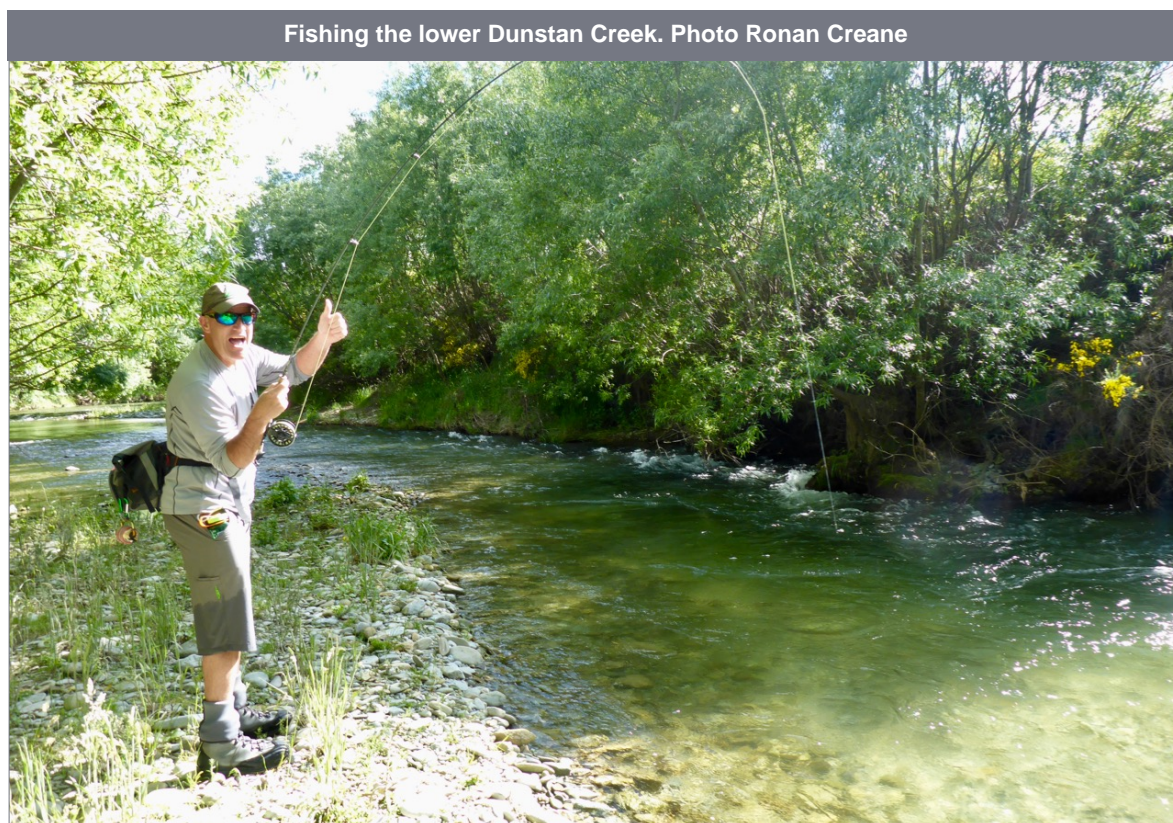
The catchment isn't a high population area so the river isn't being thrashed by people, but it is massively impacted by changes in farming practice – intensification, abstraction and fertiliser application. This is detrimental to the river health and water quality.

Best to keep it secret as it is now.

It's a community responsibility to improve Dunstan Creek. We could all do better with selective willow management which would reduce water loss.

Ecologically and aquatically, Dunstan Creek has special characteristics for a Central Otago high country river. A special landscape. Central Otago has a high degree of flora that is unique and thus the rivers – including Dunstan Creek – are unique also.

Good stream for fishing. If had to choose between Dunstan Creek and Manuherekia River, then would choose Dunstan Creek.



5 Literature review

This section summarises activity-specific data available in published popular guides and academic papers, or gained from consultation exercises which pre-date this report, or sourced by request from relevant agencies.

5.1 Angling

The angling season for the Manuherekia River and its tributaries (including Dunstan Creek) for the 2019/20 season is from 1 October to 30 April. The bag limit is one fish. Artificial fly, bait and spinner are permitted fishing methods, and fishing from a boat, canoe, pontoon or flotation device is not permitted.⁵

5.1.1 National angler survey data

The 1979/81⁶, 1994/96, 2000/01, 2007/08 and 2014/15 national angler surveys (NAS) report the following use levels, in angler days, for the waterbodies in the study area (Table 1). Data are shown for only NZ resident angler licence holders to allow comparison over time (the early surveys did not include overseas anglers). The Poolburn Reservoir is the most popular fishery in the catchment, followed by the Manuherekia River. Angling activity on the Manorburn Reservoir has varied widely over the study period, from just over 500 in 1994/95 to 3,410 in 2007/08. Dunstan Creek has consistently relatively low counts, with a peak of 360 angler days in 2007/08.

An 'angler day' is any period of time spent fishing at a waterbody – whether an all-day experience or a quick half-hour. The national angler surveys are substantial and reliable studies, with margins of error clearly stated. High margins of error generally indicate relatively high levels of activity by few respondents (one angler reporting that they fished a river 100 times gives a high error compared with 100 anglers reporting fishing a river once each, as all data are extrapolated to a population level).

Table 1: National angler survey data, NZ resident angler days by season

	1979/81 ⁷	1994/95 ⁸	2001/02 ⁹	2007/08 ¹⁰	2014/15 ¹¹
Poolburn Reservoir		2,280 ± 540	2,810 ± 600	3,840 ± 700	5,150 ± 1,280
Manuherekia River	3,000	3,570 ± 840	5,630 ± 2060	2,070 ± 650	2,100 ± 830
Manorburn Reservoir		510 ± 130	2,350 ± 540	3,410 ± 620	1,240 ± 650
Manor Burn		220 ± 90	440 ± 210	160 ± 150	440 ± 190
Pool Burn		0	370 ± 140	50 ± 30	800 ± 260
Dunstan Creek		160 ± 140	40 ± 40	360 ± 200	210 ± 150
Falls Dam		30 ± 30	130 ± 80	190 ± 90	50 ± 30

In the 2014/15 season there was 186,570 ± 8,370 angler days in the Otago Fish & Game region (Unwin 2016). The Manuherekia catchment contributed 5.3% of these, with 9,990 days.

Between the 2001/02 and 2007/08 seasons, angling activity on the Manuherekia River dropped by more than a half, and remained low in 2014/15. Unwin (2009, p33) states that this change coincided with the introduction of didymo, but that associated falls in angling activity is not always universal:

⁵ <https://fishandgame.org.nz/assets/Uploads/2019-Anglers-Notice.pdf>

⁶ The original national angling survey relied on respondents to consider their angling activity over the prior 3-5 years, so the concept of season is elastic, but 1979/81 is used as a nominal reference point (M. Unwin, pers comm.).

⁷ Richardson et al 1984. Data for only the Manuherekia River available.

⁸ Unwin & Brown 1998. Does not include figures for child licence holders.

⁹ Unwin & Image 2003. Does not include figures for child licence holders. Figure for the 'total river' count includes angler days on unspecified sections of the Clutha River/Mata-au.

¹⁰ Unwin 2009

¹¹ Unwin 2016

... usage of individual fisheries can vary from year to year, but shows little consistent patterns in relation to known didymo incursions. Some infected rivers (e.g., Mararoa, Hawea, Buller, Mataura, Motueka, Manuherikia) show evidence of a significant decline in usage from 2001/2002 to 2007/2008, irrespective of infestation levels, but others have either shown little change (e.g., Clutha, Oreti, Ahuriri, Aparima) or have experienced a moderate increase (e.g., Waiau, Twizel, Clarence, Opihi)...

The absence of any clear trend in relation to known didymo incursions indicates that its presence is only one of a suite of factors which potentially influence angling usage from year to year.

Unwin (2016) reports on angling activity by 'overseas' anglers. Numbers are low for the Manuherikia catchment for the 2014/15 season, with high margins of error, at:

- Manuherikia 40 ± 40
- Poolburn Reservoir 60 ± 60
- Poolburn 40 ± 40

There were $5,210 \pm 860$ 'overseas' angler days in the 2014/15 season in the Otago Fish & Game region (Unwin 2016). The Manuherikia catchment contributed 2.7% of these, with 140 days.

Unwin (2016) notes, in reference to non-Otago resident NZ anglers, and overseas anglers, fishing in the Otago region during the 2014/15 season:

New Zealand resident licence holders from other FGZ regions (particularly Southland, Central South Island, and North Canterbury) fished for $37,110 \pm 3,170$ angler-days within the Otago region, contributing 20% of the regional total. Most of this effort ($26,700 \pm 2,800$ angler-days; 72% of the visitor total) was expended on lakes, primarily the Clutha source lakes (Hāwea, Wānaka, Wakatipu) and Lake Dunstan. The most popular river fisheries used by visitors were the Clutha River/Mata-au ($3,570 \pm 870$ angler-days, evenly divided between the lower and upper reaches); the Taieri River below Outram ($1,480 \pm 810$ angler-days); and the Pomahaka River ($1,150 \pm 500$ angler-days). Overseas visitors expended $5,210 \pm 860$ angler-days within the Otago region (2.8% of the regional total), almost all of which ($4,920 \pm 840$ angler-days) was recorded in the Clutha catchment.

Figure 16 and Figure 17 show the annual distribution of angling effort by two month period for the Manuherikia River and Dunstan Creek respectively for four national angler surveys. Some angling is reported outside the permitted angling season in both waterways. While December-January is the peak period for both, there is no consistency between periods for relative angling popularity. Margins of error are generally quite high (as much as 100%) for Dunstan Creek, indicating a relatively high level of angling reported by few respondents to the surveys.

Figure 16: Manuherekia River angler days by two-month period. NAS data

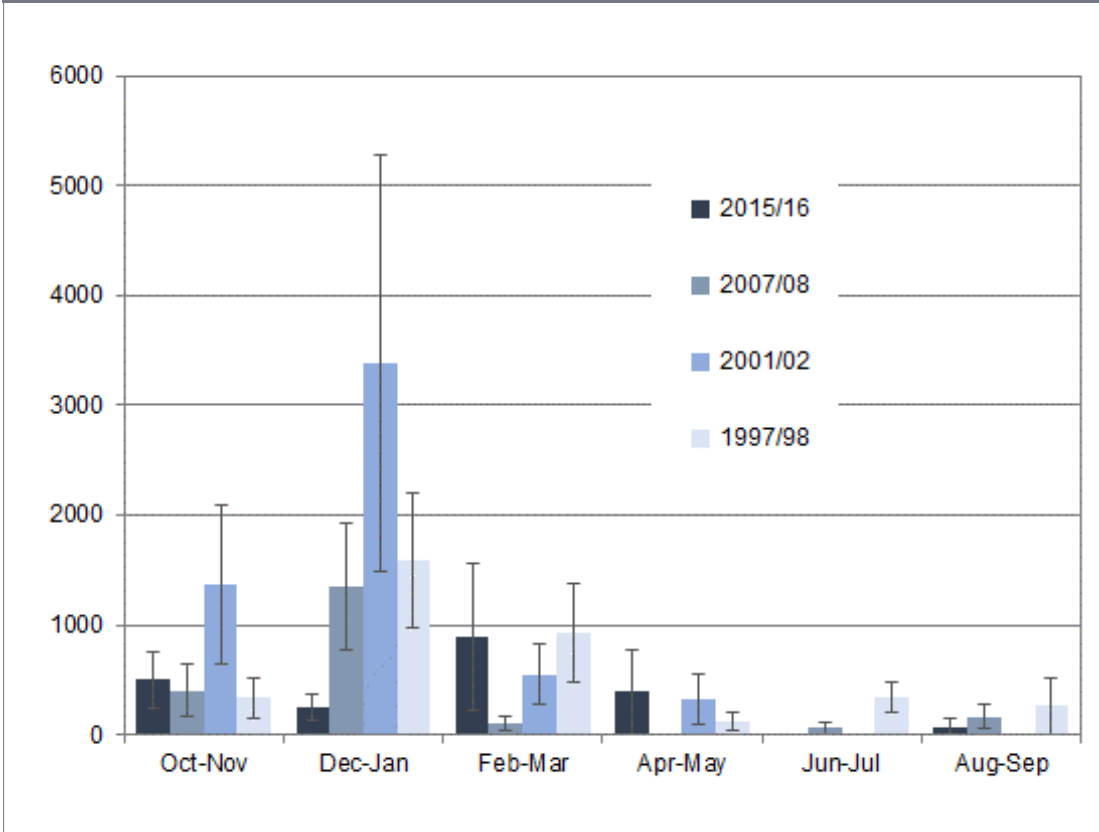
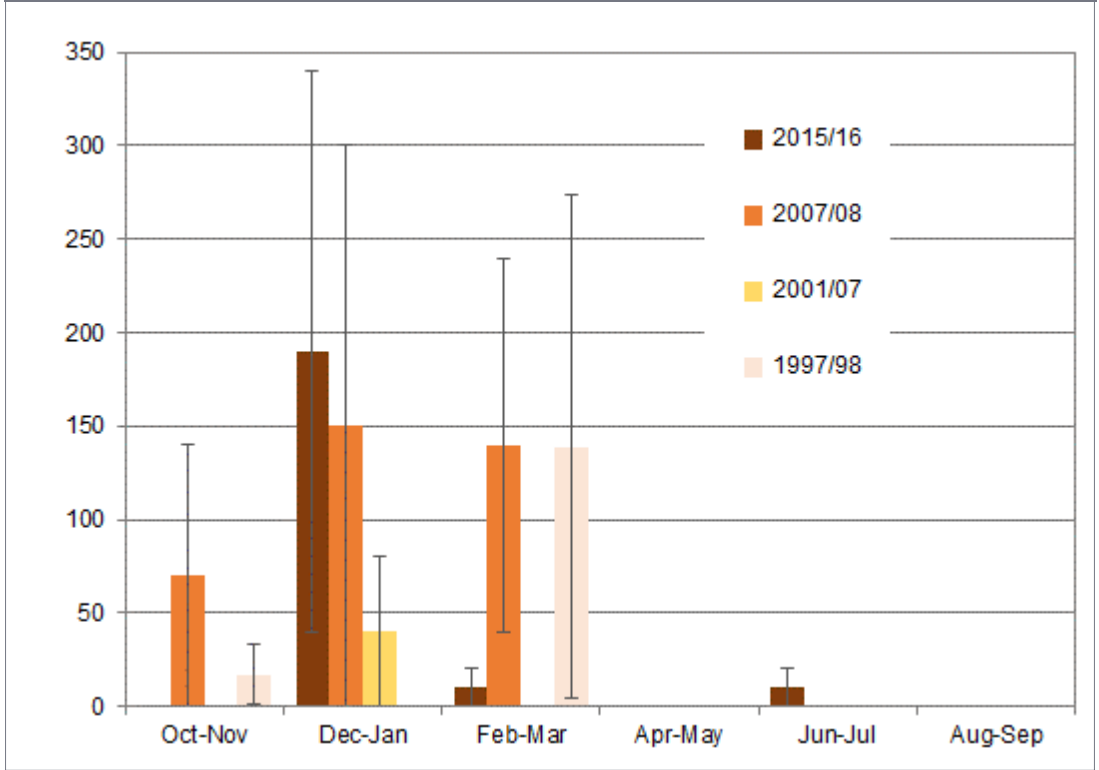


Figure 17: Dunstan Creek angler days by two-month period. NAS data



Unwin (2013) reported on a survey of national river angling values with 2,231 national anglers responding (from a sample of 11,923). Sixty-five respondents had used the Manuherekia River (the 10th most popular river in Otago in the study out of 57 waterways) and 14 had used Dunstan Creek (the 47th most popular).

