January 2023

Genesis Energy
Tekapo Hydro Scheme Reconsenting
Recreation Review

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Prepared for Genesis Energy Ltd

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Final

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1 Executive summary

Genesis Energy Ltd's (Genesis) resource consents for the operation of the Tekapo Power Scheme (TekPS or "the Scheme") expire in 2025, and require renewal. The operation of the TekPS affects the level of Lake Tekapo and the flows in the Tekapo River, and it relies on the Tekapo Canal to convey water between the Tekapo A and B hydroelectric power stations. To assist in the consent renewal process, this review identifies the recreation and tourism values of these three settings, identifies trends in recreation and tourism patterns since 1990, and the degree to which the operation of the Scheme has influenced these, and likely future trends in participation up to 2060 (the period being sought for the renewed consents). The review is based on analysis of available literature and interviews with recreational users of the setting and tourism operators.

Lake Tekapo is nationally significant for a wide range of on-water recreation activities, including boating and angling. It has international significance via its scenic values and the contribution these make to the tourism industry. The Tekapo River is regionally significant for kayaking, jet boating and angling. The Tekapo White Water Course on the Tekapo River is nationally significant for kayaking. The Tekapo Canal is nationally significant for angling, with some international use, and is nationally significant for cycling due to the location of the Alps 2 Ocean Trail on its southern bank, and for walking via the Te Araroa Trail.

Limited quantitative trend data are available to describe long-term trends in recreation participation in the study area. The key resource is the national angler surveys carried out periodically by the NZ Fish & Game Council. These indicate a decline in angling activity on the Tekapo River coincident with the arrival of didymo in 2007, a significant increase in activity on the Tekapo Canal and an increase on Lake Tekapo. Interviewees report increasing or steady recreation participation in all settings, apart from angling on the Tekapo River. Commercial accommodation monitoring in the Mackenzie District indicates steady growth in tourism, and reasonable resilience during Covid-19.

The operation of the Tekapo Power Scheme controls kayaking and jet boating opportunities on the Tekapo River via the release of recreation flows. There have been no significant changes to agreements over the frequency of these flows apart from those agreed with the Tekapo White Water Trust via its ability to remit flows for funds to further develop the white water course, and to have greater flexibility over the release dates. However, recent works on the intake gate for the Tekapo A Power Station have been associated with a temporary reduction in flow availability, and, anecdotally, increased siltation in Lake George Scott as a result of accelerated erosion in the River upstream.

Interviewees reported an increase in the frequency and duration of low lake levels in Lake Tekapo over the past three to five years, although similar statements were made in similar research in 2004. Low lake levels are considered adverse for recreation and tourism due to a reduction in scenic values, a loss of water space for recreation (and so more recreation conflict), dust effects during nor-westers, the exposure of navigation hazards and increased difficulty in launching boats. Lake level records show that Genesis has operated Lake Tekapo on average 0.295m lower from 2011-2020 than did Meridian Energy from 2000-2010 (although the average lake levels from November to June are very similar), and Meridian operated the Lake at lower average levels than the Electricity Corporation of New Zealand (ECNZ) did prior to 2000.

Mackenzie District Council growth projections to 2050 estimate that the District's resident population will rise from 4,950 in 2020 to 9,050, and peak day visitors[1] will rise from 17,378 in 2020 to 61,253, and average day visitors[2] from 3,113 in 2020 to 10,974. These projections take into account recovery from Covid-19.

[1] The number of visitors that are within an area at any time in the day, on the busiest day within in a 12-month period.
[2] The mean number of visitors that are within an area at any time in the day, within in a 12-month period.

This suggests a potential doubling in outdoor recreation participation by residents and a tripling in participation by visitors over a 30 year period. This will result in significantly increased pressure on recreation facilities, the potential for increased recreation conflict, and the need for additional recreation infrastructure, management and regulation.

Overall, the scheme has provided significant recreational opportunities for angling, and the operation of Lake Tekapo for hydro generation maintains its traditional recreational and scenic values. Walking and cycling opportunities have developed around generation infrastructure and now provide significant activity opportunities for visitors and residents.

2 Introduction

Genesis Energy Ltd (Genesis) operates two power stations in the Waitaki Catchment, managing the flow of water from Lake Tekapo via the Tekapo Canal into Lake Pūkaki. Lake Pūkaki levels and the remainder of the Waitaki Power Scheme is operated by Meridian Energy Ltd (Meridian).

The Tekapo A power station was commissioned in 1951 and generates 30MW from water diverted via a 1.4km tunnel from the Lake Tekapo Control Structure. The Control Structure controls the water level in Lake Tekapo. The Tekapo B station within Lake Pūkaki, commissioned in 1977, generates 160MW from water transported from the Tekapo power station via the 25.5km Tekapo Canal.

Genesis is applying for new water and discharge permits from the TekPS to replace those that are due to expire on 30 April 2025. The new permits sought are for the same activities, being the management of water for electricity generation and ancillary activities.

This assessment provides:

- A description of the recreation values for the existing environment and their significance;
- A review of how these values have changed in the past due to the operation of the Tekapo power scheme ('observed' from 1990);
- A review of recreation effects (positive and adverse) of the ongoing operation of the Tekapo power scheme ('predicted' up to 2060).

The objective of the assessment is to indicate how (and if) the recreation values of the TekPS have been changing over time, if they are likely to continue changing in the future, and how the Tekapo power scheme influences these values.

2.1 Study area

Figure 1 shows the waterbodies reviewed in this assessment. This includes Lake Tekapo, the Tekapo River and the Tekapo Canal.

Figure 1: Study area

2.2 Method

This assessment is based on two main approaches: literature review and interviews with recreational users of the waterbodies within the Tekapo power scheme (Lake Tekapo, Tekapo River and Tekapo Canal).

2.2.1 Literature review

There have been various resource planning exercises for water allocation in the Waitaki since 1990, and earlier. Early available reports include the Waitaki Catchment Commission and Regional Water Board's *Lower Waitaki Preliminary Resource Study* (1978) and their *Waitaki Water and Soil Resource Management Plan* (1982), but these provide little in the way of benchmarks for the quality of recreation experiences in the catchment. The Ministry of Agriculture and Fisheries, and later MAF Fisheries, carried our several surveys of angling in Waitaki Valley rivers in the 1970s and 1980s, which predate the study period (Teirney et al 1982, Pierce & Smith 1989, Pierce 1989), and focus on the lower Waitaki River.

The earliest general recreation survey of activity in the lower Waitaki River was carried out for the Electricity Corporation of New Zealand (ECNZ) in 1997 (Montgomery Watson 1997). Later surveys focused on only the Waitaki Valley (for example Greenaway 2002a and 2002b and Kearsley 2005), while Leisure Matters (2004) considered the entire catchment and included qualitative analysis via user interviews. Most recently, Environment Canterbury commissioned an online survey of recreational activity in the Waitaki catchment which identified the recreation activities undertaken by respondents, and their satisfaction with water clarity, safety, ecological health, access, visual amenity, and the number of people encountered (but no review of change over time in these values) (Harris & Taylor 2014).

All these surveys used different sampling methods and formats, and so trend analysis of recreation satisfaction or resource quality is difficult.

Otherwise, the only longitudinal research for the entire catchment for recreation – specifically angling – is represented by the five national angler surveys carried out – with a generally consistent method – between 1994 and 2016 for the NZ Fish & Game Council by NIWA, led by Martin Unwin (1998, 2002, 2008, 2013, 2016). Four of these studies provide usage data for each waterbody in the catchment, but only one (2013) provides an assessment of resource quality.

Much of this research has been reviewed and summarised in various reports for resource planning processes, notably: Environment Canterbury's *Inventory of Recreation Values for Rivers and Lakes of Canterbury New Zealand* (2004); Leisure Matters' *Recreation and Tourism Activities Collation, synthesis and presentation of existing studies* (2004) for the Waitaki Catchment Water Allocation Board; evidence (with additional new research) prepared for Meridian Energy for the Waitaki Catchment Water Allocation Board hearings (Greenway 2005); and most recently for Environment Canterbury's 'Upper Waitaki Limit Setting Process' in the report *Social-economic Profile of the Waitaki Catchment* (Taylor et al 2015). These reports generally repeat the same information and use the same references.

The literature review presented here refers to the findings of these various studies – without comprehensive referencing – where they identify recreation opportunities and activities within a waterbody without providing any trend analysis. Where trend data are available or might be surmised, references to the source text is given. The literature review aims at brevity, considering the next step of the method (interviews) provides contemporary qualitative data about changes in recreation resource quality over time.

2.2.2 Interviews

This stage of the assessment relied on in-depth telephone interviews in mid-2021 with more than 40 commercial or recreational users of the Waitaki catchment, and management agencies. Interviewees were selected by identifying all the major recreation and tourism service providers in the catchment and a snow-ball technique.[3] More than seventy relevant individuals or agencies were originally identified via online searches and recommendations. Twenty felt they had insufficient experience to comment (mostly accommodation providers), one had recently ceased operation (Ruataniwha Rides) and the remainder who were not interviewed were unable to be contacted. The interview process continued until it was felt that a consistent message emerged for the qualities of each waterbody – however, the natural limits of qualitative research will apply, in that not all opinions of all users of the study area are able to be canvassed.

Interviews were carried out in cooperation with a wider research project for both Meridian and Genesis, and while some respondents were based outside the wider Tekapo area, all were canvassed for their opinions about the Tekapo study area where relevant.

Interviews were conducted using a standard question template. Full interview summaries are available separately, and Section 0 of this report describes the findings by waterbody. Interviewees included:

- A20Cycle Tours
- Air Safaris Lake Tekapo
- Alps to Ocean Cycle Trail
- Ben Booth, angling guide
- Benmore Views Family Camp
- Braemar Station
- Cairn Station, Ōhau C campsite
- Canterbury Anglers Club
- DOC Twizel Office
- Fish & Game Central South Island
- Glenavy Fishing Camp
- Glendeer Guides
- Haldon Arm Motorcamp
- High Country Salmon visitor centre
- Jet Boating NZ Waitaki Branch
- Kurow Campground
- Lake Benmore Holiday Park
- Lake Ōhau Lodge
- Lake Pūkaki Visitor Centre
- Lake Tekapo Motel and Holiday Park & The Lakefront Lodge
- Lake Tekapo Power Boat & Water Ski Club
- Mackenzie Alpine Horse Trekking
- Malcolm Bell, The Complete Angler
- McKenzie Coastguard
- McKenzie District Council
- Mike Thomas, angling guide
- NZ Motor Caravan Assoc
- Paddle Tekapo
- South Island Rowing Incorporated
- Tekapo Adventures
- Tekapo Starlight Tours
- Tekapo Whitewater Trust
- Trail Adventures
- Waimate District Council
- Waitaki District Council
- Waitaki Recreational and Boating Club
- Waitaki Riparian Enhancement Society Salmon Hatchery
- White Water NZ
- Will Spry, Spry Fly NZ

[3] Snowball sampling (also known as chain-referral sampling) is a non-random sampling method used when it may otherwise be difficult to find respondents who meet a sampling criteria – in this case, people who have long-term experience of recreation in the Waitaki catchment. The term chain-referral is self-explanatory, whereby one respondent is asked for recommendations about who else it would be worthwhile interviewing.

3 Agency data

This section considers recreation data provided by national, regional and local government, and the Central South Island Fish & Game Council. Section 7 includes further data prepared for Genesis describing the status of the waterbodies in the study area.

3.1 Central South Island Fish & Game Council

The Central South Island Fish & Game access brochure for 'The Hydro Canals' (no date) describes the fishing opportunity on the canals:

> *These canals and the power stations on them are now owned and operated by Meridian Energy and Genesis Energy. They play a significant role in generating renewable energy for New Zealand. Access to the canals for fishing has been made possible by them and all users should ensure they respect the rules and fishing etiquette.*
>
> *Set in a spectacular high-country landscape with easy access and productive fishing, the canals are one of the most popular freshwater sports fisheries in New Zealand. Brown trout, rainbow trout and chinook salmon fishing is on offer year-round and because the canal flows are controlled and cannot flood, it is possible to fish 365 days a year. Canal flows are changeable and are based on the generation demands of their associated power stations.*
>
> *The canals provide anglers with the chance to catch a fish of a lifetime. Trout more than 4.5kg are commonly caught, trout between 10-13kg get caught occasionally and in recent years a few have tipped the scales at over 15kg! Salmon are usually 1-4kg, but they do get much bigger.*
>
> *Prior to the establishment of the salmon farms within the canals, angling effort at the canals was minimal and the resident trout were abundant and usually in poor condition. The salmon farms provide a unique fishery dynamic whereby the trout and salmon benefit greatly from the additional food sources they provide. For this reason, the size and condition of the canal fish is unmatched by any other freshwater sports fishery in New Zealand.*
>
> *Although some fish spawn in the canals the contribution they make to the population is considered insignificant. Most trout present in the canals migrate into the canals from the headwater lakes through the control gates and power stations. Spawning also occurs in the Upper Ōhau River, which provides fish stocks to the Ōhau B and C canals via Lake Ruataniwha. The presence of salmon in the canals is solely attributed to the salmon farms.*

For Lake Tekapo, the online information includes:[4]

> *This large picturesque lake offers shoreline and boat fishing for brown and rainbow trout. In recent times a "put n take" salmon fishery has been established through annual releases of thousands of salmon smolt gifted by salmon farms.*

And for the Tekapo River, there is no reference to the quality of the fishery and only access information is provided, as well as:[5]

> *The Tekapo River is harnessed for hydro power generation and has mean residual flow of 12 cumecs. Augmented by Fork Stream, Grays River, and the Mary Burn.*

The *Performance Report of the Central South Island Fish & Game Council for the year ended 31 August 2020* notes several projects within the study area, including a review of Tekapo Canal rainbow trout recruitment, with the objective of assessing "Tekapo Canal rainbow trout recruitment, spawning

[4] https://fishandgame.org.nz/centralsouthisland/freshwater-fishing-in-new-zealand/fishing-locations-and-access/waitaki-basin-lakes/
[5] https://fishandgame.org.nz/centralsouthisland/freshwater-fishing-in-new-zealand/fishing-locations-and-access/popular-river-fisheries/

and angler harvest dynamics by using otolith microchemistry to identify the proportion of angler harvested fish that have a natal origin from upstream of the canal." The results were reported:

> *This project was downsized upon receiving advice from Cawthron Institute and NIWA that there was a low likelihood of differentiating the natal origin of rainbow trout in the Tekapo Canal. Otoliths collected at various locations in the Tekapo Catchment will be assessed by a Masters student to determine variation in the age, size and growth of Tekapo Catchment rainbows.*
>
> *To address angler concerns that wintertime fishing on the upper Tekapo Canal was becoming unsustainable, an angler use and catch survey was undertaken on the upper part of the Tekapo Canal from 11 June to October 2019 to provide an evidence-based snap-shot of wintertime fishing on the Tekapo Canal. An estimated 4,149 angler days occurred during the period resulting in the catch of 3,416 rainbow trout and 1,116 brown trout. Harvest (number of fish kept) was estimated at 3% for rainbow trout and 15% for brown trout.*
>
> *A precautionary approach to managing wintertime fishing was recommended and a closure of the upper Tekapo Canal during peak use from 1 June to 31 August 2021 was adopted by Council. Additionally, an increase in best practice catch and release advocacy and initiating a process to identify long-term management options that address the sustainability of the canals was recommended.*

The Performance Report refers to the participation by the Council in the reconsenting process for the components of the Waitaki Power Scheme, including:

> *Ongoing liaison with Genesis to enable scientific research and monitoring to be undertaken on the Tekapo Power Scheme Spillway (the Upper Tekapo Riverbed) to assess fish stranding and losses and the contribution that trout originating from Lake Tekapo, using the spillway migration path, could make to angler catch in the Tekapo Canal. Fish salvage and stranding observations were undertaken after an extended spilling process and many of the recovered adult trout were tagged and released in the Tekapo Canal.*

3.2 Department of Conservation

The study area is within the 'High-Country Basins Place' as defined by the Department of Conservation *Canterbury (Waitaha) Conservation Management Strategy 2016* (CMS). The study area is within a subset of this Place, the Mackenzie Basin, with the setting description:

> *Islands in the basin's lakes provide degrees of refuge for indigenous plants and animals. They include Motuariki and Little Motuariki Islands in Lake Tekapo (Takapō), and 12 islands within Lake Benmore (Te Ao Mārama). All are considered Multiple Use islands. Only the Motuariki Islands are administered by the Department, and Ngāi Tahu has a strong cultural interest in all the islands.*
>
> *A 2011 decision of the Environment Court ruled that the basin has outstanding natural features that are of national importance. For many visitors the basin is breath-taking and easily viewed from State Highways 8 and 80, and regularly features in publications and promotions. The landscape is naturally a brown, tussock- and grassland one, interspersed with shrublands, lakes and braided shingle riverbeds, with seasonal variations from flowering vegetation, snow cover and frosts. Within this natural setting there is now a mix of dry- and irrigated-land farming….*
>
> *Prominent within the basin are the canals, rivers, lakes and infrastructure of the Waitaki Power Scheme. The scheme is regionally and nationally significant for electricity generation, although resulting in a modified environment and some adverse effects for conservation values. Resource consent processes have brought mitigations where practicable, such as*

Project River Recovery, Ōhau River flows, and periodic Tekapo River flows for white-water kayaking.

For recreation, the basin provides access to Aoraki/Mount Cook National Park and the five conservation parks, and serves the accommodation bases at Lake Tekapo (Takapō), Twizel and smaller locations. Numerous day-visitor opportunities exist for walking, cycling, boating and four-wheel driving, including to historic sites. Fishing is popular, in a wide variety of waters. The Alps 2 Ocean Cycle Trail passes through the basin. Increased public access to lake-edges is occurring as tenure reviews eventuate. Mackenzie District Council administered reserves, and public conservation lands, provide for bach accommodation at Lake Alexandrina, serviced camping areas, and numerous freedom camping opportunities.

Transpower transmission lines pass across parts of the public conservation lands and waters within the basin.

Outcomes in the CMS for the Mackenzie Basin include:

Project River Recovery, with support from hydropower companies, continues to increase knowledge of braided river ecosystems, and their species and management. This knowledge is being applied through braided river management, including for water extraction and impoundment, throughout Canterbury and elsewhere….

The Twizel and Lake Tekapo (Takapō) areas are the focus for day-visitors, with opportunities to enjoy nearby public conservation lands and waters and multiple land tenure facilities like the Alps 2 Ocean Cycle Trail. These opportunities heighten appreciation of the landscape and conservation values of the basin and encourage community action to support protection of those values.

Policy 2.6.4 of the CMS states:

Engage with Meridian Energy and Genesis Energy, or their successors, prior to the 2025 date for upper Waitaki catchment hydroelectric power resource consents 'renewal', to ensure the continuation of a compensation agreement (currently called Project River Recovery) in response to the ongoing adverse effects of the power scheme and to maintain mitigation achievements since 1991.