Respondents were asked to identify up to three reasons why they fished each river from a list of ten options (including 'other'). Table 2 shows that 'ease of access' was the main attraction for the Manuherekia River. No respondents anticipated catching large fish. 'Scenic beauty' and 'angling challenge' were the most often chosen reasons for fishing Dunstan Creek, and no respondents anticipated a good catch rate.

Table 2: Reasons for fishing the Manuherekia River and Dunstan Creek (Unwin 2013)

	Close to home	Close to holiday home	Ease of access	Area of fishable water	Scenic beauty	Wilderness feeling	Angling challenge	Anticipate good catch rate	Anticipate large fish	Other
Manuherekia	32%	17%	55%	34%	14%	8%	26%	17%	0%	5%
Dunstan	14%	7%	14%	7%	43%	21%	43%	0%	14%	0%
Mean (all Otago Rivers)	27%	13%	31%	25%	37%	24%	27%	14%	7%	4%

Resondents gave an 'enjoyment score' for each waterbody on a scale from 1 (least enjoyable) to 5 (most enjoyable). The Manuherekia received a mean enjoyment score of 2.09 putting it in 41st position in Otago out of 57 rivers. Dunstan Creek received a mean enjoyment score of 2.29, putting it in 25th place. The range of scores in Otago ranged from 3.43 (Greenstone River) to 1.44 (Water of Leith).

5.1.2 Otago Fish & Game Council Sports Fish and Game Management Plan

The *Sports Fish And Game Management Plan For Otago Fish And Game Region 2015-2025* was prepared by the Otago Fish and Game Council in 2015 and "provides a framework for the management of Otago's sports fish and game bird resources."

The Manuherekia River as a fishery is referenced several times:

Many lowland rivers in Otago have suffered a marked deterioration in water quality resulting primarily from the effects of more intensive use of agricultural land, and as a result, the sports fisheries in these catchments are in decline. The primary contaminants are sediment, E-coli, phosphorus and nitrogen. Particular rivers of concern include the Shag, Taieri, Tokomairiro, Lower Clutha valley tributaries, the Waiwera, the Pomahaka catchment below Glenken, the Catlins River, and the Manuherikia. Steps that should be taken to remedy this ongoing problem include the fencing off of waterways from intensive farmland, meeting on property nitrogen load limits and nutrient concentration limits as specified in the Otago Regional Water Plan, as well as the sensible design of agricultural systems based on the carrying capacity of the land and the catchment's receiving environment. (p15)

Brook char were introduced into Otago in the late 19th and early 20th century. Wild populations have established themselves in headwater tributary streams, particularly the Manuherikia and Nevis rivers but they offer little angling opportunity because of their small size. Their restricted distribution is due to competition with brown trout. (p18)

The trends in angler use also show increasing pressure on backcountry fisheries (including Greenstone, Hunter, Caples, Lochy, Nevis, , Hunter, Upper Manuherikia, Young and Wilkin Rivers, Dingle Burn and Dunstan Creek) to the extent that the sustainability of the recreational opportunity afforded by these backcountry waters as remote backcountry or 'wilderness' fisheries remains a significant management consideration. (p22)

The Upper Manuherikia is defined as the river above Falls Dam, which forms a discrete fishery as a result of the damming. The main threats within this fishery currently are the potential for lignite mining on the surrounding land (a threat which may be diminishing), which is Crown land but kept outside of the Oteake Conservation Park at the time of its creation, and also proposals to raise Falls Dam which could affect near-lake spawning sites and flood a section of the mainstem river. (p66)

Some rivers in Otago are fully or over allocated in terms of water abstraction for out of stream uses, resulting in degradation of aquatic habitats. Examples include the Shag, Manuherikia, Cardrona and Lindis Rivers and the Sowburn, Pigburn and Kyeburn. Mining privileges in Central Otago give owners secure property rights over water, however these expire in 2021. In several cases their use for irrigation has serious adverse effects on aquatic ecosystems in some river reaches and their existence constrains sustainable water resource management. (p36)

Two 'key actions to be completed by the end of the seventh year after plan approval include' (p55):

11.1.3.1 Catchment wide habitat projects are completed in the Manuherikia valley in conjunction with plans to increase irrigation and intensify land use thereby protecting aquatic habitats for sports fish and game and other aquatic life and securing and enhancing the recreational amenity of the river system.

11.1.3.4 Minimum or residual flows are established for all Otago rivers that maintain or restore aquatic ecosystems to a healthy and productive state so that sports fish and game populations flourish.

The Management Plan defines the upper Manuherikia River (above the Falls Dam) as a 'backcountry river'. On its page 62 it refers to the upper River as of local significance only; and on page 67 the remainder of the River is defined as a regionally significant 'rainfed river' and in a 'rural' setting (p74). However, in the Plan's appendix 5, which assesses significance in detail, the entire River is defined as regionally significant with 'local, regional, junior and commercial' use (p84).

Dunstan Creek is also referenced:

The trends in angler use also show increasing pressure on backcountry fisheries (including Greenstone, Hunter, Caples, Lochy, Nevis, , Hunter, Upper Manuherikia, Young and Wilkin Rivers, Dingle Burn and Dunstan Creek) to the extent that the sustainability of the recreational opportunity afforded by these backcountry waters as remote backcountry or 'wilderness' fisheries remains a significant management consideration. (p22)

Dunstan Creek has undergone a rise in use, recording 40 angler days in 2002/2003 and 320 angler days in 2007/2008. This indicates a productive fishery but also hints at displacement of anglers from lower down in the catchment. The main threats to this fishery is the over-allocation of water to irrigation, and the security of the fishery in the future depends on ensuring that deemed permits in the catchment are renegotiated with appropriate residual and minimum flows. (p65)

The Management Plan defines Dunstan Creek as a 'backcountry river' on page 58 and a 'rain-fed river or stream' on page 59. On its page 62 it refers to the Creek as of local significance only. However,

in the Plan's appendix 5, which assesses significance in detail, the Creek is defined as regionally significant with 'local, regional, national, junior and commercial' use (p84).

5.1.3 Angler health stream index

Keeling (2013) reports on an Angling Stream Health Index (ASHI) assessment that was trialled on the lower Manuherekia River in February and March 2010 by Rasmus Gabrielsson. Six experienced local anglers were selected to assess a range of river and recreation attributes at flows of 0.9m³/s and 1.5m³/s at Keddell Road approximately 4km downstream of the Ophir Gorge, and at a site near central Alexandra. All participants had long-term knowledge of the river in all seasons and flow conditions, but did not know the flow on the days of their assessments. The ASHI classification relies on assigning a score for eight indicators ranging from 5 (excellent) to 1 (very unhealthy/unattractive). The indicators were:

- stream flow
- water quality
- water clarity
- aquatic habitat diversity
- river bed conditions
- angling condition
- recreational potential
- description of overall river health

At the flow of 0.9m³/s the average overall ASHI score was 2.22, indicating that under these flow conditions anglers felt that the lower Manuherekia River was unhealthy / unattractive with respect to stream health and their recreational values. The ASHI score for all six participants were similar.

At a flow of 1.5m³/s the average overall ASHI score was 3.22, indicating that under these flow conditions anglers felt the river was 'okay' with respect to overall health and angling values. Five of the participants gave similar individual scores while one angler scored higher than the others, although removing this score from the overall average did not impact the final ASHI category.

In addition to scoring the eight stream health indicators on a 1-5 scale, the participants were asked to give some explanatory comments on their perceptions of attractiveness for recreation and overall stream health. At 0.9m³/s the summary comments were:

I wouldn't fish here.

Water would not attract fisherman nor swimmers.

Better flow of water needed.

Little current or flow.

I would be concerned about toxins and E-coli levels in the water when fishing / swimming if present flow levels were maintained.

Obvious algae covering bottom/river bed.

Increased flow is essential.

And for 1.5m³/s flows, comments were more positive:

I can see movement in the run.

I would probably look upstream in sections with more flow when fishing but this level is probably ideal for family recreation.

Under the current conditions it looks as good as one could expect.

I expect the water would still hold trout and fly life.

Flow is okay for fishing at this point.

Flow is okay for general recreation and perhaps still a bit low for me to fish it.

5.1.4 Popular angling commentary

Kent (2009) (the most comprehensive South Island trout angling guide) and Turner (2003) provide extensive descriptions of the angling options on the Manuherekia River and Dunstan Creek.

Manuherekia River

Kent (2009)

Rises in the tussock-covered Ewe, Wether and St Bathans ranges close to Lindis Pass, flows south down the Manuherekia Valley to enter the Clutha at Alexandra.

Access:

Lower reaches

- *Take Tarbert Street in Alexandra then Little Valley Road to the bridge.*
- *From SH 85 north of Alexandra, take Galloway Road to the river.*

Middle reaches As SH 85 parallels the river but is some distance away, access is difficult between Alexandra and Ophir.

- *Turn off SH 85 some 25 km north of Alexandra onto Ophir Road to the bridge.*
- *Omakau Bridge 2 km further north of Ophir Bridge.*
- *Blackstone Hill Runs Road, 19 km north of Omakau, cross Becks Bridge where there is access, or follow this road downstream on the true left bank to the end. Permission is required.*

Upper reaches

- *Fiddlers Flat Road off the Ranfurly-St Bathans Road provides access to the lower end of the gorge and the lower end of Falls Dam.*
- *Home Hills Run Road, off SH 85, offers access to the river above Falls Dam.*

The water in the lower and middle reaches of this long, medium sized river can be low and warm in summer, as water is abstracted for irrigation. The river is heavily willowed as it winds across pastoral land, but this does not affect fishing to any great extent. Crossings and wading are safe although the shingly riverbed can be slippery.

Stocks are reasonable, with browns out-numbering rainbows and averaging 0.75 kg (75 fish/km at Ophir). Trout are difficult to spot in the brownish water. The river improves upstream from Becks but the best section lies above the St Bathans Bridge. The river rises after rain but usually remains fishable. During the day fish will accept small mayfly imitations but sedge fishing in late evening often brings the best results.

There are some large trout in the gorge but you need to be a rock-climbing angler to fish some sections. In low water progress can be made, with frequent deep fords, but anglers need to be agile and sure-footed. Some pools are so deep that double-weighted nymphs are required to cover fish.

Above Falls Dam a lot of walking is required between fish. The country is typical of Central Otago, being barren, windswept and tussock-covered, but it has a beauty all its own. The river is small and shingly with few pools likely to hold fish. These can easily be spotted on a bright day and are best fished to early in the season before the drop back down to Falls Dam.

Turner (2003)

The Manuherikia rises in the high country north of the Falls Dam and flows down the Manuherikia Valley to the confluence with the Clutha River at Alexandra. In the headwaters above Falls Dam the river is rapid and partially braided with limited holding water and a scarcity of overhanging bank cover.

Immediately below the dam the river enters a gorge with very deep holes and rock buttresses. This section is extremely difficult to get at. After 3km the river becomes more accessible, the mainly single channel providing a variety of very good water.

Between St Bathans Bridge and Becks Bridge the river is once again partially braided and fairly shallow. From Becks to the confluence the river is mostly confined within willow-lined banks and the stream's characteristics are generally the same for the entire distance, (approx. 40km), although there is another gorgy section near Lauder. Abstraction for irrigation takes place in the lower river and low flows below Becks can have a detrimental effect on the fishery.

Between Alexandra and Ophir access is difficult due to the distance from the road and thick willow growth. However, from Becks to the dam there is no problem as roads are never far from the river. Access to the headwaters can be gained from either Hawkdun Hills runs road, or Home Hills runs road, both of which meet at the top Manuherikia Bridge, approximately 10km above the dam.

The Manuherikia holds brown trout and a few rainbows, which are often taken up as far as Springvale. As a general rule the average size increases towards the headwaters, with some 'trophy class' fish in the gorge above St Bathans, and a 500-750g average throughout the lower river.

The headwaters and small tributaries have a population of Brook char, but typically they do not reach more than 20cm in length.

Very few anglers fish the river above the Falls Dam. Early in the season a few fish can be found, but it's generally not worth the bother unless you like a long day walking in the wide-open spaces.

In the gorge below the dam in parts you need pitons and a rope to get at the river. Here and there an agile angler can scramble down and fish the deep holes. Worm fishing is worth trying, as is spin fishing. Some anglers have caught large fish by drifting a heavily weighted nymph along the rock walls where fish tend to lie alongside undercut ledges. The rest of the river right down to Alexandra is suitable for all types of angling. During the height of summer the best fishing is often after dark using Sedge patterns and feathered lures.

Dunstan Creek

Kent (2009)

Drains the Dunstan Range, flows southeast and joins the Manuherikia River at Becks.

Access: From the St Bathans-Becks road, which crosses the stream and from a farm track up the true right bank, but permission from the local farmer is required to open the locked gate.

This small clear freestone stream draining tussock-covered hills holds only a few trout. It is best early in the season before low water flows in summer. The lower reaches hold more fish but these waters are heavily willowed and overgrown with broom, making casting frustrating. In places, one needs to wade quietly up the stream itself. In the middle and upper reaches a lot of walking is necessary between fish. The gorge has a few stable pools.

Turner (2003)

Rising in the Dunstan range north-west of St Bathans, the Dunstan flows roughly parallel to the Manuherekia and merges with it at Becks.

The headwaters are typically partially braided and fast flowing. The stream then flows through a gorge for several kilometres. The pools hold some nice brown trout, but not in any great number. From the bridge near St Bathans to the confluence the stream is braided and shallow for 3km and then flows through a confined, willow-lined channel.

The water is accessible from various points on the Becks/St Bathans road, but having reached the stream it must be waded, as scrub and willow prevent progress along the banks. In summer, low flows below St Bathans drastically reduce the amount of holding water and the number of fish.

Dunstan Creek is not a renowned fishery, but early in the season the lower reaches can hold a few brown trout. The average size is around 1 kg, but larger fish are found in the gorge. Some good size rainbows are available to the early season angler. Anglers should be aware of the effort required to cover the water, which is definitely 'boots and shorts' territory.

The Dunstan is best fished with small dry flies and nymphs, or with a floating worm. In some sections anglers using light spinning tackle and small lures, especially Veltics will pick up a fish or two.

There are no Fish & Game access brochures for the two waterways, and no substantial online description of their fishing options.¹²

5.2 Swimming

This section reports on the findings of the 2018 ORC survey of swimming activity in the region. This relied on a self-selected sample of respondents who answered a simple set of questions about swimming location and quality, and indicated their swimming sites by dropping a pin on an online map. Not all pins were dropped accurately, but almost 1300 swimming sites were identified by 850 respondents, which gives a reasonable indication of the main swimming locations and issues, at least at a relative level.

Forty-three responses were for the Manuherekia River, 11 for Blue Lake, 4 for the Lower Manorburn Dam, and 4 for Falls Dam. No respondent named Dunstan Creek as a swimming location. Figure 18 shows the waterbodies which gained more than 10 responses, with the Manuherekia the 8th most often named swimming destination.

Respondents were asked to describe the quality of their swimming experience. For the Manuherekia River, seven swimming areas were identified, and a range of quality ratings were given for each. Figure 19 shows the count of ratings by river section, with a grade of 1 identifying a poor swimming experience and 5 an excellent one. Most responses were for swimmers near Alexandra, and most responses were for ratings of 3 or above. This is, however, a small sample size, and results are merely indicative. The intercept survey results discussed in Section 3 are far more reliable.