3.3 Environment Canterbury

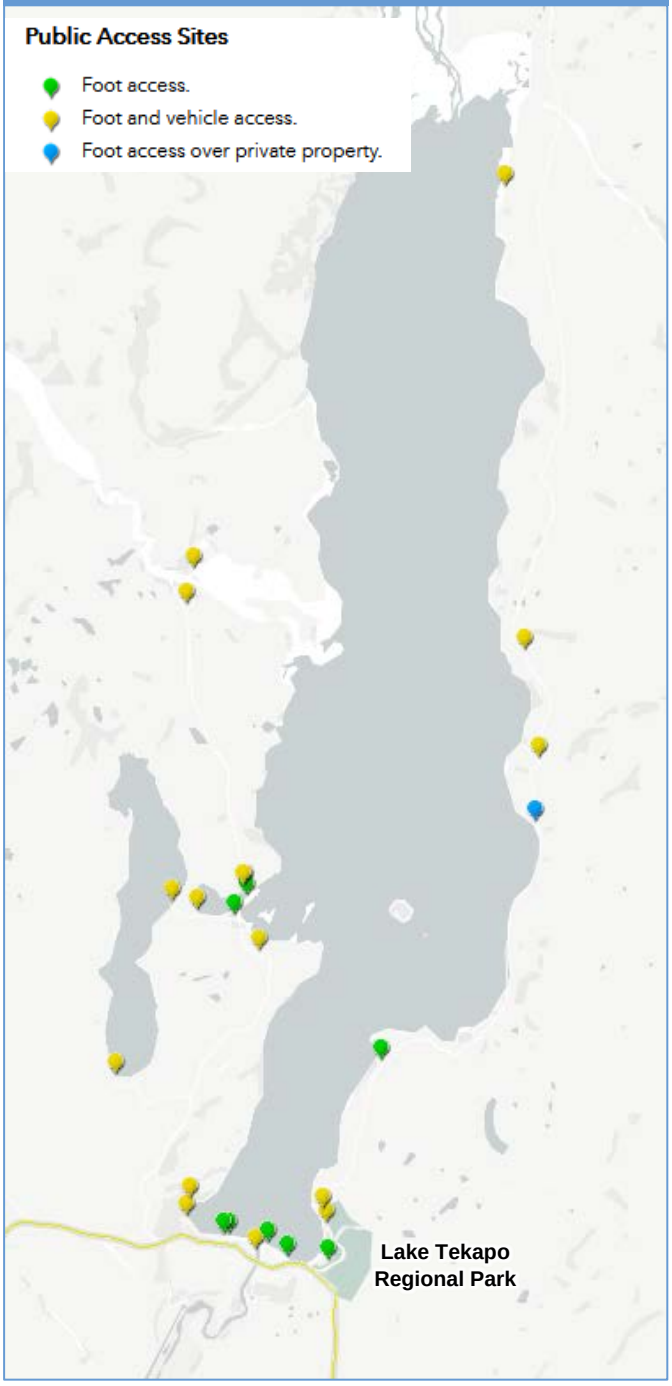
Environment Canterbury (ECan) provides an inventory of public access options to Lake Tekapo via its 'Publicly Accessible Water Recreational Sites' data layer in the Canterbury Maps online service (Figure 2). Water's edge access is only available along the southern shore. No data are provided for access to the Tekapo River or Canal.

ECan also manages the Lake Tekapo Regional Park in the south eastern corner of the Lake (Figure 2) according to the Lake Tekapo Regional Park Management Plan (ECan 2009).

The Management Plan references recreation on the Lake shore:

The area along the lake edge is used extensively for picnicking and water activities. During the winter the park is used for cross country skiing.

Figure 2: ECan Publicly Accessible Water Recreational Sites



3.4 Mackenzie District Council

The Mackenzie District Council is currently preparing a planning process called *Te Manahuna Ki Uta - Destination Mackenzie*. The project in planned to develop a Destination Management Plan for the Te Manahuna/Mackenzie District as part of a wider tourism journey that includes Aoraki Mt Cook National Park, the upper Waitaki Valley and the Lindis Pass.[6] This is due in 2021. Otherwise, the Council has no relevant published data on recreation within the study area.

[6] See: http://www.mackenzie.govt.nz/Site/Community/Public_Notices/destination_mackenzie.aspx

4 Setting descriptions from literature

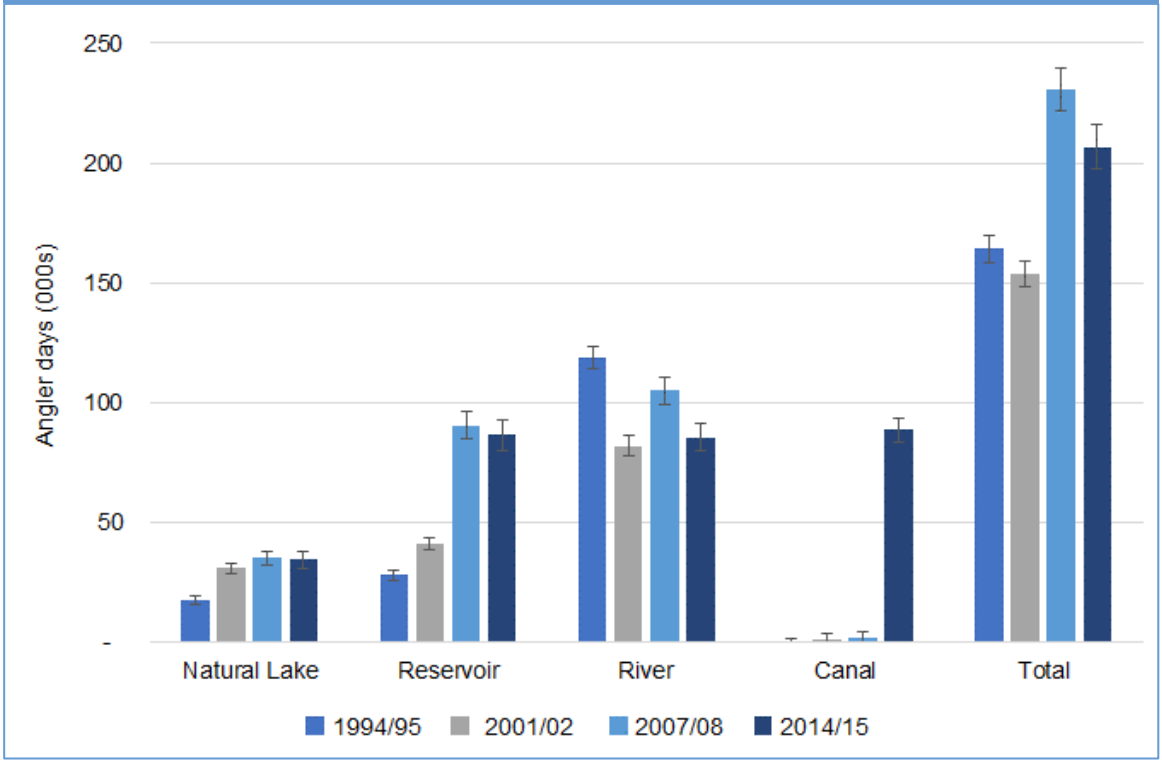
This literature review provides a description of the recreation values for the existing environment, and a review of how these values have changed in the past due to the ongoing operation of the Tekapo Power Scheme ('observed' from 1990) where suitable literature is available.

4.1 Study area

There is only one series of studies which provide longitudinal data about recreation participation across the entire study area – the national angler surveys (Unwin and Unwin *et al* 1998, 2002, 2008, 2016). Figure 3 shows trends from these studies in angler-days[7] by waterbody type in the Central South Island Fish & Game Region. The Waitaki catchment accounted for 80% of all angler activity in the Region in the 2014/15 season, and in that season 30% of all angler days in the Region occurred on canals (Unwin 2014), a sharp increase on previous surveys. Unwin (2014) noted (p41):

> *The 88,730 angler-days expended on canal fisheries is almost entirely confined to the upper Waitaki hydroelectric canals* [including the Tekapo Canal]*, which accounted for all but 90 angler-days of the canal total. This figure may well be conservative, due to a data capture problem whereby respondents who fished one or more of the canals described this to the interviewer by saying only that they fished "at Twizel" or "around Twizel", leading the interviewer to code their effort against the Twizel River…..*
>
> *A striking feature of the canal fisheries is their appeal to anglers from throughout New Zealand, with over half of the total effort (45,290 ± 3,730 angler-days; 51%) coming from licence holders outside the Central South Island region. The Ōhau canal accounted for 61% of the canal total, compared to 26% for the Tekapo canal and 12% for the Pūkaki canal, consistent with its high-profile location on SH 8 near Twizel where it is ideally placed for anglers travelling along a major South Island tourist route. Collectively, the three canals are*

Figure 3: Central South Island angler days by water type (Unwin 2016). ±1 std error shown



[7] An angler-day is any time spent fishing on a waterbody, whether it be one cast or a full day.

by far the most heavily used fishery under FGNZ jurisdiction, well ahead of the other four waters in the top five: the Waimakariri River (59,160 ± 5,250 angler-days); Lake Benmore (47,460 ± 5,380 angler-days); the Rakaia River (46,210 ± 5,930 angler-days); and Lake Rotoiti in the Eastern region (40,110 ± 4,190 angler-days). Overseas visitors expended 5,090 ± 720 angler-days in the Central South Island region (1.7% of the regional total), including 900 ± 360 angler-days on the canal fisheries…..

Excluding canal fisheries from the Central South Island data for the four surveys conducted to date gives a clearer picture of the underlying long-term trends in usage by New Zealand resident anglers, and suggests that these trends differ for lake and river fisheries. Lake fishing has increased in popularity, up from 45,320 ± 2,850 angler-days in 1994/95 to 125,570 – 121,010 angler-days in 2007/08 and 2014/15, primarily associated with the three large hydroelectric lakes on the Waitaki River (Lakes Benmore, Aviemore, and Waitaki) rather than the Ashburton and Waitaki headwaters. By contrast, effort expended on rivers has been variable, and shows some evidence of a decline over the period of record.

Angler-days for NZ resident anglers on the three waterbodies in the study area were: 6,286 in 1994/95; 21,340 in 2001/02; 16,650 in 2007/08; and 32,980 in 2014/15. The Tekapo Canal accounted for 18,320 extra angler-days in 2014/15 compared with 2007/08. Without this figure the 2014/15 season would have had 16,180 angler-days – similar to 2007/08, a reduction on 2001/02, but far more than in 1994/95.

Unwin (2002) attributed the growth in lake fishing in the 2001/02 season compared with 1994/95 to a poor salmon season:

The largest changes, in the North Canterbury and Central South Island Regions, were associated with the poor salmon season, with mainstem river fishing falling by almost one third (from 204,600 ± 9,800 angler-days in 1994/96 to 140,100 ± 6,200 angler-days in 2001/02). In the North Canterbury Region, where there are no other waters able to sustain fishing on a comparable scale, the poor salmon season was directly reflected in substantially reduced effort for the Region as a whole. In the Central South Island Region, by contrast, anglers appear to have switched their attention to the many lake fisheries available, notably Tekapo, Alexandrina, Ōhau, Benmore, and Aviemore. There was also evidence of a marked increase in effort on the various canals of the upper Waitaki hydroelectric schemes, which rose from 1,900 ± 700 angler-days in 1994/96 to 13,500 ± 2 300 angler-days in 2001/02.

Table 1 summarises the significance of the waterbodies by activity at the regional, national and international level.[8]

Table 1: Recreation significance by waterbody

Waterbody	International	National	Regional
Lake Tekapo	Scenic values	Range of activities, boating, angling	
Tekapo River			Angling, jet boating, kayaking
Tekapo White Water Course		Kayaking	
Tekapo Canal		Angling, cycling, walking	

Appendix 1 presents the findings of two studies which attempt to provide an assessment of the location and scale of recreation values of the Waitaki catchment (Harris & Taylor 2014 and Greenaway 2005). Neither are based on on-site intercept surveys and both only indicate the range of activities available and the relative significance of the more accessible recreation settings. Neither present any trend data.

[8] This summary is based on Greenaway (2005) (evidence presented at the Waitaki Water Allocation Board hearing) and Leisure Matters (2004) and is updated based on the findings of new data gathered for this assessment.

4.2 Lake Tekapo

Lake Tekapo's recreation facilities and services are focused around the Tekapo township, and include (Figure 4 and Figure 5):

A. Boat launch area (McKenzie District Council);

B. Tekapo Springs;

C. Lake Tekapo Power Boat & Water Ski Club; Lake Tekapo Boat Ramp (McKenzie DC);

D. Lake Tekapo Motel and Holiday Park & The Lakefront Lodge;

E. Paddle Tekapo (small boat hire);

F. McKenzie District Council lakeshore reserves;

G. Tekapo White Water Course;

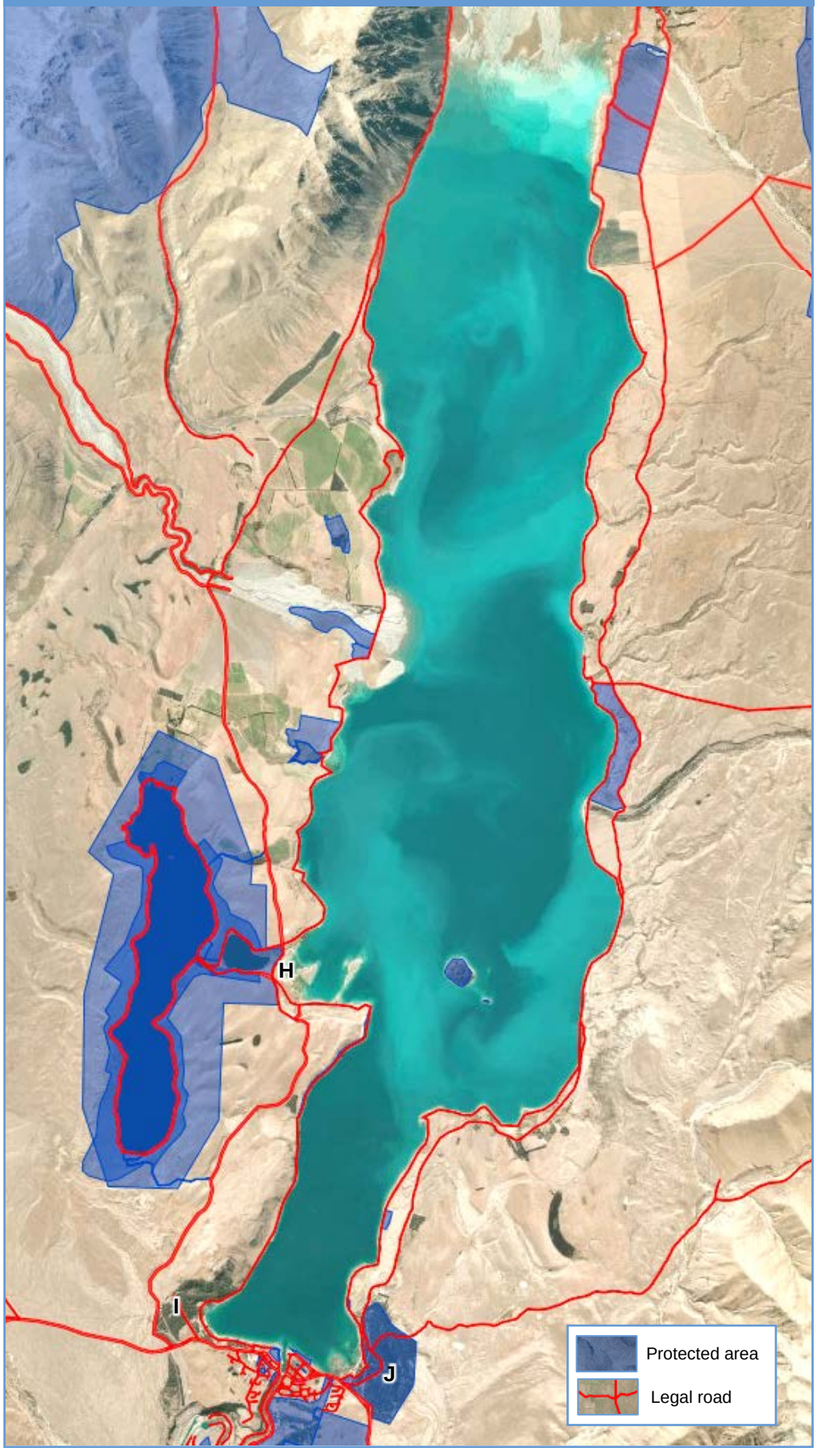
H. Lake McGregor (1,660 angler days in 2015/16); and

I. Mount St John Observatory / Dark Sky Project.

J. Lake Tekapo Regional Park

Figure 4: Tekapo

Figure 5: Lake Tekapo



The Lake is largely bounded by legal road, and is largely LINZ-administered lake bed (hydro parcel) within the road boundary. There is little substantial area of protected public land adjacent to the Lake.

Lake Tekapo has a normal 8.8m operating range from 702.1 metres above sea level (masl) to 710.9 masl. The minimum and maximum operating levels vary throughout the year. The current minimum operating levels of the Lake are:

- 1 April and 30 September – 702.1 masl; and
- 1 October and 31 March – 704.1 masl.

The level of the Lake may be further reduced to 701.8 masl if the Electricity Commission determines that reserve generation capacity is required. This has not occurred during Genesis period of ownership.

The current maximum operating levels for the Lake Tekapo are:

- September to February – 709.7 masl;
- March – 710.0 masl;
- April and August – 710.3 masl; and
- May – 710.6 masl;
- June and July – 710.9 masl.

Recreational activities include:

- Sightseeing from carparks and lakeside areas, including the Church of the Good Shepherd, and aerial flights;
- The Alps 2 Ocean Cycle Trail (A2O Trail) which begins in Tekapo and follows the Tekapo Canal (as an alternative to starting the Trail at Mount Cook);
- Swimming, boating and water skiing based around the Lake Tekapo Power Boat & Water Ski Club, accommodation, small boat hire and the McKenzie District Council boat ramp;
- Angling.

There are no trend data available in literature for these activities, apart from for angling from the national angler surveys, and use of the A2O Trial. The national angler surveys show an increase in angling activity for the Lake from 3,000 (±770) angler-days in 1994/95 to 8,910 (±1,990) domestic angler-days in 2014/15. In 2014/15, 830 (±270) angler days were from overseas visitors, making a total of 9,740 (±2,010) angler days on the Lake in that season (international angler days were not counted in the previous national angler surveys).

A2O trail data indicate increases in patronage on the entire trail of 35% between 2018 and 2019, and a 25% increase in 2020 (Miller, 2020), and anecdotal reports indicate significant growth from domestic tourism during the Covid-19 period.

Leisure Matters in 2004 reported perceptions at the time that low lake levels were a problem over summer for water skiing. For example: “The slalom course cannot be used when the water level is low. Users don’t have confidence in water levels at the moment. The result has been cancelled events. It has been worse in the summer in the last four or five years. It is expected to be lower in the winter but not in the summer.” (Leisure Matters 2004).