¹² See: <https://fishandgame.org.nz/otago/freshwater-fishing-in-new-zealand/fishing-locations-and-access/>

Figure 18: ORC 2018 swimming survey, number of responses by waterbody

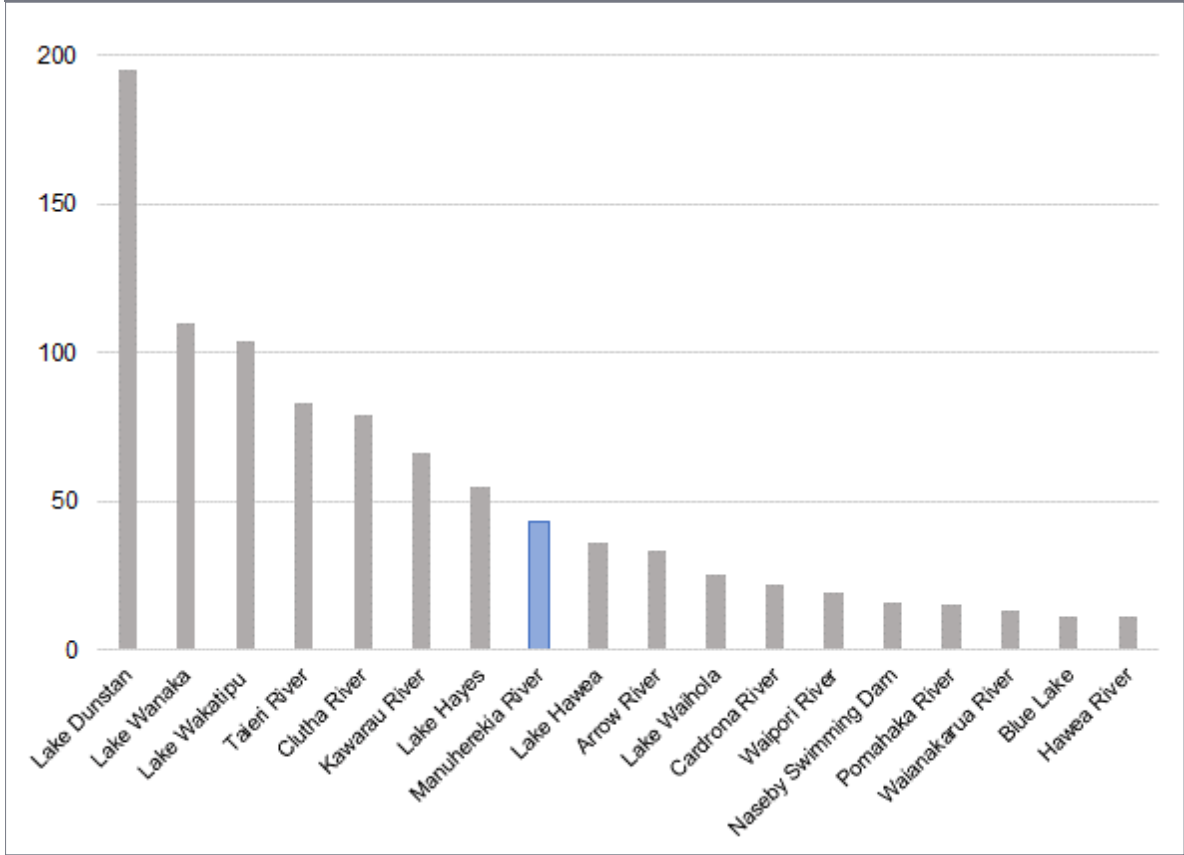
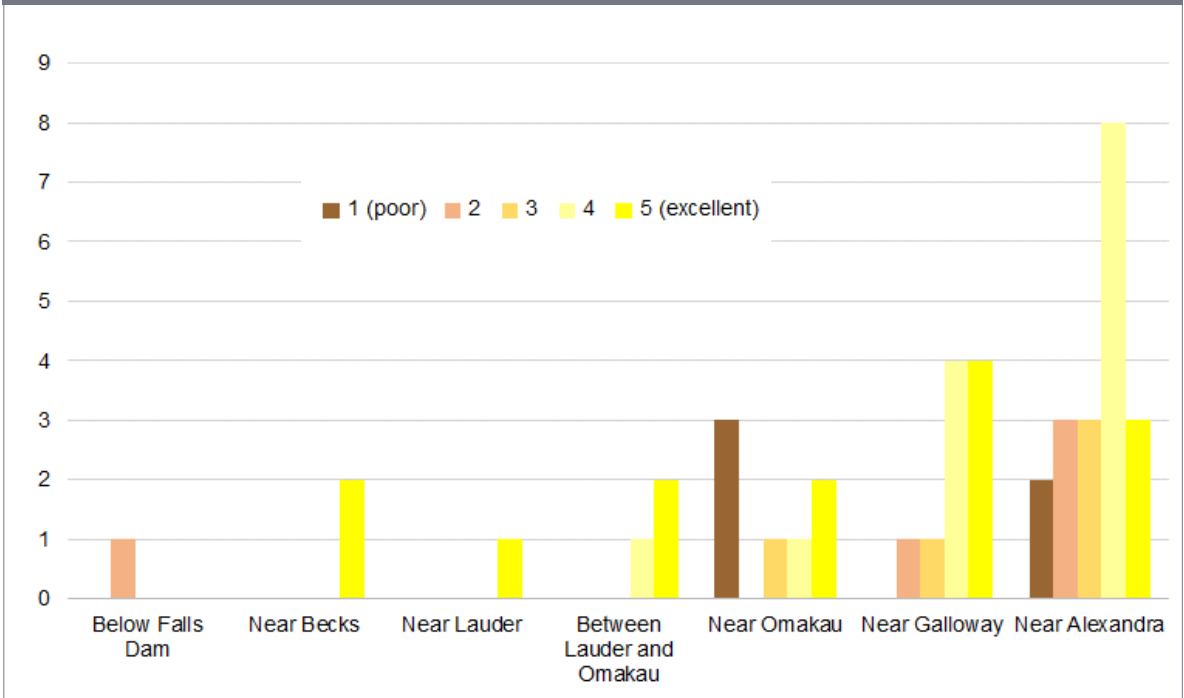


Figure 19: ORC 2018 swimming survey, quality ratings by swimming site, Manuherekia River



Swimming locations identified by respondents in the Manuherekia catchment are shown in Figure 20 and Figure 21.

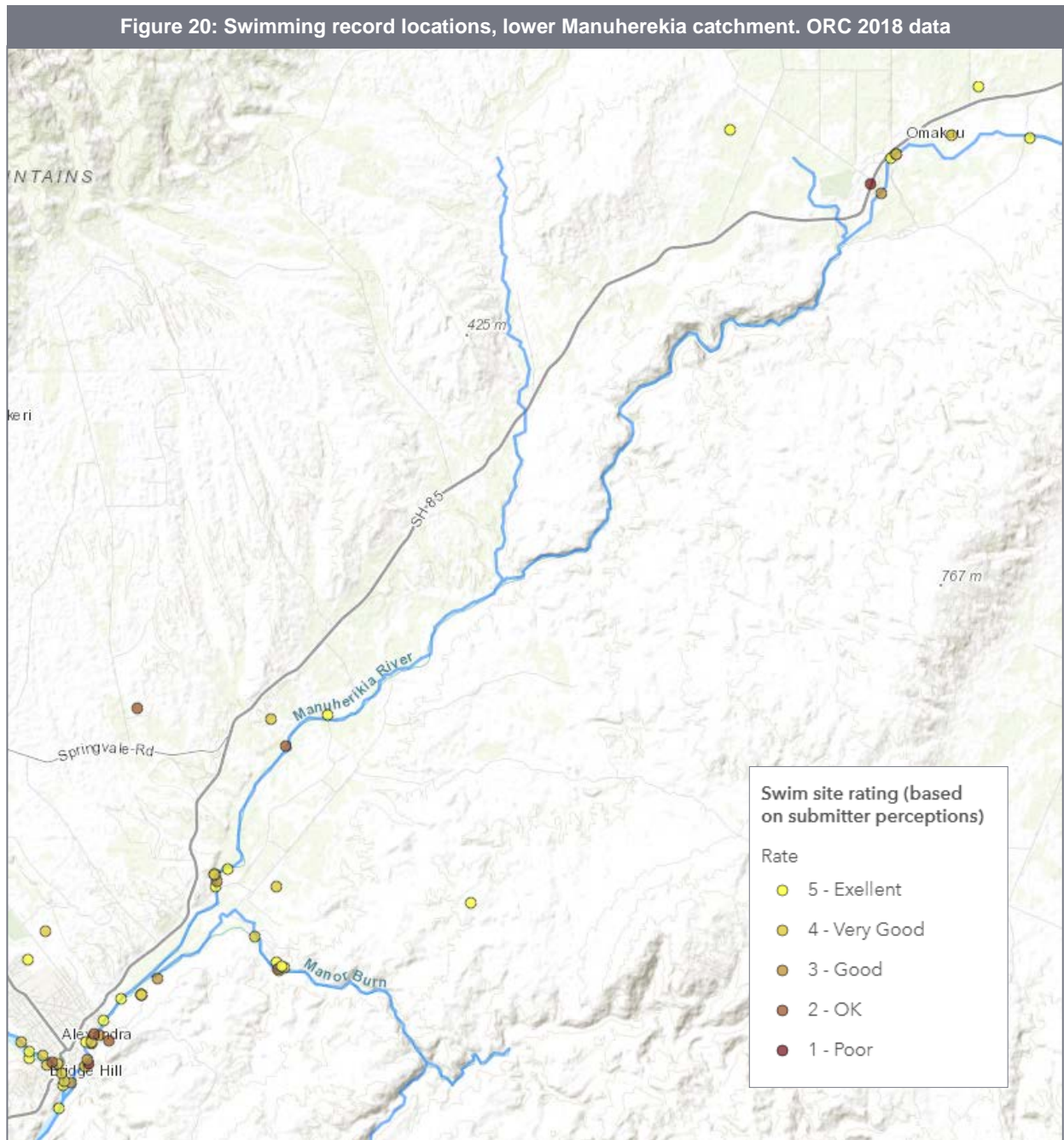
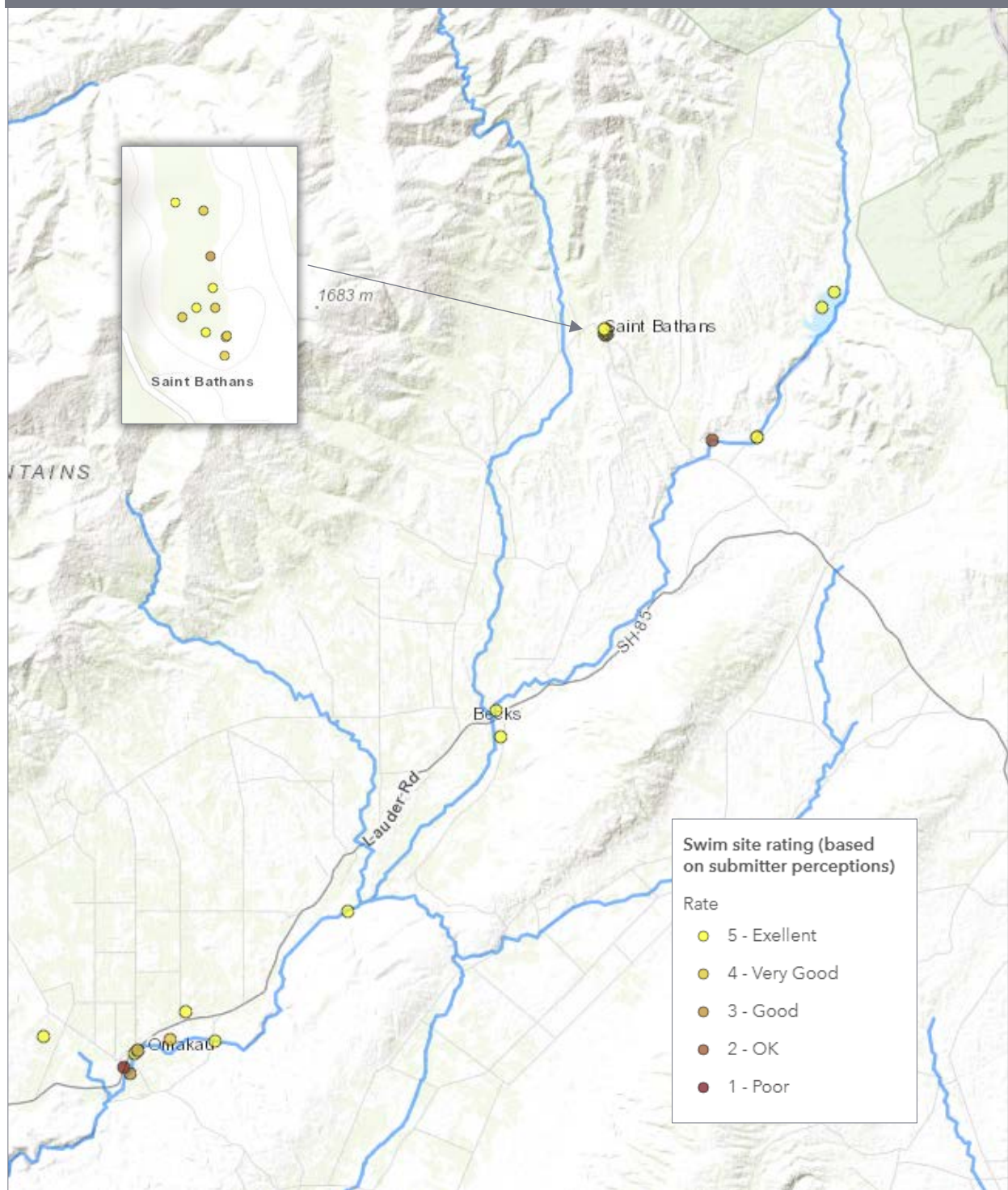


Figure 21: Swimming record locations, upper Manuherehia catchment. ORC 2018 data



5.3 Kayaking

Charles (2013) in his national guide of whitewater kayaking options identifies one whitewater run on the Manuherekia River – the four to six hour Class IV to V experience on the Ophir Gorge:¹³

One of the runs to do in the area, the Manuherekia has been popular with Otago paddlers since its first descent in 1985 by a University of Canterbury Canoe Club team who had read a report that it was Class III! A small, tight gorge, it needs more than normal flow, but thanks to the Otago Regional Council gauge at Ophir you won't have to waste time driving to the river to check it out.

Initially the gorge is narrow and the water flat. The rapids begin after 3km. A diversion tunnel on the right after 5km heralds the beginning of the gorge proper. Between the beginning and end of the tailrace are a number of steep technical Class III - IV rapids. All are easily portaged on the tailrace. They continue 2km past the tailrace outflow. Two steep and technical Class V rapids follow each other in quick succession, both with high objective danger from rock sieves and undercuts. Optimal flows are between 15 and 50 cumecs; at over 50 cumecs the water is very turbulent and becomes solid Class V. Below, the gorge relents before issuing onto Central Otago farmland just after the Chatto Creek confluence. From here to Keddell Rd is a half hour of flat water. It is possible to take out at Chatto Creek and walk 4km along the old railway line to the Chatto Creek Pub.

TO GET TO THE PUT IN: 1.5km east of the small settlement of Omakau on SH85 is a short gravel road down to the Ophir Bridge. Put in there.

TO GET TO THE TAKE OUT: Drive east on SH85 towards Springvale. Look for Keddell Rd. Turn down this and follow it 1.5km down to the river.

Egarr (1995), in his earlier but more comprehensive guide, describes several kayak options:

The Manuherekia is a small river which is almost dry in summer, as it loses considerable flow to a variety of small irrigation schemes. It joins the Clutha at Alexandra. In its upper reaches the flow is controlled by the Falls Dam reservoir, which has a narrow and interesting gorge below it, although there is seldom sufficient flow for paddling. This is because the reservoir fills during winter and the gorge would not contain water until the reservoir overflows in spring. From this gorge the river meanders over a shingle bed, confined in gorges such as Lauder Gorge. It is not until the river reaches Omakau that it is of sufficient size for a trip.

The Ophir Gorge lies between Omakau and Springvale and is the longest and steepest section of the river. To run this gorge rain is needed to bring the flow levels above 0.5m on the water recording station at Ophir Bridge, below Omakau. It has been paddled at flows of up to 1.4m. Put-in at this bridge. Initially the gorge is narrow and of low gradient, until a diversion tunnel on the right bank takes around half of the river's flow to cut off a wide bend. It is here, about twenty minutes below the put-in, that the gorge becomes steeper and rocky rapids occur. Depending upon flow levels, these may be grade III or more.¹⁴ The diversion tunnel returns the flow to the natural river bed shortly after.

Below this lies a section of grade II - III rapids, then two particularly difficult rapids - both are steep, tight and bouldery, providing very technical boating. However, they are often mere filters that cannot be run except at very high flow levels. A series of short grade III chutes

¹³ The river classes in Charles (2013) are: Class I – moving water with a few riffles and small waves. No obstructions. Class II – Easy rapids with waves up to one meter. Clear channels obvious without scouting. The ability to move your craft across the current is not necessary. Class III – rapids with high irregular waves and narrow passages. The ability to spin and manoeuvre is necessary. Class IV – Difficult rapids requiring a series of controlled moves, cross-current and spinning in confused water. Scouting often necessary and a reliable roll is mandatory.

¹⁴ Egarr (1995) uses 'grades' rather than 'classes' as in Charles (2013), but the rating definitions are similar.

leads down to the first of these rapids, which ends in a sharp righthand bend. It can be portaged along the water race above the river on the right. The second rapid is a longer one and includes a 2m fall with sieve conditions. Inspect, or portage on the left. Both of these rapids would be grade V. A third sieve rapid is encountered before the gorge eases to flow out onto open country above the railway bridge. It is possible to take-out at the railway bridge by following the railway line (now a walking and biking track administered by the Department of Conservation) from the Chatto Creek Tavern. There is another takeout 5 km lower down at the Keddell Road bridge. Below Keddell Road are shallow, braided river flats with numerous willows.

5.4 Jet boating

Part 91 of the Maritime Rules administered by Maritime NZ limits boat speeds to a maximum of 5 knots within 200m of any shore or structure, which would therefore preclude jet boating or water skiing on any waterbody in the study area. Uplifts of the 5 knot rule may be applied for on a temporary or permanent basis to allow high boat speeds close to a shore. The ORC Navigation Safety Bylaw 2019 provides for an uplift of the 5 knot rule from the confluence of the Clutha River/Mata-au to the Falls Dam in St Bathans, between August and September when the flow is between 10m³/s and 45m³/s as measured at the Ophir gauge. Prior to 2019, the Otago Branch of Jet Boating NZ (JBNZ) would apply for one-off 'manual' uplifts to enable organised runs on the River.

The Otago Branch holds an annual family run on the River from Omakau to Becks with up to around 12 boats. Some casual use is made of the River downstream of the Ophir Gorge, and the Gorge has not been attempted. Jet boats would be able to navigate the River at flows above 45m³/s, particularly in the River below the Ophir Gorge, with approximately 12m³/s the minimum flow.¹⁵

There is no uplift of the 5 knot rule on Dunstan Creek.

5.5 Commercial activities

In the Manuherekia catchment, as stated above, there are no uplifts to Part 91 of the Maritime Rules and so no commercial jet boating on the Manuherekia River.

Maritime New Zealand generally retains authority over licensing commercial vessels under the Maritime Rules (prepared in accordance with the Maritime Transport Act 1994). Part 80 of the Maritime Rules controls 'marine craft' used for adventure tourism (specifically commercial jet boats operating on rivers, and commercial rafting). Certificates awarded by Maritime New Zealand under this Part of the Rule are limited to specified rivers, and compliance is audited by Maritime NZ. Part 40 of the Rules controls general passenger (Part 40a) and cargo-carrying (Part 40c) in commercial marine craft (such as water taxis and recreational fishing boats), excluding adventure tourism, with audits completed by approved private companies. Anyone licensed under Part 40 would be able to undertake a commercial trip on a waterbody, but not for the purposes of adventure tourism.

Administration of navigation safety in New Zealand varies from district to district, with different levels of engagement by local and regional authorities and Maritime NZ:

- The ORC administers navigation safety on the Otago and Karitane Harbours and has no role in the management of the Clutha/Mata-au catchment, besides delegating some authority to develop navigation safety bylaws to the CODC and QLDC.
- The CODC administers only the surface of Lake Dunstan and its tributaries via the Central Otago District Council Lake Dunstan Navigation Safety Bylaws 2017. The Council does not administer those parts of the Maritime Rules which control licensing of commercial waterborne activities.

¹⁵ Richard Currie, Chair Otago Branch Jet Boating NZ

- Maritime NZ administers navigation safety on all waters where no local bylaws apply in accordance with the Maritime Rules, and therefore on the Manuherekia River and Dunstan Creek. It also applies Part 40 and 80 of the Maritime Rules to the entire catchment.

5.5.1 Department of Conservation concessions

Table 3 identifies the number of commercial recreation concessions issued by DoC for Conservation land adjacent to each waterbody (at March 2020). The names of concession holders are not provided. The data merely help indicate the relative levels of commercial activity in each waterbody. The guided fishing concession is most likely held by the NZ Professional Fishing Guides Association and applies to all members of the Association.

Activity	Number	Location
Bus parking	1	Manuherekia River Conservation Area - Ophir
		Manuherekia River Conservation Area - Springvale
Guided fishing	1	Manuherekia River & Catchment Marginal Strip
		Manuherekia River (East Branch) Marginal Strip
		Manuherekia River (West Branch) Marginal Strip
		Manuherekia Marginal Strip
Guided walking	1	Manuherekia Track (Hawkdun Runs Road to Homestead Track)
		Manuherekia Track (Homestead Track to East Manuherekia Track)
Guided biking	16	Otago Central Rail Trail
Guided photography	1	Dunstan Creek
Guided walking	1	Dunstan Pass Track

5.6 Water Safety New Zealand

Water Safety NZ provided an analysis of its Drownbase preventable drowning fatalities database for Otago between 1 January 2008 and 31 December 2019 for this study.¹⁶ The figures provided are described as ‘provisional as at 02/03/20’ and are heavily anonymised.

Preventable fatalities include recreational and non-recreational drowning deaths. They do not include those fatalities arising as a result of road or air vehicle accidents, homicide, suicide or of unknown origin, as these are not considered applicable to the prevention and rescue efforts of the water safety sector.

- There were a total of 968 preventable drowning deaths within New Zealand for the period 1 January 2008 – 31 December 2019.
- Of these, 59 occurred in the Otago region.
- 20 fatalities occurred in streams or rivers in the Otago region.
- Of these, five occurred in flooded rivers. The flooded rivers were all due to rainfall. The rivers were:
 - Clutha/Mata-au
 - Young
 - Kakanui

¹⁶ Felicity Fozard, Water Safety NZ, pers comm

- Dart
- Silverstream
- A further four fatalities were noted to be in rivers with a strong or swift current, but the water level appeared to be normal.
- There was one death in the Blue Lake. There was no indication that lake level changes were involved in this death.
- There were no recorded deaths in the Manuherekia River.

5.7 Hunting

Fish & Game NZ provides little information online about game bird hunting in Otago, beyond:¹⁷

The Otago Region offers veritable smorgasbord of game bird hunting from mallards on large coastal wetlands to upland game upon briar rose-strewn Central Otago hills.

In between there are countless pond and river bank hunting opportunities, along with small stream stalking and evening shooting over grain crops. Otago pretty much has it all when it comes to game bird hunting - all you have to do is get a licence and get out there.

No hunting sites are identified.

There are no Recreational Hunting Permit areas (or 'Open Areas') administered by DoC adjacent to the Manuherekia River or Dunstan Creek.¹⁸ Game bird permits are required when hunting for wildfowl on Conservation land, in addition to a bird hunting licence from F&G (regardless of where the hunting occurs). Small game hunting is likely throughout the study area, particularly rabbits.

5.8 Public access and pedestrian and cycling activity

There are few expansive areas of reserve directly adjacent to the Manuherekia River or Dunstan Creek, or in the Manuherekia Valley generally. Figure 22, Figure 23 and Figure 24 on the following three pages show Land Information New Zealand (LINZ) data for legal roads, hydro parcels (publicly accessible riverbed) and protected areas (council and DoC reserves mostly, including esplanades). Public access in the lower Manuherekia River is largely via hydro parcel, but with infrequent access points via legal road. Marginal strips extend upriver from Omakau and Lauder. The River above Falls Dam reaches the Oteaka Conservation Park, but has limited direct connection with it via public land, with only slender lengths of marginal strip. Dunstan Creek has extensive areas of hydro parcel, legal road and marginal strip downstream of St Bathans, and although upstream it features adjacent legal road and marginal strip – and a connection with an isolated parcel of the Lauder Basin Conservation Area, and an unformed legal road connecting the Lindis Valley, there is no practical public access.

The relative levels of use of the Manuherekia Valley for running and cycling can be shown via Strava data. Strava is a social media application which uses GPS records from subscribers' smartphones uploaded to a central database, allowing speed and time comparisons with other cyclists, runners, kayakers and swimmers (for example), and the monitoring of individual activity or training targets. While the service is popular with professional athletes, its membership is dominated by casual recreation participants. Strava does not state its membership numbers, but 42 million international users were reported in 2019 (80% outside the US) with an additional million users joining per month. It is now popular amongst regular cyclists and runners, and is also used by the likes of rowers, kayakers, waka ama and swimmers.

¹⁷ fishandgame.org.nz/otago/game-bird-hunting-in-new-zealand/

¹⁸ maps.doc.govt.nz/mapviewer/Index.html?viewer=dto&baseLayer=Map&layers=Open%20Hunting%20Permit%20Areas,Public%20Conservation%20Areas

Comparisons between different forms of data gathering show a degree of reliability for Strava data with a range of 1% to 12% of users recorded on-site that are connected to the service; and this is growing (Herrero 2016, see also). A 2019 study carried out by the author of this report showed approximately 30% of mountain bikers accessing the Codgers Mountain Bike Park in Nelson were using Strava for each visit, and 7% of pedestrians. Such response rates would compare favourably to an on-site intercept survey of users in an outdoor setting, particularly since the Strava data are collected over all seasons and all day (an intercept survey would normally only cover relatively short time periods and be confined to specific interception points). Nevertheless, caution needs to be applied to the use of Strava data as they show participation by only Strava members. There will be an inherent bias to the more competitive and tech-savvy, and some data accumulate from users staying logged in when they are doing other activities, such as driving. Some records are also offset by tens of metres due to either poor GPS reception or map projection errors. However, most records appear in their correct locations.

Strava is therefore a little like a tag and release programme, but unlike, for example, tagging 10 longfin eels with GPS devices and seeing where they head to breed¹⁹ Strava essentially tags several thousand active people in an area and monitors where and how they recreate. Its greatest strength is therefore in showing the relative value of settings for different forms of recreation. The results are shown in 'heatmaps' which indicate relative levels of use of settings for cycling and running. Data for the heatmaps show use over a rolling 24 month period, with the images used here captured in May 2020. The brighter the colour of a trail (the 'hotter' it appears) the more use it receives.

Figure 25 shows the Strava heatmap for running in and around Alexandra. Running is a good proxy for walking activity, showing the same trails used. The length of immediate riverside area accessed is limited to the area adjacent the town centre downstream of Little Valley Road and the Otago Central Rail Trail. Figure 26 shows cycling for the same area, with similar use patterns apart from less activity in urban Alexandra.

Figure 27 and Figure 28 show Strava data for the entire Manuherekia Valley for cycling and running, respectively. Beyond Alexandra, running is largely confined to the Otago Central Rail Trail, Ophir and around Blue Lake, and some isolated rural areas where one or two individuals are likely to be completing regular running circuits. Cyclists venture further, with some traversing to Omarama via the upper river and the Omarama Saddle.

These data suggest pedestrian access to the Manuherekia River is heavily focused around Alexandra, with limited opportunities for easy public walking access along extensive lengths of riverside in any other location. Road-end access is scattered the length of the Manuherekia River, and on Dunstan Creek extends only as far upstream at St Bathans.

¹⁹ As NIWA did in 2019 and earlier in the century see <https://www.rnz.co.nz/national/programmes/ourchangingworld/audio/2018695044/mystery-of-the-longfin-eel-s-breeding-ground>

Figure 22: LINZ property map showing roads, hydro parcels and protected areas for lower Manuherehia

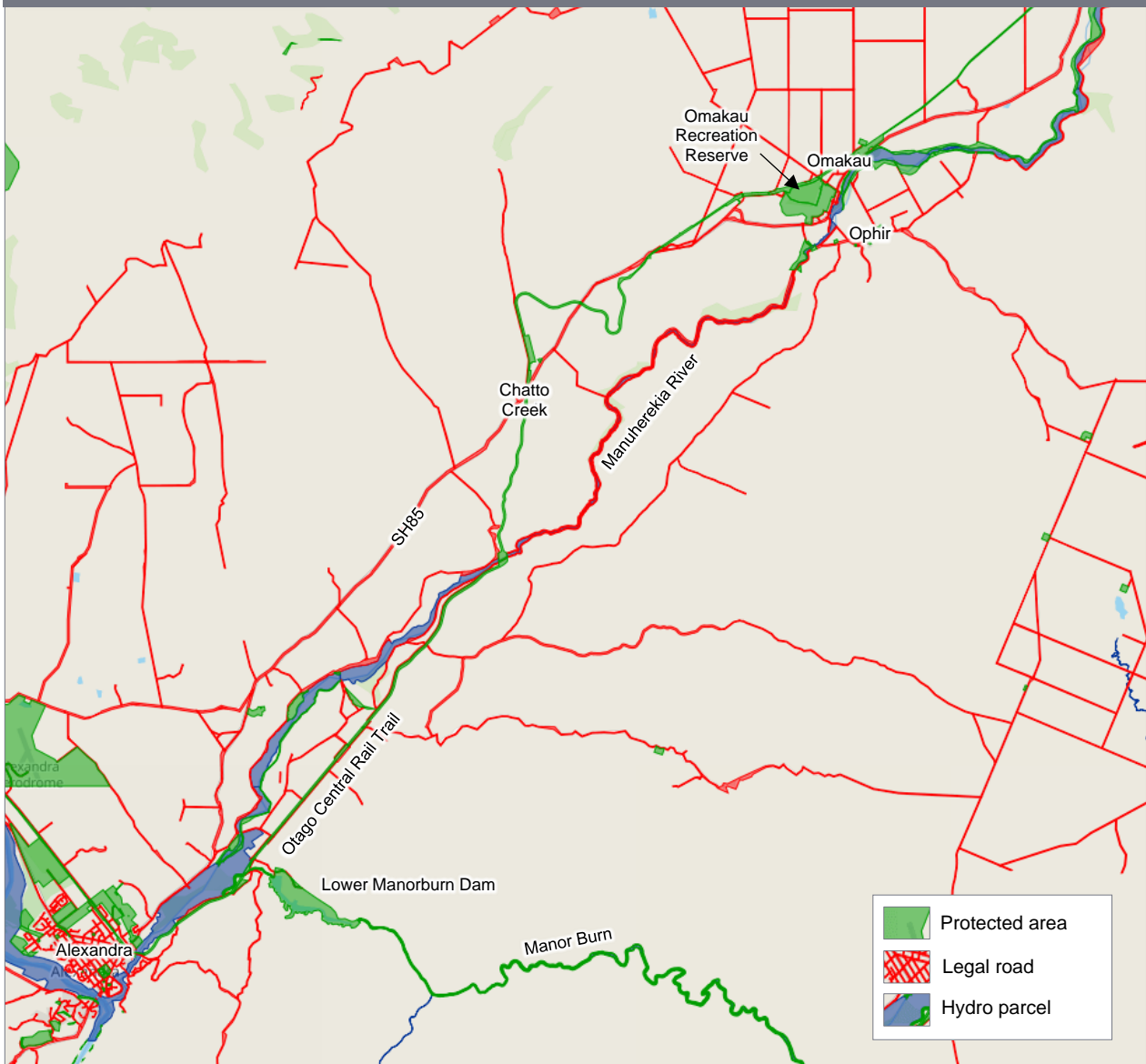


Figure 23: LINZ property map showing roads, hydro parcels and protected areas for mid Manuhereikia