Kent (2009) describes the angling resource on the Lake:

> *Although this lake is coloured by glacial flour brought down by the Godley River, brown and rainbow trout survive. Generally, the best spots for shoreline fishing are the mouths of the various clear-water creeks flowing into the lake. These include the Mistake, Cass and the*

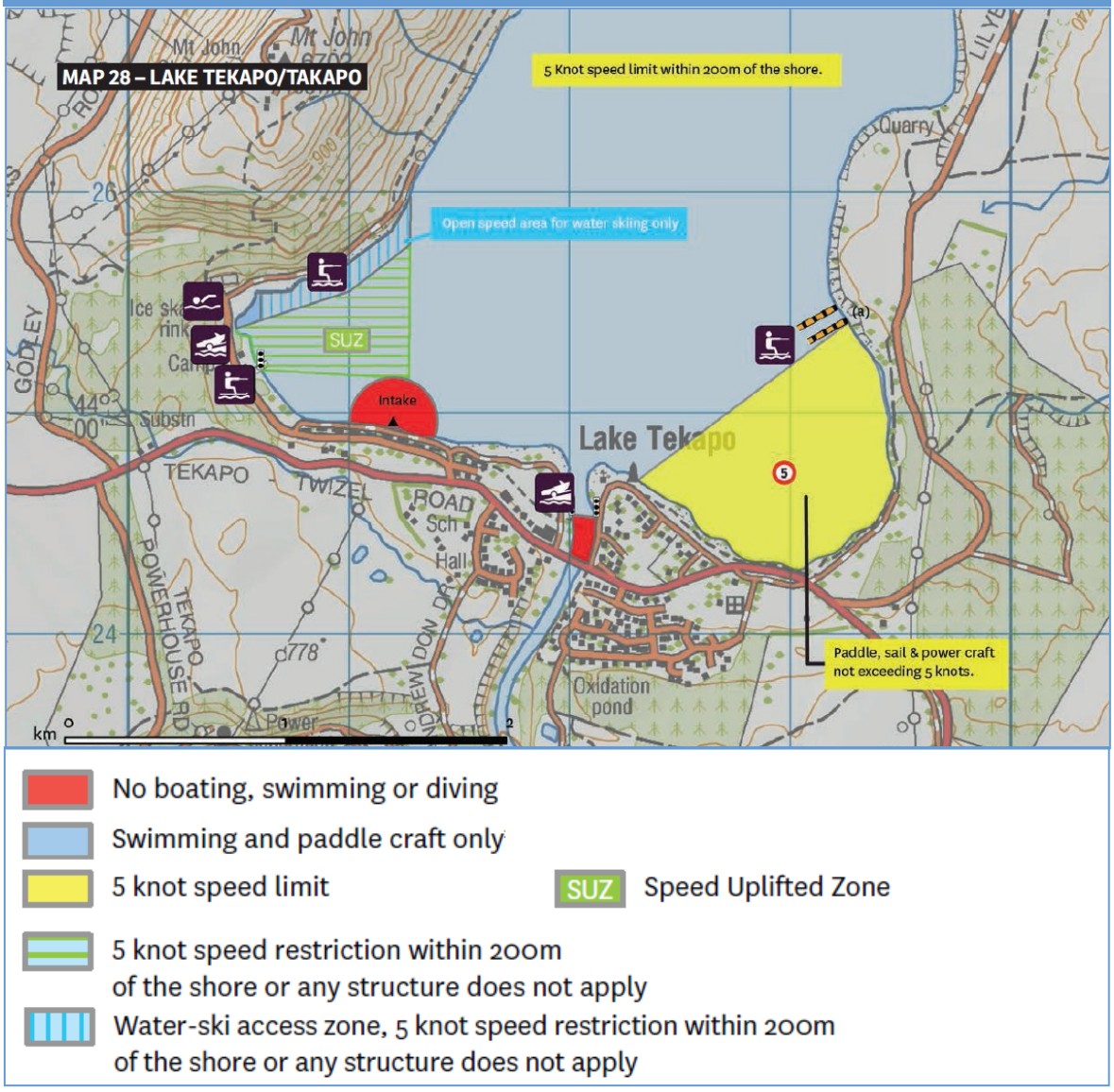
outlet of Lake McGregor and Glenmore Station Tam on the western shore, and the Coal, Boundary and Macauley on the eastern shore. However, most fish are caught by trolling a spinner from a boat.

Fish & Game Council Fishing Regulations (2020/21 season) state that Lake Tekapo is open all year to angling with bag limits of six sports fish in total, no more than four to be trout or four to be salmon.

Bathing water quality at the Tekapo Beach was assessed as 'good' by Environment Canterbury in the 2013/14 season, and has been assessed as 'very good' for all subsequent seasons up to the 2019/20 season (the latest data available) (Arthur 2018 & 2020).

The Environment Canterbury Navigation Safety Bylaws 2016 define boat speed and activity controls for Lake Tekapo (Figure 6). These include speed uplift zones in the south-western corner of the lake for water skiing and other boating activities (where vessels can exceed 5 knots within 200m of the shore), a reserved area for swimming and paddle craft, a slow zone in the south-eastern corner for sail, paddle and motorised craft, exclusion zones around hydro infrastructure, and the application of the requirement to maintain a speed of less than 5 knots within 200m of the shore for the remainder of the Lake.

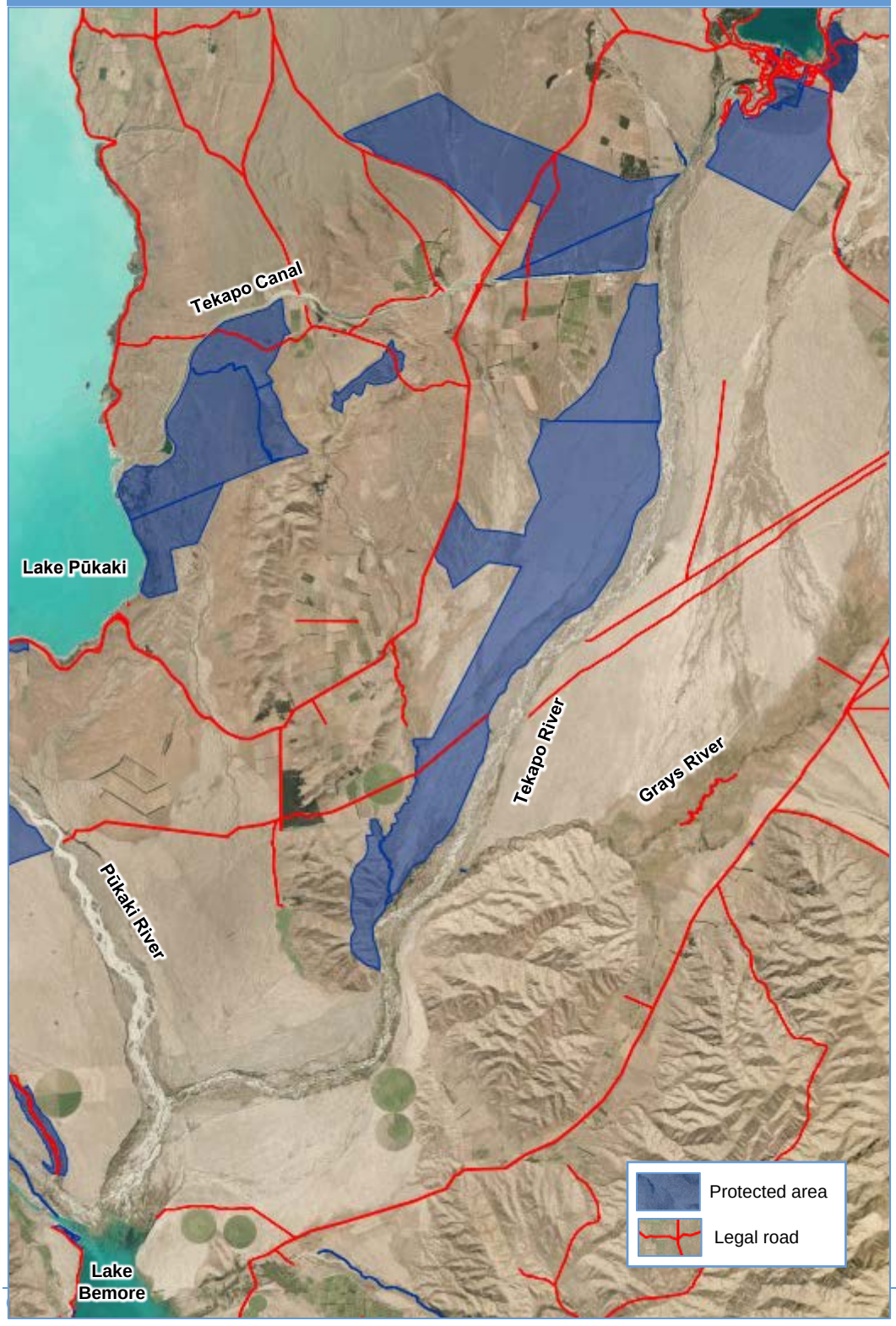
Figure 6: Lake Tekapo Environment Canterbury Navigation Safety rules



4.3 Tekapo River

The Tekapo River has been substantially modified by the canal diversion and has, as a result, become an important trout angling setting below Fork Stream, at least prior to the advent of didymo. High flows with poor visibility previously limited the River's trout angling values. The national angler surveys show varying angling activity for the River with a high in 2001/02 of 4,910 (±700) angler-days in 2001/02 and a low of 1,390 (±370) angler-days in 2014/15. Didymo was discovered in the River in 2007 and this may account for the decline in angling activity (Unwin 2009). In 2014/15, 310 (±250) angler days were from overseas visitors.

Figure 7: Tekapo River



Kent (2009) describes the angling resource on the River:

> *Drains Lake Tekapo and flows south to enter Haldon Aron on Lake Benmore. The upper river has been severely modified for hydroelectric power generation and there is very little worthwhile fishing above where Fork Stream enters….*
>
> *Although this medium-sized river is subject to fluctuating flow rates as a result of power generation, the river holds very high numbers of trout (250 trout/km). The river has a mean residual flow of 12 cumecs but becomes unfishable when the Tekapo Dam is fully open.*
>
> *The riverbed is wide open, shingly, somewhat unstable and exposed to the nor'wester. On a sunny day in spring when the orange Californian poppies are in flower there is no better sight than looking upstream towards snow-covered Aoraki/Mt Cook. The river is heavily willowed in some sections and braided in others. Wading is not difficult and the tails of most pools can be crossed. Trout can be spotted along the edges in optimum conditions, but generally the water should be fished blind or many fish will be missed. There are long, deep glides and ripply shallow runs. After heavy rain the river dirties from silt brought down by Fork Stream, and it may take three days to clear.*
>
> *The larger fish will often lie deep beneath the drop-off at the head of the deeper pools, and only heavily weighted nymphs or a mouse imitation at night will interest them. The majority of fish are browns but some well-conditioned rainbows in the lower reaches can be exciting. Trout will respond to a wide selection of flies and lures, although during a rise they can be selective. This is an ideal river for beginners, with plenty of fish, plenty of safe water and few casting obstructions. However, beware of the nor'wester. At present, this river and its mouth are heavily infested with* Didymo geminata*.*
>
> *There are a number of side channels and ponds in the Tekapo Valley and most contain trout. Pattersons Ponds, below the Tekapo spillway, hold some good-sized browns.*

Fish & Game Council Fishing Regulations (2020/21 season) divide the River into two sections. Upstream "of lower powerlines across river about 1km upstream of Lake Benmore" the season runs from the first Saturday in November until April 30. Downstream of the powerlines, the River is open all year. The bag limit for both sections is four trout and two salmon.

Bathing water quality in the Tekapo River is not assessed by Environment Canterbury (Arthur 2018 & 2020).

Between 8 and 15 annual water releases are made into the Tekapo Whitewater Course administered by the Tekapo Whitewater Trust (based on a consent allowance of 4820 cumec hours of water per season). The Trust can remit part of this water allocation in exchange for payment by Genesis Energy, allowing fundraising for course development. The Trust's annual returns to the Charities Commission from 2017 detail annual activity and participation (Table 2) (previous years provide only financial records). For the 2020 year, when low paddler days were recorded, the Trust reported:[9]

> *The 2019/20 season has resulted in limited access to the Tekapo Canoe Course due to the Genesis Energy Ltd Tekapo A Station Head race Upgrade Project. This only allowed the public to use the canoe course from October 19 to 12 January 2020. Thereafter water was diverted down the Tekapo River to supply water for the Tekapo B Station preventing use of the course. As a result overall usage was down on previous seasons. Also the Lake Tekapo headwaters experienced a huge rain event in December 19 causing the Lake to reach MCL (Maximum Control Level) and Genesis was forced to spill over the period 7 to 28 December 2019, resulting in the cancellation of a slalom competition weekend and our priority event for*

[9] See: https://register.charities.govt.nz/CharitiesRegister/ViewCharity?accountId=1bea1531-c461-de11-abd3-0015c5f3da29&searchId=312bdc3d-88d2-4a45-ae39-8cda5176fcca

the season, a 6 day Canoe Slalom NZ National Training Camp. Consequently only 9 of a scheduled 12 releases were conducted reducing our 24 day schedule to 15.

Table 2: Tekapo Whitewater Trust annual reporting activity details				
Year ended June	**Paddler days**	**Events**	**Water volume used – cumec hours**	**Lost events due to high lake levels, spills etc**
2020	520	9	1440	3
2019	1140	10	2837	0
2018	2182	8	2552	5
2017	1000+	13	2512	0

Egarr & Egarr (1981) describe the kayaking resource on the Tekapo River pre- and post-scheme:

> *The Tekapo River bed is now dry except for a small amount of seepage into the river bed…. Apart from the unlikely event of a dam failure, the Tekapo is now unable to be used by boaters.*
>
> *Previously, the river had good white water over the first 7km as the flow dropped over boulders, creating pressure waves of 1.5 metres in height. Below this the river spread out and became braided, although it still flowed at a good speed. The lower river was prone to willow obstructions in the many braided river channels. Apart from the 7km down to Fork Stream confluence the trip was relatively straightforward and easy. The upper section contained good white water up to Grade 3 conditions depending on water levels. We do not imagine that anyone would wish to boat the Tekapo Canal and we doubt this is allowed; the water flows at a good speed. The river must, consequently, be considered as unusable for recreation now. The river bed lies in a dry tussock basin.*

In 1995 Egarr (1995) wrote:

> *An artificial whitewater slalom site is being constructed just above Lake Scott about 2km below the Lake Tekapo outlet. A 30 – 65 cumecs flow will be diverted across a loop in the river to create a grade III whitewater course of 300 – 400 metres in length. Completion is due by the end of 1995. Contact South Island canoe clubs of the NZ Canoeing Association for details. At present there is a half hour, grade II trip from the dam down to Lake Scott when water is released.*

Jet Boating New Zealand identifies the Tekapo River as having an uplift of the 5 knot Maritime Rule (permitting jet boating on waterways of less than 400m width)[10] "when flow at recorder downstream of Maryburn exceeds 20 cumecs"[11]. The route is described as Class 2, with launching at Lake Benmore (Halden, Falstone, Ōhau C).[12] The Environment Canterbury Navigation Safety Bylaws 2016 describes the Tekapo River upstream of the Lake George Scott weir as reserved as a non-powered vessel area.

[10] Part 91: Navigation Safety Rules: 91.6 Speed of vessels
(1) No person may, without reasonable excuse, propel or navigate a vessel (including a vessel towing a person or an object) at a proper speed exceeding 5 knots:
(a) within 50 metres of any other vessel, raft, or person in the water; or
(b) within 200 metres of the shore or of any structure; …
Also Clause 8 of the Environment Canterbury Navigation Safety Bylaws 2016
[11] Which is the Speed Uplift Zone description for the River in the Environment Canterbury Navigation Safety Bylaws 2016, Attachment A.
[12] See: http://www.jbnz.co.nz/river-information/

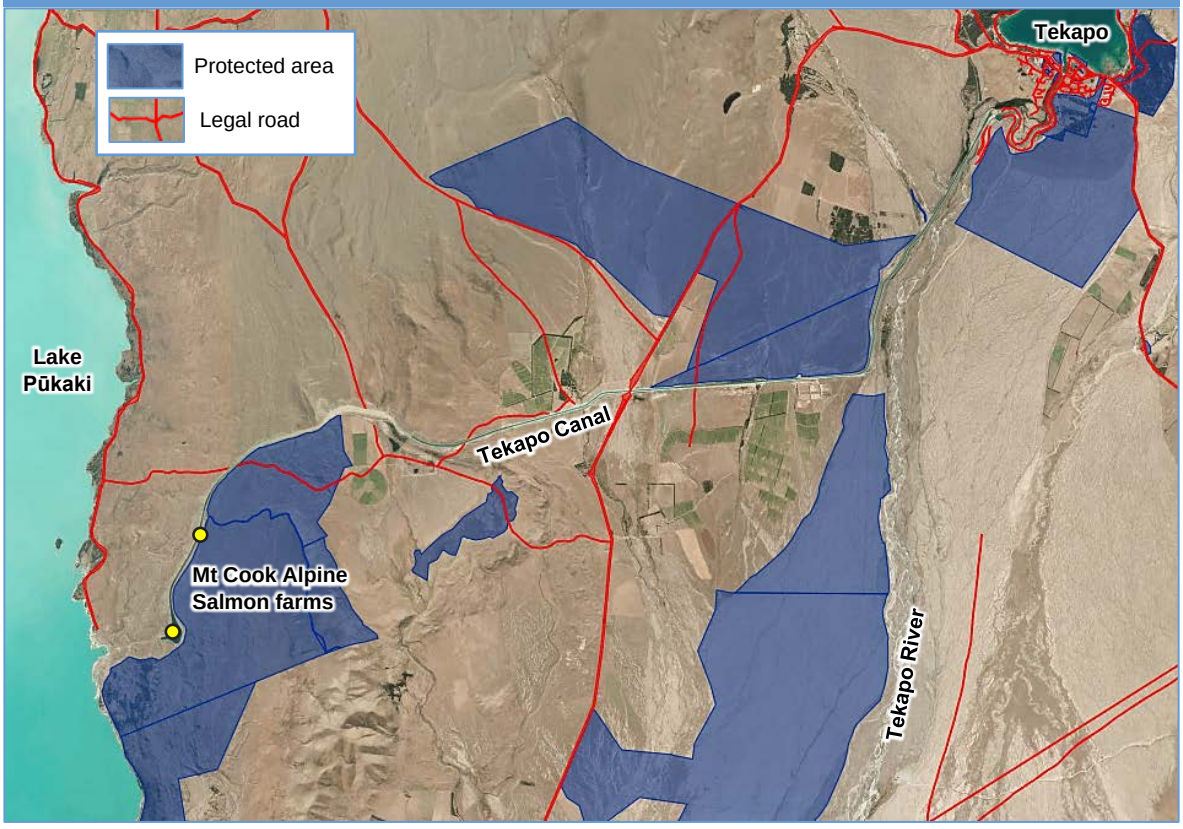
4.4 Tekapo Canal

4.4.1 Access

The Tekapo Canal and adjacent roads are within land owned by Genesis. Gates and bicycle squeeze barriers were installed by Genesis along the length of the Tekapo Canal to allow access along its south side. The Alps 2 Ocean 'alternative route' from Tekapo to Twizel relies on this access, and toilets for riders are available at the Mt Cook Alpine Salmon farm. Genesis also provides and maintains permanent toilets for public use at several locations along the Tekapo Canal Road. Vehicle access to the canal road for the public is maintained to approximately 7 km downstream of Tekapo A Power Station, and also around the head pond above Tekapo B Power Station to a point approximately 4 km upstream of the head pond. Several legal roads bisect the Canal and provide access to the private canal roads, as well as some unformed legal roads which are not used (Figure 8).