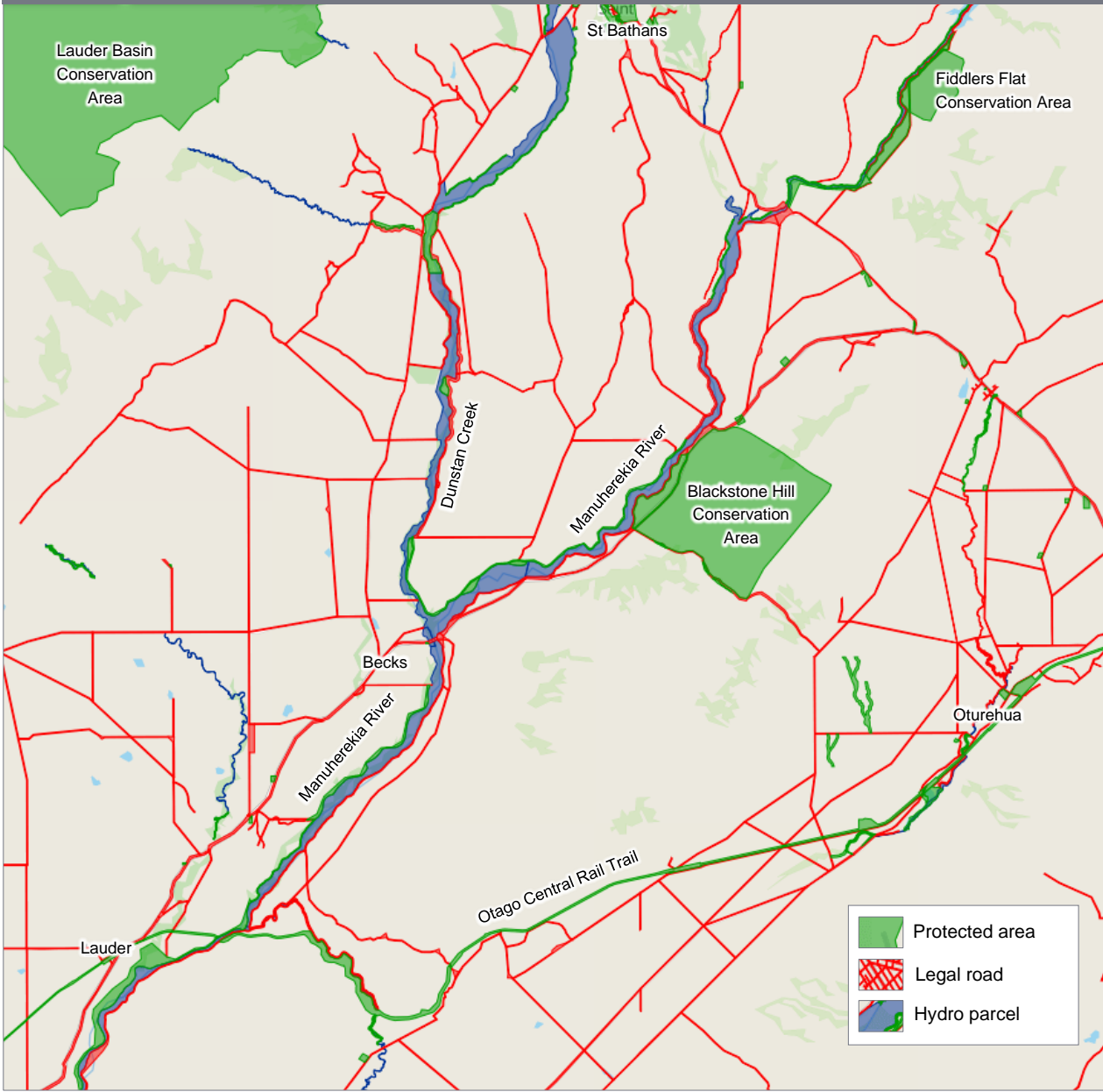


Figure 24: LINZ property map showing roads, hydro parcels and protected areas for upper Manuherekia