Mt Cook Alpine Salmon's farms are based on the canal, but do not provide a visitor experience. The company's local outlet is based at the Lake Pūkaki Visitor Centre.

Figure 8: Tekapo Canal



4.4.2 Cycling and running

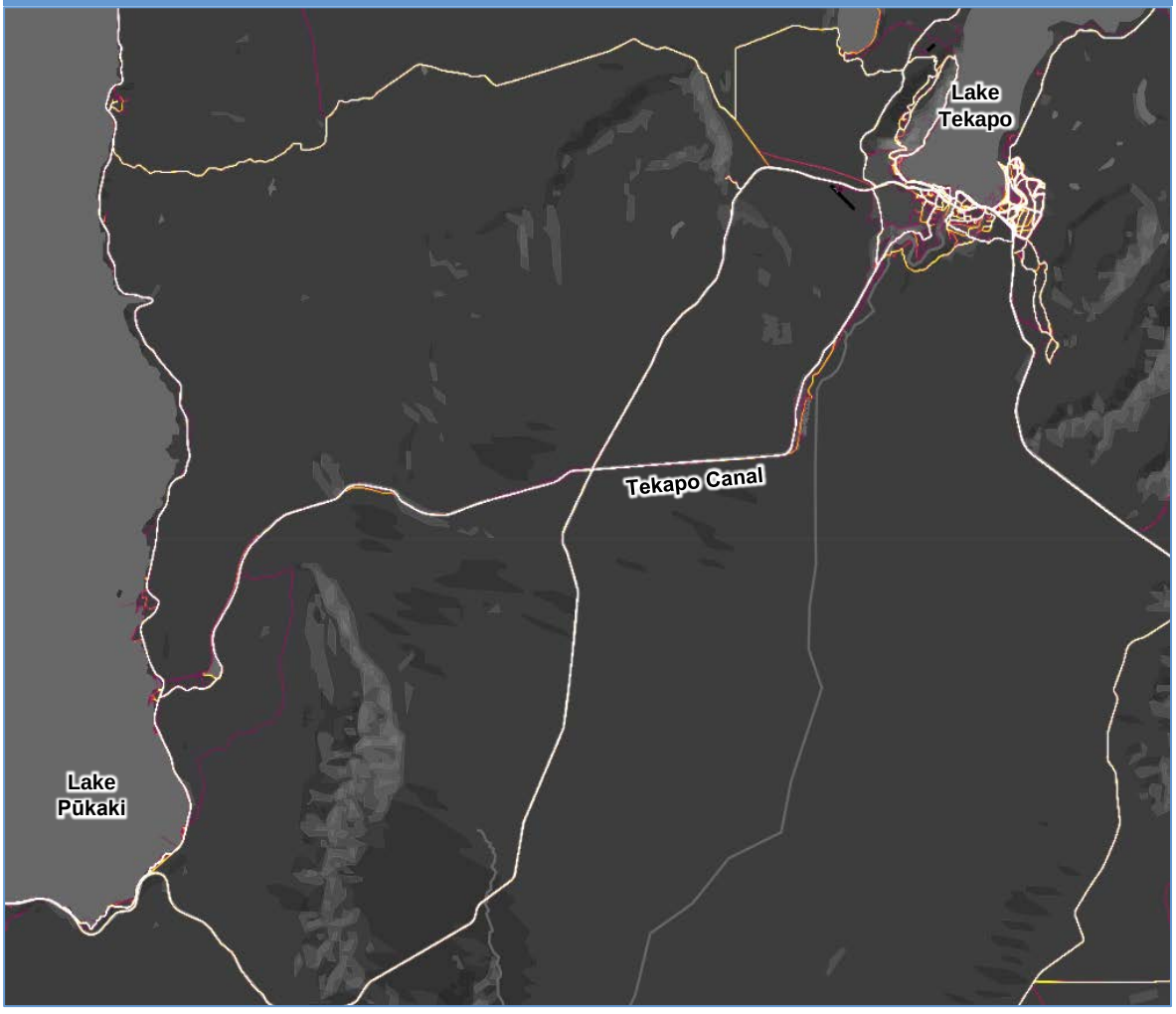
Strava heatmaps show the relative levels of participation in cycling and running beside the Tekapo Canal. Strava is a social media application which uses GPS records from subscribers' smartphones and other devices uploaded to a central database, allowing speed and time comparisons with other cyclists, 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 indicated that it had 50 million international users in early 2020 (80% outside the US) with an additional million joining per month.

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.[13] Such response rates would compare favourably to an on-site intercept survey of users in an outdoor setting, particularly since 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). Calibrations on mountain bike tracks in Nelson in 2021 carried out by the author of this report indicate uptake levels for Strava of between 20% and 50% of riders, with the lower figure at the entrance to a mountain bike park and the larger figure at a more remote setting. 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's greatest strength is in showing the relative value of settings for different forms of recreation. In the experience of the author of this report, if an area is publicly accessible, it will appear on the Strava heatmap.

Heatmaps indicate the cumulative activity of Strava subscribers in any setting. The brighter the colour (the closer to white), the more activity there. Figure 9 shows a relatively high level of activity on the

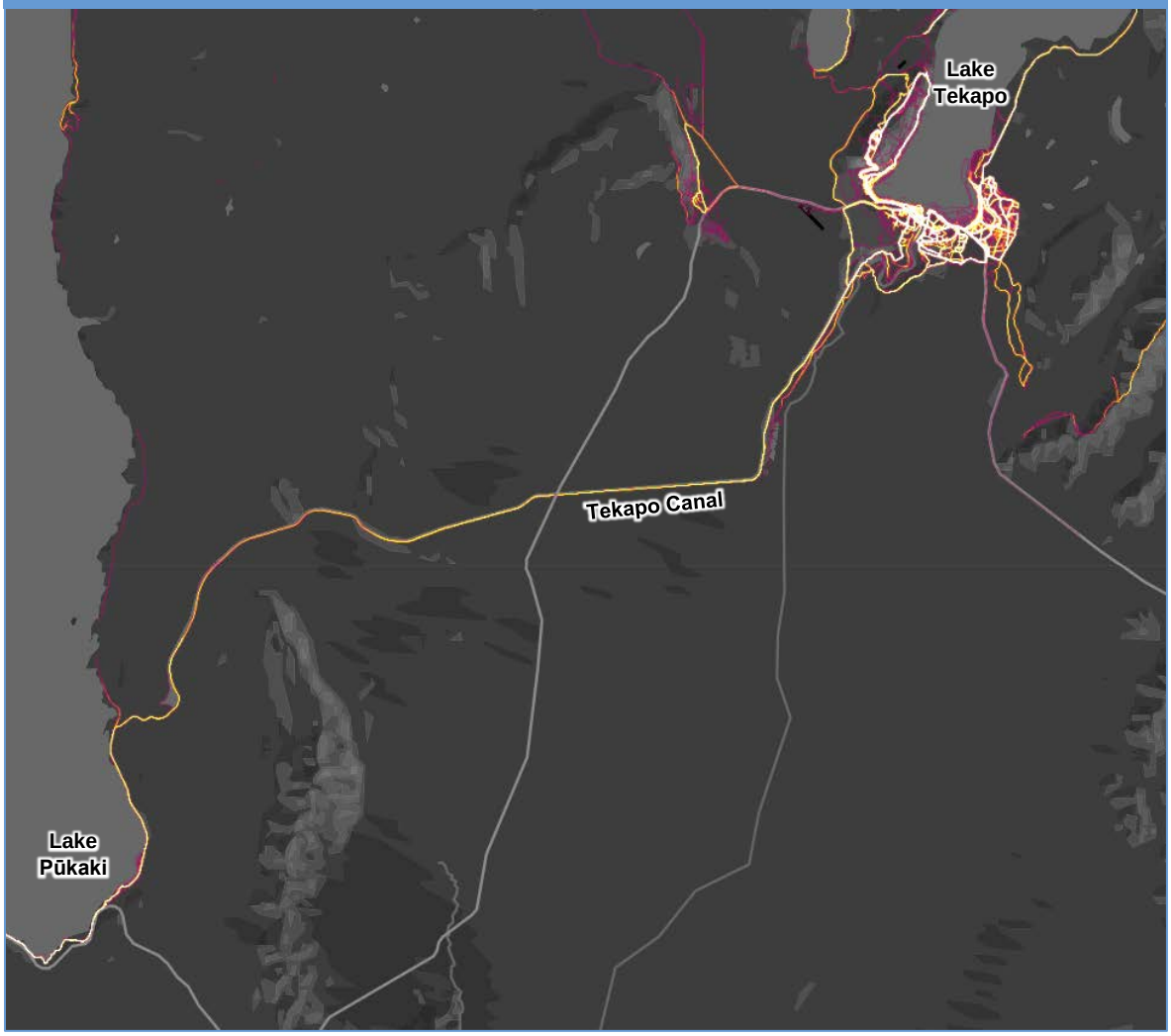
Figure 9: Strava heatmap for cycling, 24 months to May 2021, Tekapo Canal



[13] Herrero, J. 2016. *Using big data to understand trail use: three Strava tools*. TRAFx Research See also https://medium.com/strava-metro/cdc-finds-strava-metro-data-correlates-strongly-with-census-active-commuting-data-8ab1be0fe130

southern side only of the Canal for cycling. Figure 10 shows it to be the preferred route for running between Lakes Tekapo and Pūkaki (a 30km distance). It is also the route of the Te Araroa Trail between Tekapo and Twizel.