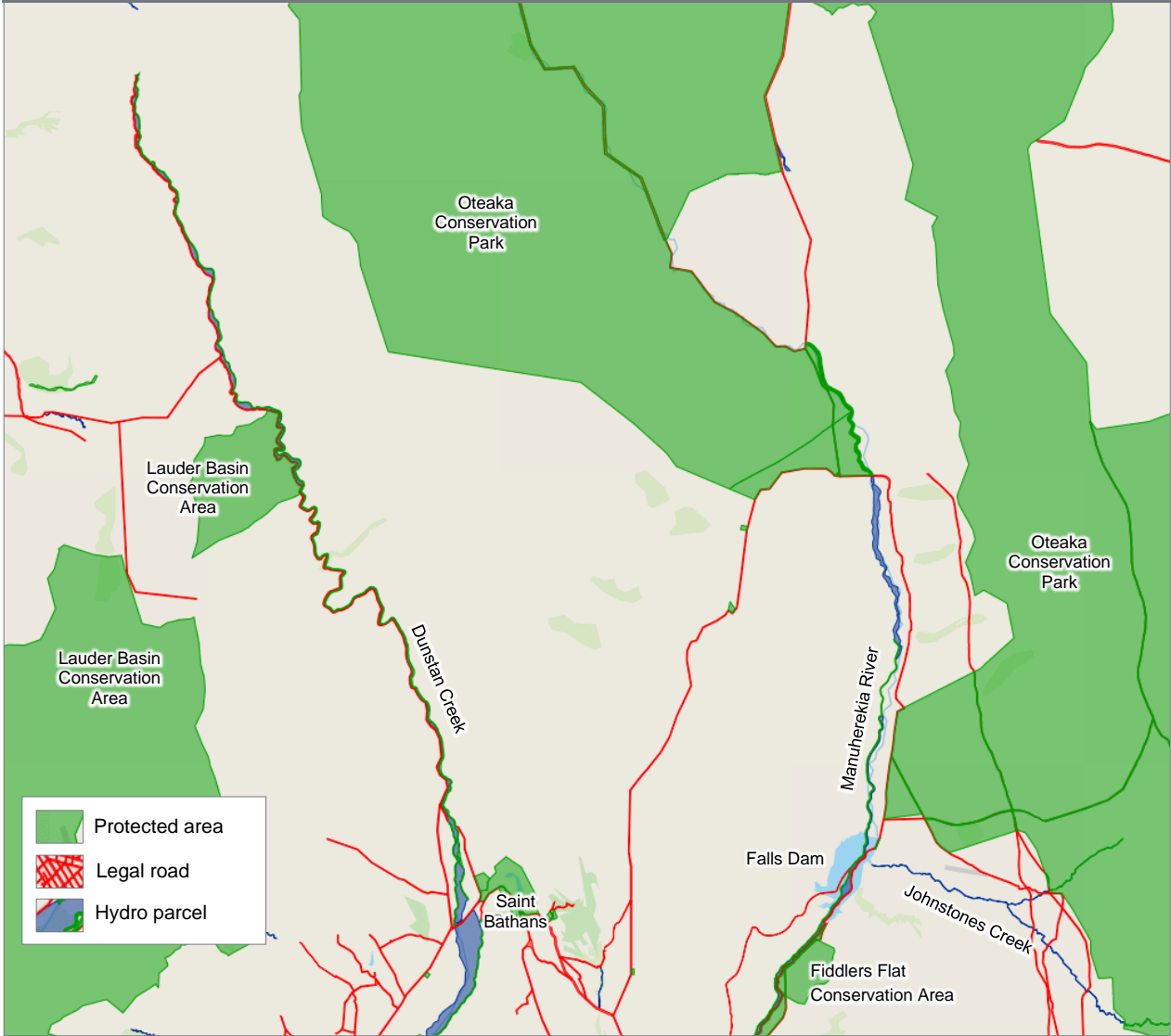


Figure 25: Strava heatmap for running near Alexandra

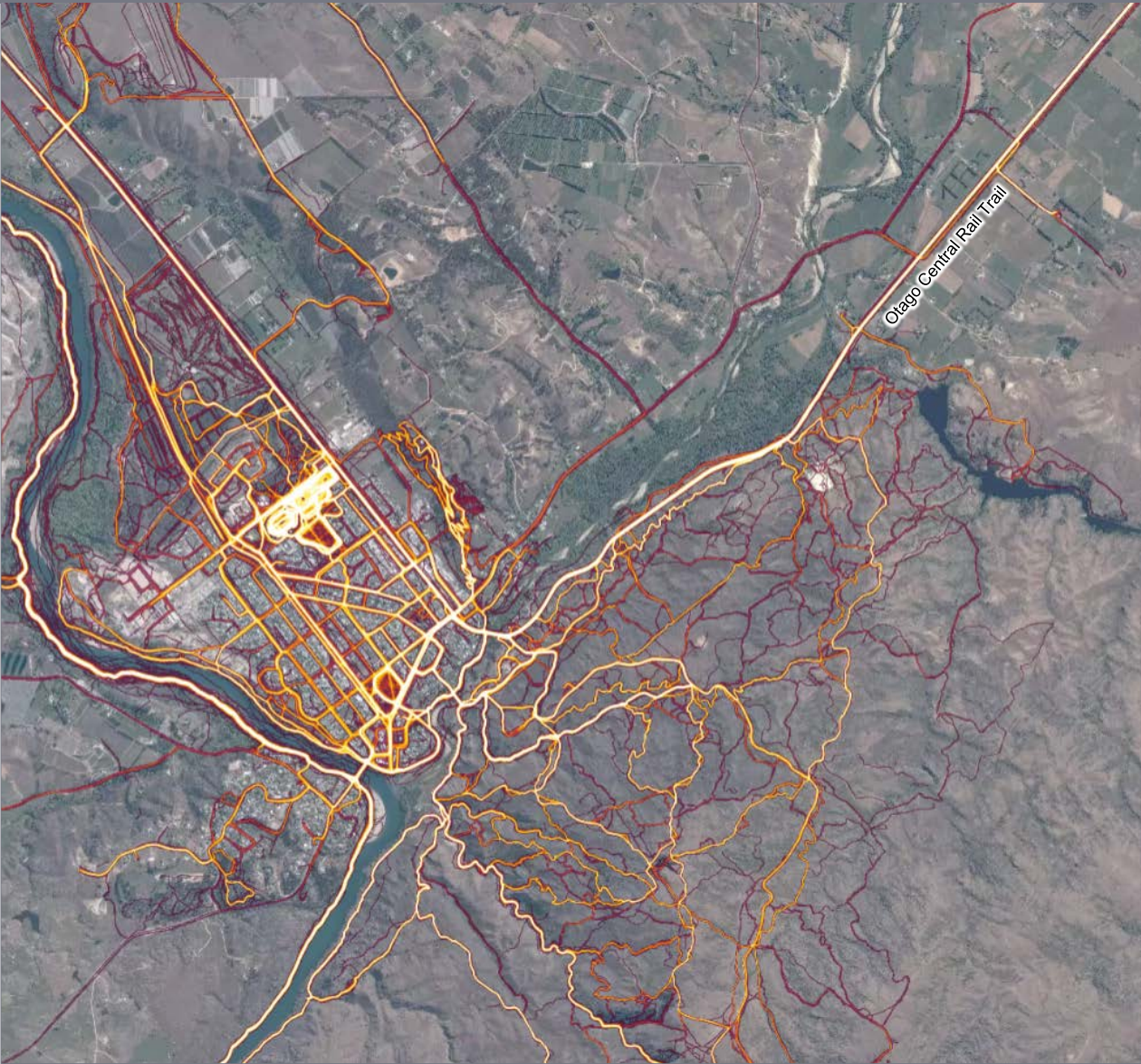


Figure 26: Strava heatmap for cycling near Alexandra

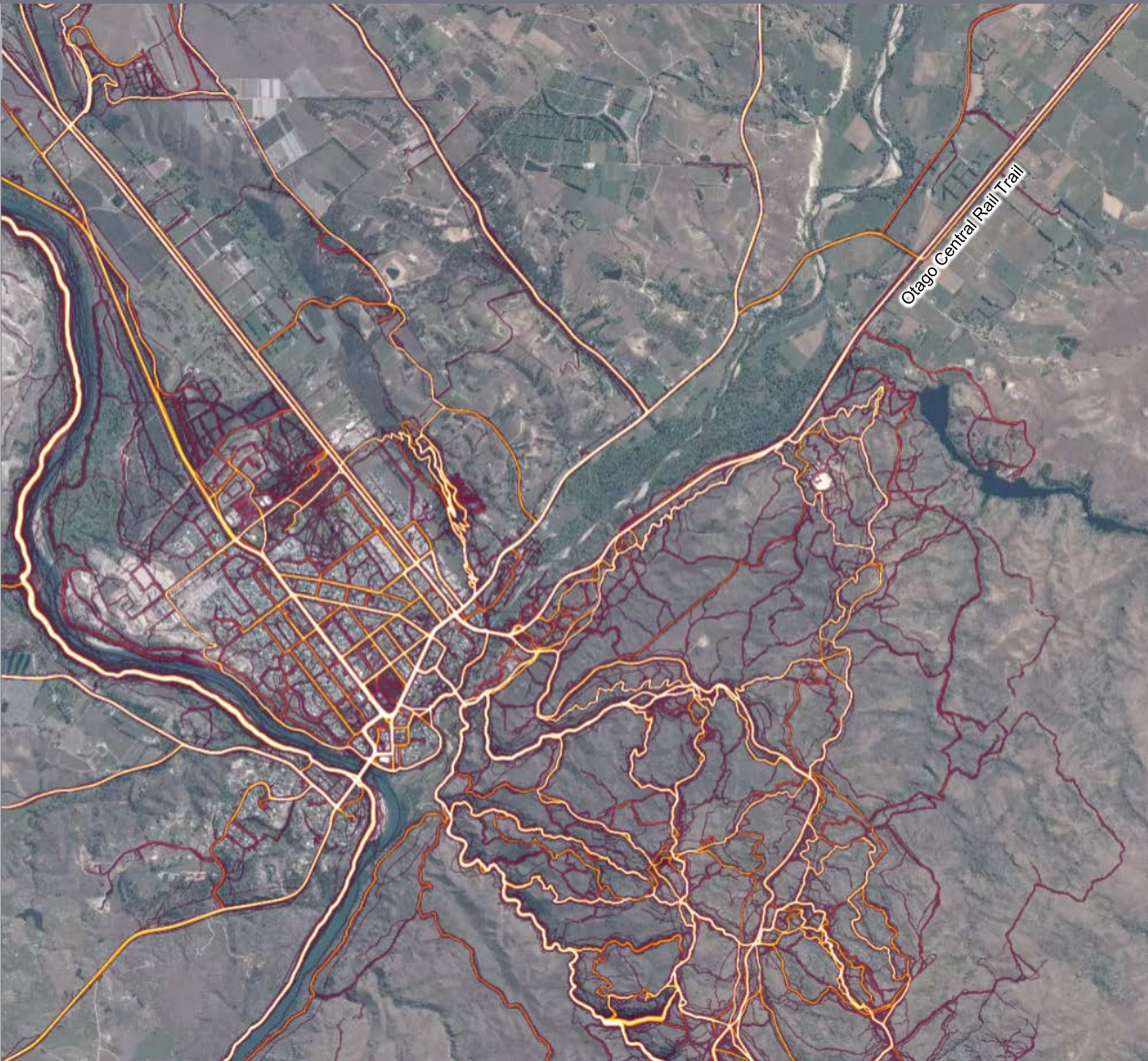


Figure 27: Strava heatmap for cycling in the Manuherekia Valley

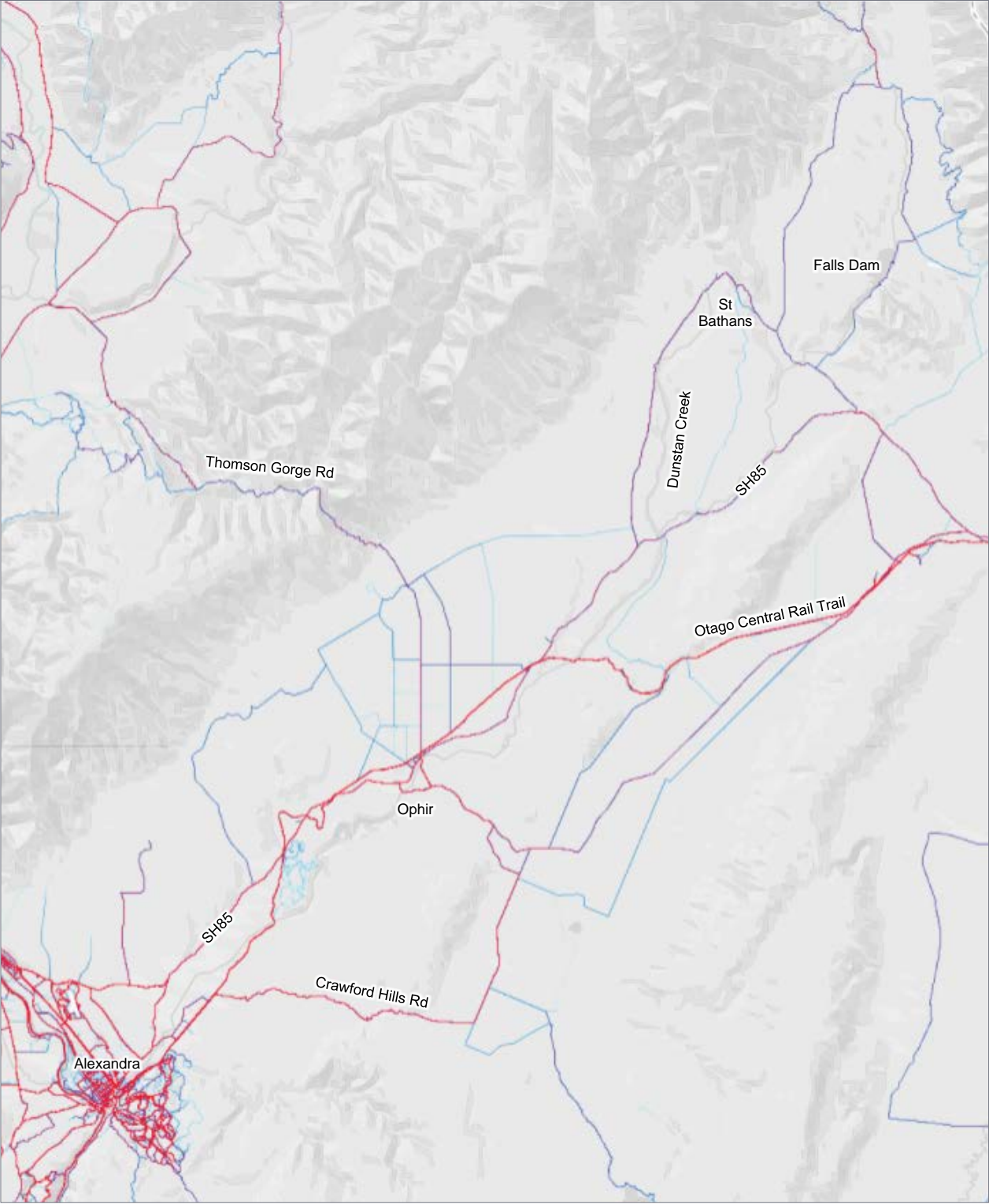
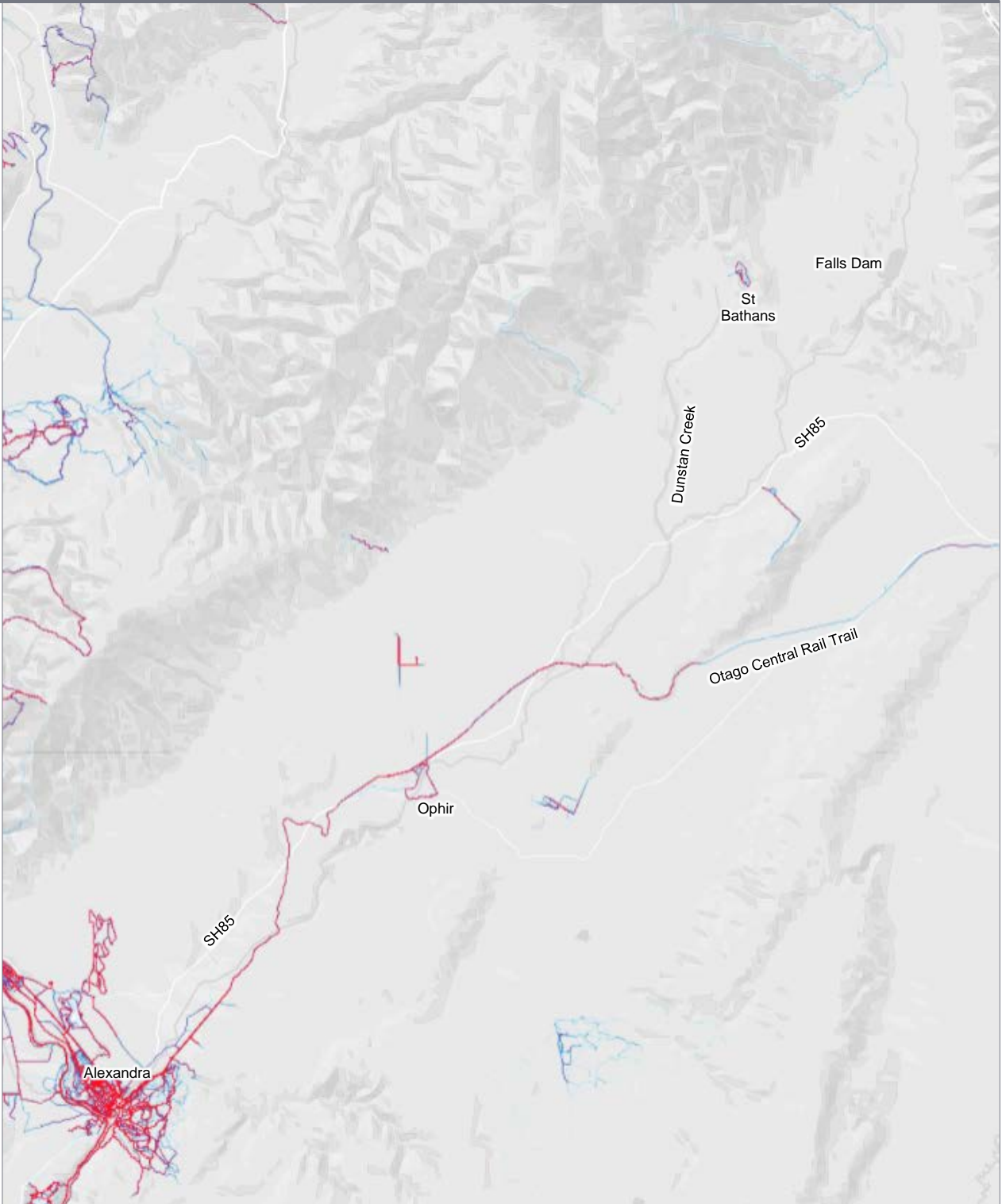


Figure 28: Strava heatmap for running in the Manuherekia Valley



5.9 Otago Regional Council consultation for water quantity plan change

The ORC carried out a process of consultation about the “values and aspirations held by takata whenua, the local community and other stakeholders for the Manuherekia Rohe/Catchment” between August 2016 and September 2019 to provide advice for the planning process for the water quantity plan change proposal. A summary is provided in ORC (2019). The method included multiple community drop-in sessions, and online and mail surveys. As stated, the consultation focused on values and aspirations (such as maintaining and improving water quality) rather than on locating and quantifying specific recreation values. However, 200 people attended one of six In August 2016 public drop-in sessions in Omakau, Oturehua and Alexandra, and formal feedback identified six groups of recreational uses of the Manuherekia rohe:

- Swimming,
- Fishing,
- Kayaking, white water, boating,
- Floating, playing, wading,
- Picnics, BBQs, camping,
- Duck shooting, hunting.

Information provided by attendees on feedback forms was collated and turned into a word cloud showing the relative scale of interest in each issue (Figure 29, with larger words representing more references). This indicates the importance of swimming and fishing.



5.10 Central Otago Outdoor Recreation Strategy 2012 – 2022

The Central Otago District Council's Outdoor Recreation Strategy reviews "existing resources and experiences" for outdoor recreation in the District and "provides guidance for the future – with the aims of minimising potential conflict and identifying opportunities to maximise the region's social and economic well-being, as well as its national and international standing."

For the Manuherekia River, the Strategy identified:

- Rock climbing on its true left bank adjoining the Lookout Estate Alexandra (between the old road rail bridge and the Shaky Bridge).
- Poor water quality for swimming in the River.
- Angling on the "medium sized" Manuherekia River.
- A desire for more multi-day walking and biking opportunities through the upper valleys of the west and east branches of the Manuherekia River via the Omarama Saddle.
- That the, "Clutha River is recognised as a national experience for grade two multisport kayaking. The Nevis and Kawarau rivers are recognised nationally for their important and unique whitewater and the Ophir Gorge in the Manuherekia is recognised regionally as an important white water river."
- A desire to promote access to the riverbed and nearby wetlands for game fowl hunting.
- That the Manuherekia River is 'currently' used for swimming and picnicking by locals as well as national and international visitors.
- Some interest in four-wheel drive access in the River above Falls Dam.

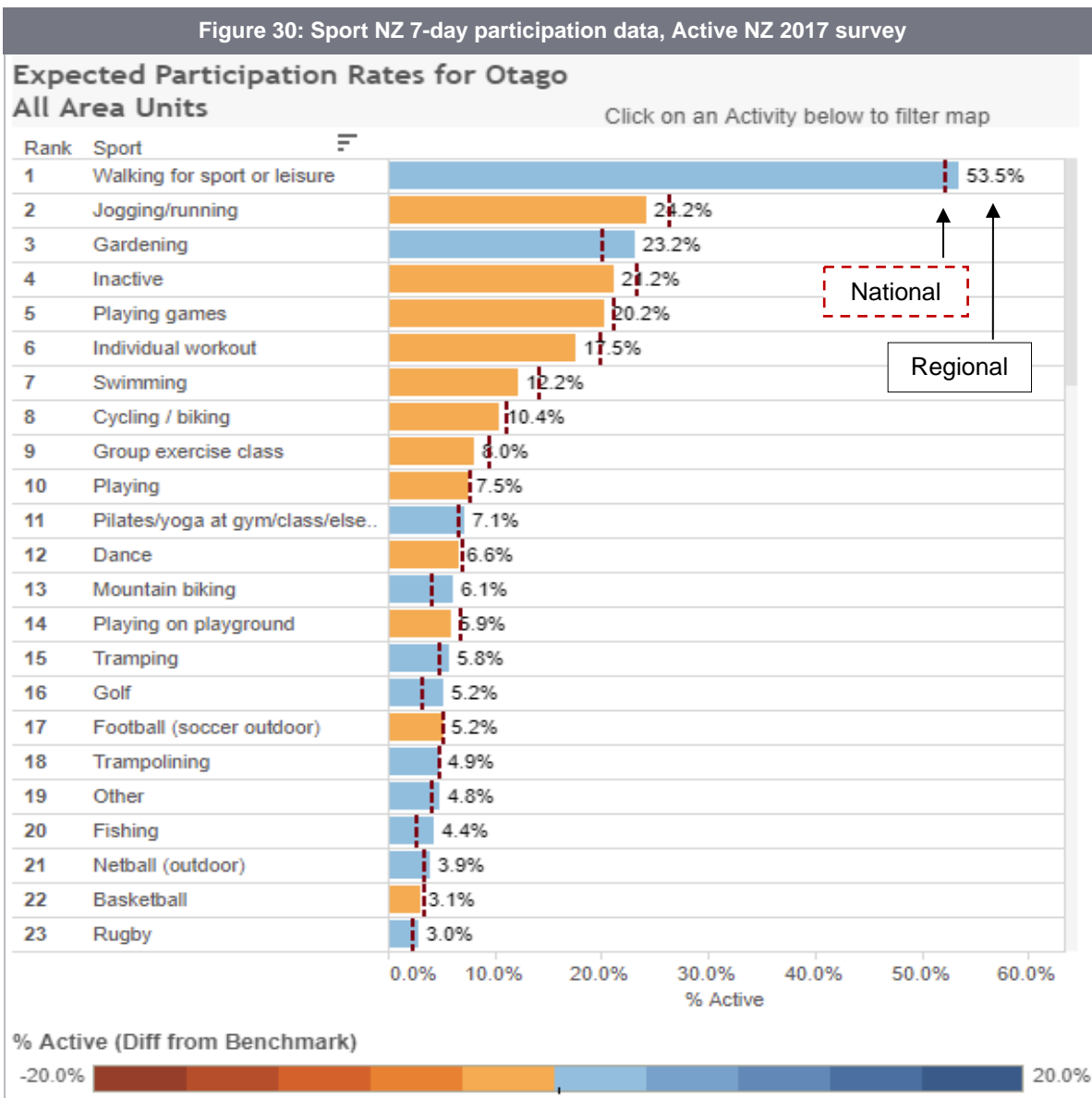
Manuherekia No. 1 Bridge. Otago Central Rail Trail east of Lauder



5.11 Regional recreation participation

This section briefly provides a quantification of participation in the recreation activities identified in this review, for context. Figure 30 shows the 7-day participation data²⁰ for Otago from Sport NZ’s 2017 Active NZ survey – a very large-scale quantification of national participation levels and trends. This indicates the high levels of participation in walking and running and swimming – all of which need a venue, generally outside the home. Compared with national data, Otago participation levels are lower for running and swimming, but are much higher for mountain biking and fishing. Participation data for activities with lower levels of participation than those shown in Figure 30 come with high error margins, considering they are modelled from smaller response sets, and it is dangerous to read too much into the specifics – other than to note that the following are more specialist sports (but in the same range of participation as tennis at 2.0% participation and rugby union at 3.0%):

- Kayaking and canoeing – 1.0%, and
- Hunting – 1.3%.



²⁰ Sport NZ also provides similar data based on 12-month participation – which give much higher participation rates for most activities. The 7-day data show regular participation levels.

6 Significance of the waterbodies for recreation

Smith (2009) completed a review of national and international literature to identify the status of significance methodologies for river values, including recreation. A key finding of the review was that, “to date, the work associated with assessing river values is *ad hoc*, and much is based on subjective assessments. Work which attempts quantitative assessment tends to address one (or at most two) values; none appears to offer a satisfactory method ...”.

For the Manuherekia River and Dunstan Creek there are only a few published data sources upon which to rely for making an assessment of significance, and relative quantitative data only for angling via the national angler surveys (see Section 5.1.1).

This section reviews relevant national analyses of the significance of freshwater bodies to recreation and tourism since 1981 to see where the Manuherekia River and Dunstan Creek have been identified, and relies on this and other data presented in this report (including the intercept survey and angler and kayaker interviews in Sections 0 and 4) to make an assessment of the significance of the two waterways.

6.1 What is ‘outstanding’ or significant?

A review of literature relating to Water Conservation Orders (WCOs) and comparative recreation assessments of freshwater bodies illustrates 35 years of struggle with identifying the significance of rivers and lakes for recreation; and identifying their use and value for recreation at national and regional levels (Greenaway 2016). Research began well, with an exceptional national review of river recreation by the Egarr brothers (Egarr & Egarr 1981). This, and the National Angler Surveys (NAS) carried out for F&G NZ (the Unwin, and Unwin *et al*, reports from 1998 to 2016, and other reports based on those data used in Section 5.1.1) appear to be the only relevant comprehensive and methodologically sound pieces of work completed at the national level since 1981. Egarr & Egarr (1981) is now out-of-date, and the NAS apply only to angling.

Several studies have reviewed specific recreation activities, and the significance of rivers for those activities. Examples at the regional or sub-national level include whitebaiting in the South Island (Kelly 1988), kayaking on the West Coast (England 2011) and river and lake recreation at the regional level (Sutherland-Downing 2004) and river recreation at the national level (Galloway 2008). These rely on unique methodologies, apply to single activities, or are desktop studies relying on anecdotal data and, in some cases, weak methodologies. More recently, comprehensive and stakeholder-led reviews have provided more comprehensive data – but these are region-specific (not in Otago) and include River Values Assessment System (RiVAS) analyses for, for example, angling, swimming, kayaking and jetboating;²¹ and the likes of Rankin *et al* (2014) and Greenaway *et al* (2018) for kayaking and jet boating respectively in Canterbury.

Most recently, and most relevantly, the *Community Environment Fund: Outstanding Freshwater Bodies Project* (Harper 2017) summarised the findings of multiple specialist reviews of the history and methods of assessing significance of in-river values and summarised these for definitions of ‘outstanding’ and approaches to identifying recreation significance in WCOs. The author of this report was a member of the technical advisory group for the Project and contributed the specialist report on recreation. The full recreation review is appended to Harper (2017) (Greenaway 2016). The Project did not set out to identify outstanding rivers, but to consider methods and definitions. Harper made the following useful summary points based on legal opinion and review of existing WCO decisions:

- Being outstanding is a high test. The term ‘outstanding’ distinguishes something from others based on its exceptional qualities and is typically used to describe the ‘best of the best’. An outstanding value has a higher threshold than a significant value. An

²¹ See <https://researcharchive.lincoln.ac.nz/> and search on the phrase ‘rivas’

outstanding value will always be significant, but a significant value will not necessarily be outstanding.

- A water body needs to have at least one outstanding value before qualifying as an Outstanding Freshwater Body under the National Policy Statement for Freshwater Management 2014 (NPSFM). A sum of significant values is not enough to qualify the water body as outstanding, based on legal opinion. There will be exceptions and a water body with a sum of significant values (none alone individually outstanding) could potentially be incorporated this way.
- A water body can only be reviewed in the context of its present condition. It cannot be assessed on its past condition or its potential under the NPSFM.
- Water Conservation Order decisions are clear that where sufficient data about a particular value of a water body are not available, then the value is not outstanding until the appropriate evidence is provided.
- Individual recreation values have contributed to WCO protection decisions and include for recreation: whitebaiting, eeling, angling amenity, jet boating, caving, canoeing, kayaking and rafting.
- There is no clear method for identifying outstanding whitebaiting settings.
- There is no one 'obvious' set of characteristics and associated thresholds which can be applied to determine whether angling amenity is outstanding. The combinations of the characteristics assessed depend on the type of fishing experience being sought e.g. large trophy fish, high numbers of fish, salmon or trout, wilderness, and/or scenic natural characteristics. However, it is implicit in WCO decisions that in order to be outstanding as a recreational fishery or angling amenity, the waterbody must contain an exceptional biological feature such as an abundance of fish, exceptionally large fish, high salmon run numbers, or high numbers of large fish, and have an exceptional angling amenity to justify a finding that it contains an 'outstanding recreational fishery'.
- There is no conclusive evidence in literature which suggests that any of the following can be outstanding in their own right: bird watching, tramping, walking, biking, camping and picnicking.
- Jet boating, caving, canoeing, kayaking and rafting have been specifically recognised as outstanding and subsequently protected under a number of WCOs. As such, all are identified as key sub-values which have the ability to be outstanding in their own right. The preliminary findings from the WCO review on this value set show that in order to qualify as outstanding for boating, the waterbody must be reliable/predictable for the activity under normal flows, and meet at least one of the following criteria:
 - have participation rates which are significantly higher than anywhere else in the country,
 - non-local usage of 20% or more,
 - contains a unique/rare characteristic shared by few other rivers in New Zealand,
 - additionally, waterbodies identified in WCO decisions as being outstanding for boating activities also typically provide a highly scenic and/or wilderness experience.
- There is no conclusive evidence in literature which suggests that any other boating activities such as rowing, sailing, wind surfing, kite surfing, river boarding, water skiing and wakeboarding can be outstanding in their own right.

- While it is clear that swimming is a national value that needs to be accounted for in management decisions, it is unclear whether alone it would make a water body outstanding for the purposes of the NPSFM. Swimming has not been identified in any of the WCO decisions as being outstanding in its own right.
- Nationally significant waterbodies are not necessarily outstanding.

6.2 Significance summary for Manuherehia River and Dunstan Creek

The Manuherehia River and Dunstan Creek have not been subject to a nationally-accepted assessment of its significance to recreation at the local, regional and national levels. Sections 6.3 to 6.10 below provide a summary of various national and regional reports and plans which consider the significance of the waterways. However, it is doubtful that any of these historic assessments could be considered robust or definitive, and no high-level protections like Water Conservation Orders apply. However, the documents referred to are consistent in not identifying the waterbodies as nationally significant or as outstanding. Including relative assessments reviewed in Section 5.1.1, the following observations are made:

Manuherehia River

- Statutory documents including the DoC Otago Conservation Management Strategy (CMS), Central Otago District Plan and Otago Regional Council Regional Water Plan for Otago do not identify the significance of the recreation values of the Manuherehia River, although the District Plan notes the 'classic' kayaking run in the Ophir Gorge and the 'popularity' of fishing on the River. The Regional Water Plan identifies trout as a 'significant' ecosystem value of the River, but not a regionally significant one. The CMS makes no specific reference to the River for recreation.
- The Otago Fish & Game Council Sports Fish and Game Management Plan (Section 5.1.2) defines the Manuherehia River as a regionally significant river for trout fishing.
- Popular angling commentary (Section 5.1.4) does not describe the River as having outstanding or significant features.
- Angler interviews (Section 4) indicated strong fishing values throughout the River, strong local commitment with guiding activity and regional use.
- National angler survey data (Section 5.1.1) indicate that the Manuherehia catchment contributed 5.5% of all angler days in Otago in the 2014/15 season, and the Manuherehia River contributed 21% of the activity in the catchment.
- The Manuherehia received a mean enjoyment score of 2.09 putting it in 41st position in Otago out of 57 rivers in Unwin's 2013 review of national angling values.
- Kayaker interviews (Section 4) indicated significant regional whitewater values in the gorges, and particularly Ophir Gorge. The *Central Otago Outdoor Recreation Strategy 2012-2022* (Section 5.10) describes the Ophir Gorge as a regionally important white water river (while the Nevis and Kawarau rivers are considered nationally significant).
- The intercept survey (Section 3) indicated that while 50% of respondents were from beyond the local area, there were few visitors from the North Island (5%), most respondents were from the lower South Island, and 11% were international. However, many internationals in Alexandra at the time of the survey were itinerant workers (fruit harvesting mostly). By comparison, a survey of Otago Central Rail Trail users in 2014/15 had 40% of respondents from the North Island, 22% from the South Island and 39% international (CODC, 2015), and would easily be a nationally significant recreation setting.

- Historic national assessments of the significance of freshwater bodies do not identify the River as significant.
- There is little commercial activity associated with the River beyond the Otago Central Rail Trail and guided fishing (Section 5.5.1).

These data indicate that the Manuherekia River is not nationally significant or outstanding for recreation, but it does have regionally significant values for angling and kayaking. The demographic profile for the intercept survey indicates that it has regional significance for other recreation values such as swimming and walking, relating mostly to visitors from the lower South Island (Otago and Southland). In sum, the Manuherekia River can be described as regionally significant for recreation below Falls Dam. The recreation values of the River above Falls Dam appear to be confined largely to angling, with some walking and cycling in the valley generally. While there is reference to the landscape values of the upper River, the angling resource is not highly-rated by itself (see the popular guide references in Section 5.1.4 for example), and the upper River is most likely of only local significance for recreation.

Dunstan Creek

- Statutory documents do not identify the significance of the recreation values of Dunstan Creek although the Regional Water Plan identifies trout as a 'significant' ecosystem value of the Creek, but not a regionally significant one.
- The Otago Fish & Game Council Sports Fish and Game Management Plan (Section 5.1.2) defines Dunstan Creek as both a locally and regionally significant river for trout fishing.
- Popular angling commentary (Section 5.1.4) does not describe the River as having outstanding or significant features.
- Angler interviews (Section 4) indicated strong fishing values in the upper Creek, above St Bathans, strong local commitment, guiding activity with helicopter access (a relatively large investment), regional use, remote values and the potential to catch large fish.
- National angler survey data (Section 5.1.1) indicate that the Manuherekia catchment contributed 5.5% of all angler days in Otago in the 2014/15 season, and Dunstan Creek contributed 2% of the activity in the catchment.
- Jellyman & Graynoth (1994) in their review of significant headwater and trophy fisheries nationally did not identify the upper Dunstan Creek, but in Otago listed the upper and lower Clutha River/Mata-au and the Nevis, Greenstone, Caple, Hunter and Pomahaka Rivers.
- Dunstan Creek received a mean enjoyment score of 2.29 putting it in 25th position in Otago out of 57 rivers in Unwin's 2013 review of national angling values (compared with the Manuherekia River at 41st position).
- Kayaker interviews (Section 4) indicated no whitewater values in the Creek, and some local use for swimming and walking near Cambrians.
- Historic national assessments of the significance of freshwater bodies do not identify the Creek as significant.
- There is some commercial activity associated with the Creek (Section 5.5.1) including guided walking, photography and guided fishing.

Significant recreation values on Dunstan Creek are confined to angling, and these do not appear to be regionally significant in the reach below St Bathans, considering its low level of use and good accessibility (noting the increasing influence of willow and other weeds impeding access). The

reaches above St Bathans have poor accessibility, but commercial guides and regional visitors are willing to invest effort to experience the remote setting with its high quality scenic and natural values, angling challenge, clear water and the chance of catching a trophy fish. This upper section of Dunstan Creek is of at least regional significance for angling.

6.3 DoC Otago Conservation Management Strategy

The Otago CMS (2016) describes the Clutha River/Mata-au as of regional significance for whitebait, trout and salmon fishing, but is silent about recreation on the Manuhereki River and Dunstan Creek:

Some of New Zealand's largest rivers flow through Otago. The Clutha River/Mata-au catchment is the largest in New Zealand, draining some 20.5 million hectares of land. It is the country's second-longest river and its lower reaches have extensive natural and historic resources. The Clutha River/Mata-au is important for hydroelectric power generation and farming, and supports salmon, brown trout and whitebait fisheries of regional significance. A variety of tributaries feeds into the river during its progress to the sea, which have important natural and scenic values in their own right.

The CMS is otherwise shy of applying statements of significance to many specific resources (although, for example, it describes the Greenstone Recreational Hunting Area as providing nationally important hunting for fallow deer (p61) and the Taieri River as regionally important for trout fishing (p101)). There is no reference to the other waterbodies in the study area, apart from in general terms and via their roles in contributing to Otago's unique landscape.

The 'Outcome, policies and milestones for the Freshwater/Wai Māori Place' (section 2.10) include:

Otago's large river systems and lakes, including the Clutha River/Mata-au, Dart River/Te Awa Whakatipu, and Taieri and Kawarau rivers, and lakes such as Wakatipu (Whakatipu-waimāori), Wānaka and Hāwea, are recognised for their ecological, cultural, landscape and recreational values and their contribution to conservation and the region's well-being and prosperity.

6.4 Central Otago District Plan

The CODC District Plan (April 2008, at July 2018) does not attempt to define the scale of significance of the waterbodies in the study area for recreation, although they are described as 'significant'.

Section 2.3.4 of the Plan (Land Use) states:

Recreation, particularly activities based on the outdoors, is becoming an increasingly significant land use in the District. The popularity of activities such as cross country skiing, mountain biking, motorised snow activities, tramping, boating, game bird hunting, and fishing is increasing. Passive recreation activities such as picnicking and sightseeing are also popular activities for both locals and visitors alike. Development of the Otago Central Rail Trail, will further enhance recreation opportunities. Section 2.4.3 demonstrates that water based recreation in the District is significant.

And

Tourism, which relies to a large degree on a number of the land uses listed above (eg. viticulture, recreation, conservation) is an increasingly important component in the Central Otago economy. The development of the Otago Central Rail Trail, improved public access to back country areas through the tenure review process; conservation and promotion of heritage values including those associated with the Otago Goldfields Park as promoted by the Otago Conservation Management Strategy, the burgeoning viticulture industry, and the comprehensive integrated golf course, hotel, viticultural and residential resort development at McArthur Ridge are likely to strengthen Central Otago's tourist industry.

Section 2.4.3 (Use of Water Resources) notes in relation to recreation:

Recreation is a significant use of the District's water resources and one which is likely to increase particularly during vacation periods. The recently created hydro lake, Lake Dunstan is proving to be a popular recreational resource. While the creation of the lake has resulted in the preclusion of recreational pursuits that relied on swift currents and rapids it has made other forms of recreation for which still water is needed or preferable (eg. swimming, sailing, water skiing, rowing) more accessible to a greater number of people...

Boating activities also occur on Lake Roxburgh, the Manuherikia River and at Blue Lake. The Blue Lake is also the site of the annual triathlon event, "The Ghost to Ghost." The gorge on the Manuherikia River between Ophir and Galloway is a classic white water kayaking run which is periodically paddled when higher water flows allow...

Fishing is possibly the most popular recreational activity involving the District's water bodies. Most of the District's water bodies have significance for fishing in particular Lake Dunstan, the salmon fishing of the Clutha River/Mata-au below the Roxburgh Dam, Lake Onslow and the Pomahaka, Taieri and Teviot Rivers. The Poolburn, Manorburn, Falls and Frasers reservoirs and a number of smaller irrigation reservoirs (such as Rutherfords Dam) and rivers such as the Manuherikia and Nevis are also popular and productive fishing spots.

The upper Manuherikia River and Dunstan Creek are identified as Outstanding Natural Landscapes (section 2.3.1). There are no further references to recreation on either waterbody in the District Plan.

6.5 Otago Regional Council Regional Water Plan for Otago

Schedule 1 of the *ORC Regional Plan: Water for Otago* (updated to 1 July 2018) lists the natural and human use values of Otago's surface water bodies. Schedule 1A focuses on 'natural values', which includes reference to recreation attributes of the region's rivers and lakes. Sources of data for the conclusions made are dated and limited, and include, in relation to recreation, Grindell & Guest (1986), Grindell (1984) and the 1982 draft document for Grindell (1984). These documents are reviewed later in this section of this report.

Schedule 1A identifies regional waterbodies which have a recreation or scenic value which contributes to an 'outstanding natural feature or landscape'. Dunstan Creek is identified as having outstanding values for 'old gold sluicing landscapes at Blue Lake'. While both Dunstan Creek and the Manuherikia River are identified as having trout as 'significant' ecosystem values – but not 'regionally significant' ones – and in only the 'lower reaches' for Dunstan Creek. No waterways in the catchment are identified as significant for gamebird hunting.

6.6 New Zealand Recreational River Use Study

Galloway (2008) reported on the findings of a survey of individuals who recreate on and around rivers in New Zealand (New Zealand Recreational River Use Study). Individuals were invited to participate in an internet survey via direct contact at river recreation-related events and electronically via a range of related web sites, group membership, internet bulletin boards, magazines and newspapers. Just over 1300 respondents completed the survey which ran from October 2007 to March 2008.

Twenty-three activities were represented in the data, and the dominant respondents were white water kayakers, anglers and multisporters. Respondents were grouped into four broad activity groups: Boating (non-motorised) (55.4%), Fishing (21%), Boating (motorised) (2.4%), and Shore-based (21.2%).

The survey was designed to evaluate respondents' motivations and site preferences, in relation to their level of specialisation in their activity. It was not designed to ascribe values to defined reaches

of rivers throughout New Zealand. A list of 1,043 rivers was compiled and respondents were asked to indicate up to ten rivers that they had last visited, and the next ten that they wished to visit. This provides a snapshot, rather than a complete picture of the respondents' experiences and views. A total of 4921 rankings was provided for 513 rivers. Rivers referred to more than 100 times include the Waimakariri (227), Tongariro (191), Buller (154), Hurunui (128), Kaituna (118), Mohaka (116), and Clutha/Mata-au (113). The Manuharekia River was ranked 44th nationally with 24 references (12 for non-motorised boating, 7 for angling and 3 for shore-based activities) and Dunstan Creek once (with no additional data provided).

For each visited river, respondents were asked to rate its scenic beauty, wilderness feeling, degree of challenge, and opportunity to develop Whanaungatanga / companionship, on a 9-point Likert scale, with 1 being the lowest and 9 the highest ranking. The question was phrased generally, and therefore is not able to identify different values supported by different reaches of each river. At best, it provides a general, broad brush impression of the values ascribed to the whole river, compared to the general values ascribed to other rivers. While 513 rivers were identified by respondents as of recreational value, insufficient responses were gained from most of those to support further analysis for these values.

The Manuharekia River was ranked (out of 71 rivers):

- 40th for scenic beauty (a mean of 6.59 within a range of 3.05 for the Avon River to 8.6 for the Arahura River),
- 38th for wilderness feeling (a mean of 5.91 within a range of 2.0 for the Avon River to 8.38 for the Whataroa River),
- 12th for challenge (a mean of 6.62 within a range of 3.1 for the Avon River to 7.8 for the Ruakituri River), and
- 18th for companionship feeling (a mean of 5.86 within a range of 3.25 for the Hinemaiaia River to 6.82 for the Waitaha River).

Respondents were asked to indicate the importance of selected site values in general terms (not specific to any river). The highest rated items were 'clean and unpolluted river water' and 'wilderness character' and 'scenic beauty'. The lowest rated items were the availability of a car shuttle service, and the presence of bathrooms, changing rooms, showers, etc. Large differences were reported in terms of how important the four groups rated the importance of preferred site values. Wilderness values were highest rated among all activity use groups, and facility values lowest. The Fishing group placed significantly greater importance on wilderness values than the other three groups. The Boating (non-motorised) group placed greater importance on social-skill values than the other groups.

6.7 Sustainable Water Programme of Action (MfE)

The Ministry for the Environment (MfE) completed several national reviews of the sustainable management of waterbodies to advise government policy early this century. Various studies were commissioned by MfE to identify and quantify various freshwater values, and a process of consultation completed. Three studies commissioned by MfE are relevant to this exercise.

6.7.1 Waterbodies of national importance for recreation

Neither the Manuharekia River nor Dunstan Creek were identified as 'potentially nationally significant for recreation values' by the Ministry for the Environment (MfE) within the report, *Potential Water Bodies of National Importance for Recreation Value* (2004a).

The MfE study is based on a weak methodology and its findings are open to challenge – noting that MfE's report is designed to be a catalyst for discussion rather than provide a conclusive analysis.

Five criteria were used to identify potentially national significant waterbodies:

- *That the National Angler Survey results for the 2001/02 and/or 1994/96 seasons showed at least 10,000 angler days for the waterbody.*
- *Of a national telephone survey (Fink-Jensen et al 2004a) of just over 1000 'freshwater recreational users' at least ten²² respondents had to report use of a waterbody.* Lake Taupo topped the list with 250 references, the Waikato River 36, and the Whanganui River 16.
- *Selected recreation groups were requested to respond to an internet-based survey to identify significant waterbodies (Fink-Jensen et al 2004b). The threshold was a mention of a waterbody by more than ten people. Canoeists and kayakers were reported by MfE to be well-represented in this survey. Two respondents mentioned the Manuhereki River, and none mentioned Dunstan Creek.*
- *The presence of a water conservation order.*
- *Reporting of significance for whitebaiting by a number of key informants.*

6.7.2 *Waters of national importance for tourism*

The Ministry of Tourism used the results of their International Visitor Survey (IVS) (2002 data) and Domestic Travel Survey (DTS) (2001 data) to describe how tourists use freshwater resources in New Zealand, and to locate their activities (Ministry of Tourism, 2004).

For international tourists, the Ministry identified the top eight locations of importance for freshwater-based activities undertaken by international visitors, including those locations where more than 20,000 visitors participated in the activity in 2002. The regions in decreasing order of importance were:

- | | | |
|---------------|-----------------|-------------------|
| 1. Queenstown | 4. Taupo | 7. Hanmer Springs |
| 2. Waitomo | 5. Te Anau | 8. Auckland |
| 3. Rotorua | 6. Christchurch | |

The data from the DTS showed parallels between international and domestic visitors and their preferred freshwater locations. The Ministry selected the top four locations from the DTS data, as these were the only statistically significant locations. The top locations for freshwater activity by domestic tourists did not include Otago and were:

- | | | | |
|----------|---------------------|-------------|------------|
| 1. Taupo | 2. Hamilton/Waikato | 3. Auckland | 4. Rotorua |
|----------|---------------------|-------------|------------|

6.7.3 *Waters Programme of Action: Potential water bodies of national importance. Technical Working Paper*

This report summarises the findings of a variety of studies into the significance of the nation's waterways, including the two studies listed above (although the technical report apparently pre-dates those).

The technical report notes the following 'assumptions and limitations' in the method applied to identifying waterbodies of potential national significance for recreation:

- *Some of the initial list (survey, angling and whitebaiting information) is based on numbers of people using water bodies for recreational activities. This approach assumes there is a correlation between the number of people who visit a water*

²² The MfE report states 'over 10 people' as a measure in its text (p9), but uses ten (more than nine people) as the threshold in its summary table which presents the relevant rivers.

body and its value for recreation. Under this approach the very special and remote places that are not highly visited may be under represented.

- *Some of the initial list is based on dated reports or unclear information.*
- *Comparison across the different sources of information may not be a valid approach.*

The technical report listed, as of potential national significance for recreation and for tourism in Otago: Lake Wānaka; Clutha River /Mata-au; Lake Wakatipu; Shotover River; Kawarau River; Lake Hāwea (for only scenic value); Lake Dunstan (for only scenic value); and Lake Hayes. There are therefore some inconsistencies with the antecedent reports.

The technical report notes the following ‘assumptions and limitations’ in the method applied to identifying waterbodies of potential national significance for tourism:

- *Assumptions were made about the actual water bodies visited based on the location and the type of activity undertaken, and from discussions with regional tourism organisation representatives, local councils and tourism operators.*
- *The list does not include water bodies that may be nationally important for tourism outside of the nine regions identified by the International Visitor Survey and Domestic Travel Survey, with the exception of those identified for their scenic values.*
- *Information is based on 2002 data for the International Visitor Survey and 2001 data for the Domestic Travel Survey.*
- *The list does not include water bodies that may be of national importance for tourism in the future.*
- *The economic value of tourism for individual water bodies has not been determined.*

6.8 National Angler Surveys

Fish & Game NZ carry out national surveys of angler activity every 6 or 7 years. The national-level research from 1979 to 2015 is summarised in Section 5.1.1 of this report. For completeness, detail from the earliest studies – which were carried out at regional levels – is summarised here.

Richardson *et al* (1984) surveyed angling effort, angler origin and values in Otago and for the Manuhereikia stated:

The Manuhereikia is one of the larger Clutha tributaries, and it drains an extensive area of Central Otago and joins the main river at Alexandra. Existing developments include Falls Dam in the headwaters (for irrigation storage), an additional diversion for irrigation in the middle reaches, and major abstraction (for irrigation) of the larger tributaries (Dunstan Creek, Ida Burn, and Manor Burn). There is a high probability that Falls Dam will be enlarged and the water used for hydro-electric power generation. Development, including the construction of a liquefaction plant near the mine, of lignite deposits in the catchment also appears to be a medium to high probability (N.R.N. Watson pers. comm.).

Despite the high commitment of water for out-of-stream uses, and the resultant low flows at certain times of the year, the Manuhereikia attracted just over 10% of the respondents. Anglers who lived nearby, and those who were willing to travel far to visit the Manuhereikia, fished throughout the river. Its good access, high degree of solitude, and pleasant scenic qualities outweighed the low catch rate and small trout, and the river had an above average importance rating. Although spinners were used most frequently, artificial flies were also

popular. Picnicking, swimming, and camping were the main activities which anglers combined with their visits to the Manuherikia. The respondents' high regard for this river, with its importance as a spawning area for trout from the mainstem, should justify some degree of protection being given against further water abstraction.

6.9 National inventory of wild and scenic rivers

In 1982 the National Water and Soil Conservation Authority released a draft inventory of wild and scenic rivers and sought submissions. A resulting document was published in 1984 (Grindell 1984), which provides a list of what were considered to be “*nationally important wild and scenic rivers*”. A total of 43 rivers were identified in the South Island. Seven tributaries of the Clutha River/Mata-au were identified, but not the Clutha River/Mata-au itself. The tributaries were the Matukituki, Lochy, Greenstone, Dart, Rees, Shotover and Pomahaka.

The Ministry of Agriculture and Fisheries made a substantial submission to the draft inventory in relation to freshwater angling values (Teirney *et al* 1982). The recommendations made in this document were based on the national angler surveys carried out between 1979 and 1981. The Clutha River/Mata-au was recommended as nationally significant for its recreational fishery values, but the Manuherikia River and Dunstan Creek were not.

6.10 A list of rivers and lakes deserving inclusion in a Schedule of Protected Waters

In 1986 the Protected Waters Assessment Committee released its recommendations for a, “*list of those lakes and rivers which the committee commends as suitable for inclusion in a Schedule of Protected Waters*” (Grindell and Guest 1986). The intention of the study was to advise the then Ministers of Works and Development and Conservation of, “*those waters deserving inclusion in a schedule of Protected Waters that can be attached to the Water and Soil Conservation Bill.*”

The Committee’s analysis built on the *National Inventory of Wild and Scenic Rivers* (Grindell 1984), but expanded the scope of assessment from that study’s limit of wild, scenic, recreational and scientific values to include, in addition: fisheries, wildlife habitat, flora, tourism and cultural values.

The Committee developed a three tier classification (groups one, two and three) to define an order of importance for the waters identified as outstanding. In terms of including the waters in a schedule of protection (p12), “*anything less than the first group would provide an inadequate representation. If the Schedule should be bigger, then the second group should be used for making a selection. If the two together are insufficient then the third group should be used for making a selection.*”

Only three tributaries of the Clutha River/Mata-au were identified as significant, including the Greenstone, Kawarau, Lake Wakatipu.

6.11 New Zealand Recreational River Survey

Although almost 30 years old, the New Zealand Recreational River Survey (Egarr & Egarr 1981) is often quoted in recreation assessments as it is the only national analysis of recreational river values available based on actual site visits, with a focus on motorised and non-motorised boating activities including kayaking, swimming, rafting, drift-boating and pack-floating (using a tramping pack for buoyancy). As a result of the increased use of plastic kayaks, the growth of commercial rafting and the development of creek boating (kayaking narrow waterways), many of the assessments made in the study are out-of-date. However, they can assist when identifying the significance of a waterway at a national scale.

The survey grouped river sections according to four categories:

Category A: All rivers with:

Exceptional recreational value and exceptional scenic value.

Category B: All rivers with:
 Exceptional recreational value and impressive scenic value,
 High recreational value and exceptional scenic value.

Category C: All rivers with:
 Exceptional recreational value and picturesque scenic value,
 High recreational value and impressive scenic value,
 High recreational value and picturesque scenic value,
 Exceptional recreational value and moderate scenic value.

Category D: All rivers with:
 High recreational value and moderate scenic value,
 Intermediate recreational value and exceptional scenic value,
 Intermediate recreational value and impressive scenic value,
 Intermediate recreational value and picturesque scenic value.

The Manuherekia River was assessed in three sections:

- Above the Falls Dam: no suitable flow for boating or kayaking. Low recreation value and uninspiring scenic value.
- The Three Gorges – Falls Dam Gorge, Lauder Gorge, Ophir Gorge: Low recreation value and picturesque scenic value, noting that the assessmen predated plastic kayaks. “The Manuherekia River is small year round as the Falls Dam tends to even out the flow, reducing the peak flow and giving a good flow of water even in late summer. About the only craft able to successfully negotiate the river are canoes or kayaks. It would be possible to run the three gorges on a lilo but the rock is particularly sharp edged and would probably damage inflatable craft and airbeds. The rock would also easily catch on clothing. One canoeist has been drowned in the Ophir Gorge after being wedged between rocks in a short section of fast current.”
- Lower Manuherekia River: Uninspiring scenic value and insignificant recreation value. “Below the Ophir Gorge where more water is drawn off for irrigation, the river is particularly shallow and flows quietly over shingle, flanked by willows. The land on either side of the river is used for grazing or orchards and is irrigated. The river is seldom of sufficient size for any form of boating except in flood when it may be canoed.

Dunstan Creek was described as having uninspiring scenic value and insignificant recreation value, with the text:

Above St Bathans, Dunstan Creek is confined to a single channel in a deep valley - it is normally too small for boating or canoeing and a good deal of its water is drawn off into water races for irrigation . Below St Bathans the river becomes very braided as it flows out onto the wide valley floor of the Manuherekia. The river is shallow and meanders across the valley between willows, broom and gorse. The river is never likely to attain sufficient size for recreational use. The small Blue Lake at St Bathans is used for boating in summer, and some swimming but its main use is in winter when ice skating and curling take place.

7 Conclusion

This assessment of recreation values on the Manuherehia and Dunstan Creek is based on three forms of research – literature review, intercept survey and user interviews – and so presents a comprehensive description of the main recreational uses and users of the two waterways, as well as flow preferences and experiences of change in resource quality.

The Manuherehia River has regionally significant angling, swimming, kayaking and jet boating values, and in reaches near settlements – such as Alexandra, Omakau and Becks – is popular for walking and picnicking. The River presents a scenic setting and is of a moderate scale, and so is accessible to a wide range of skill levels for all activities.

Swimmers prefer relatively low and safe flows – between 2 and 4m³/s – and have noted declining water quality and more periphyton in the River, particularly over the past five years. Sediment in the lower river is described as reducing beach amenity.

Kayakers prefer flows above 15m³/s and rely on freshes to enjoy, particularly, Ophir Gorge, although kayak training in the River below the Gorge occurs at lower flows. Water quality deterioration has also been experienced by kayakers, but since specific flows are sought, there is no reported loss of opportunity.

Anglers described a range of preferred flows, with the lowest reference for an ‘okay’ flow at 1.5m³/s, but others preferring minimums between 3 and 8m³/s. However, for anglers, flow is only one component affecting the fishing experience. Maintaining habitat for trout over the season is a significant issue, and water temperature is important over summer. Anglers also report reductions in water quality, more periphyton and more low flows affecting water temperature and trout holding water.

Jet boating events have been held on the River for many years annually between Omakau and Becks by the Otago Branch of Jet Boating NZ. In 2019 a seasonal uplift was secured to enable any boater to use the River between the Clutha/Mata-au confluence and Falls Dam in August and September and when flows are between 10 and 45m³/s.

Representatives of all user groups describe an increase in the growth of willows and other weeds adjacent to the River.

Dunstan Creek is primarily an angling resource, with some casual local use for swimming and walking in the lower reaches, particularly near Cambrians – although weed growth is impeding access in this reach. The Creek upstream of St Bathans is enjoyed for its scenic values and offers a regionally significant angling experience, and one of value to commercial angling guides – although guides operate throughout the Creek as well as on the Manuherehia River. The upper Creek is accessible either by walking the riverbed (rarely), via private road by permission only, or by helicopter. Many anglers reported visiting the upper catchment as a ‘treat’ rather than a regular event. Preferred flows in Dunstan Creek for angling ranged from 2m³/s to 4 or 5m³/s. Anglers and other users report declining water quality in the Creek downstream of St Bathans.

Perceptions of declining water quality in the Manuherehia River and lower Dunstan Creek match measured trend analysis for *E.coli* levels.

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