Figure 10: Strava heatmap for running, 24 months to May 2021, Tekapo Canal



The Ministry of Business, Innovation & Employment operates a cycle and pedestrian trail counter on the Alps 2 Ocean (A2O) Trail on the Canal 7km from the Tekapo village. For the year ended 28 Feb 2020, the calibrated count for walkers and runners was 16,775 unique users, and for cyclists 1,602 unique users (Kennett and Northcote, 2020). The research authors noted:

> *The pedestrian numbers are particularly high mainly because this section of trail is used for training by the nearby Tekapo Army Camp. It is also part of the Te Araroa Trail (2,000 full length walkers a year) and is also used by people fishing in the area. The estimation is that 70% of the pedestrian counts are there-and-back trips. Therefore, to derive the number of uses by walkers and runners, multiply the counts by 0.65 (70%/2+30%).*
>
> *Of the 2,195 cycle counts 577 were going toward Tekapo, mainly doing there-and-back trips and being counted twice. Approximately up to 1,041 cyclists (2,195 minus 577 x 2) are starting the A2O from Tekapo. This results in an estimation that 53% of the cycle counts are there-and-back trips and 47% are through trips. Therefore, to derive the number of uses by cyclists, multiply the counts by 0.73 (53%/2 + 47%).*

The counter on the Canal recorded the second highest level of use of all seven counters on the A2O after the counter installed on the Trail in urban Oamaru. That is, higher counts than at Mount Cook, Lake Pūkaki, Lake Ōhau, Kurow and Rakis Tunnel (south of Duntroon). Figuracion (2016) notes that most users of the A2O begin the ride at Tekapo compared with Mount Cook. There are no reliable published trend data for use of the A2O over time, and the Canal section.

4.4.3 Angling

Kent (2009) wrote prior to the major growth in angler activity on the Waitaki hydro canals in the 2010s, but still describes the resource accurately:

> *All* [the hydro canals] *contain rainbow and brown trout, and the Tekapo-Pūkaki canal also holds salmon, these having escaped from the salmon farm. The aesthetics of all the canals leave a little to be desired but some amazing trout have been caught, especially those feeding downstream from salmon farms. Recently a 15-kg rainbow in prime condition was landed on a huhu grub.*
>
> *Trout will rise at times and some can be spotted along the edges waiting for wind-blown terrestrials. Generally, however, glacial flour, especially from Lake Pūkaki, makes sight fishing impossible. Some trout cruise the canals on a regular beat, and can be ambushed by watching their rise forms.*

The Tekapo Canal showed an increase in angling activity from 870 (±240) angler-days in 1994/95 to 22,680 (±1,990) angler-days in 2014/15. In 2014/15, 380 (±220) angler days on the Canal were from overseas visitors.

Figure 11 shows the origin of anglers and angler-day estimate for the Waitaki canals for the 2014/15 season (Unwin 2016). Anglers on the Tekapo Canal were largely drawn from Canterbury and Otago (89%).

Figure 11: Estimated angling effort on upper Waitaki canals in 2014 (angler-days ± 1 SE) (Unwin 2016)

Angler origin	Ohau Canal	Pukaki Canal	Tekapo Canal	Undefined	All canals
Northland	10 ± 10	-	-	-	10 ± 10
Auckland/Waikato	110 ± 50	20 ± 20	50 ± 40	-	180 ± 70
Eastern	500 ± 390	-	80 ± 80	-	580 ± 400
Taranaki	120 ± 70	10 ± 10	220 ± 190	-	350 ± 200
Hawke's Bay	-	-	800 ± 770	-	800 ± 770
Wellington	330 ± 230	220 ± 210	220 ± 210	-	760 ± 380
Nelson/Marlborough	770 ± 350	790 ± 510	260 ± 130	90 ± 90	1,910 ± 640
West Coast	130 ± 70	-	110 ± 70	-	240 ± 100
North Canterbury	12,060 ± 2,370	850 ± 300	6,170 ± 1,140	20 ± 20	19,110 ± 2,650
Central South Island	25,380 ± 2,500	6,730 ± 1,640	10,630 ± 1,630	600 ± 310	43,340 ± 3,420
Otago	9,720 ± 1,500	920 ± 470	3,650 ± 1,130	160 ± 160	14,450 ± 1,940
Southland	4,290 ± 1,050	1,120 ± 680	490 ± 210	100 ± 90	6,000 ± 1,270
Overseas	520 ± 290		380 ± 220		900 ± 360
All regions	53,950 ± 3,950	10,670 ± 1,940	23,050 ± 2,460	970 ± 370	88,730 ± 5,060

Fish & Game Council Fishing Regulations (2020/21 season) divides the Canal into two sections. Upstream from the State Highway 8 Bridge, the season runs from 1 September to 31 May, and downstream from the bridge is open all year. The bag limit for both sections is four sports fish of

which no more than two can be trout. There is a minimum size limit of 500mm for salmon, and a bag limit of two.

4.4.4 Swimming

Bathing water quality in the Tekapo River is not assessed by Environment Canterbury (Arthur 2018 & 2020). The Environment Canterbury Navigation Safety Bylaws 2016 make no reference to the Tekapo Canal.

5 Interview findings

This section summarises the reporting from interviews. Interviewees report on their experiences and perceptions, and these are not calibrated in this assessment against any objective measures, and some opinions are contrary to others.

5.1 Lake Tekapo

5.1.1 Visitor patterns

- Recreational activity at Lake Tekapo is increasingly varied and in recent years, the township has expanded quite rapidly. Tourists used to move through the area quickly but now stay for longer. Additionally, more people are investing and buying property in the Tekapo township.
- Most visitors to Paddle Tekapo are tourists passing through who are looking for an activity or two to do while they are in Tekapo. Not many come specifically to kayak or paddleboard – some from Christchurch and Timaru may, but the majority are general holidaymakers.
- As more people come to visit Lake Tekapo, and Lake Tekapo becomes more significant to the area, differences in lake levels are noticed more.

5.1.2 Angling

- Lake Tekapo is a significant fishery and was described as underutilised. It could cope with a lot more angling pressure. Brown and rainbow are self-sustaining and Fish & Game manage a put-and-take salmon fishery – stocking the Lake periodically with only female fish (which take about 1.5 years to mature, at which point Fish & Game promotes the salmon fishery). The Lake is not known for big fish, but it's an excellent fishing setting with great potential.
- The Lake generally has a low level of productivity due to the glacial flour discolouring the water and reducing weed and insect life. It fishes best at low levels when anglers can access the more stable and productive parts of the water. At high levels, shore based anglers are fishing over bare cobbles with little plant or insect life.
- Clarity can suffer after a flood, but this is not generally a deterrent to fishing.
- Lake Alexandrina and Lake McGregor are high value fisheries – enhanced by the work of the Lake Alexandrina Conservation Trust with enhancements for spawning. The Lakes have exceptionally large, good condition fish. There is no research to identify the relationship between the fish in the three lakes (Alexandrina, McGregor and Tekapo), but it should be expected that there is a drift downstream of small fish with adults returning to spawn.
- Most other tributaries of Lake Tekapo support spawning. Their outlets to the Lake are highly valued for angling – with a lot of international anglers taken by guides – the Godley River and Coal Creek in particular. The Lake offers the benefit of always having fish to replenish these tributaries after floods.
- Boundary Creek can be disconnected from the Lake at low lake levels. Low levels can occur after a fresh which attracts rainbows into the Creek to spawn, but they cannot then return once the fresh subsides.
- The only missing link for trout in the Lake is passage back upstream into it. Plenty of fish get downstream from the Lake and it is the origin of many of the fish in the Tekapo Canal and the Tekapo River (the latter from spills).
- The Lake does not have the popularity of Lake Benmore for example, but then it doesn't have the same number of camping areas or easy access for boats. There is the capacity for

a lot more fishing on the Lake and perhaps if more access and accommodation was provided, it would be more popular.

- The Lake might become more productive as a fishery over time with climate change as the glaciers retreat, the amount of glacial flour drops, floods become less frequent, and the water becomes more clear. Land intensification near the Lake will result in more nutrient inputs, more algae and more weed growth – and so more food for trout and salmon. There will be a sweet spot between too little and too much nutrient.

5.1.3 Hunting

- Game bird hunting is mostly around the Lake on private and public land – and it is not clear if the Lake levels have an influence on bird numbers. (Boffa Miskell (2021) notes generally stable or increasing populations of black swan, Canada goose, mallard and paradise shelduck on the Tekapo River, but has no data to relate this to management of lake levels.)

5.1.4 Boating and water skiing

- The appeal of water skiing in the catchment, specifically at Lake Tekapo, is the scenery and the ease of access to the Lake. Lake Tekapo is a very easy lake to "read" – e.g., observe and understand the conditions, which makes it easier to stay safe. Additionally, there is a big area that a lot of boats and other recreational users can use.
- Over the past 20 years the number of visitors to Lake Tekapo has steadily increased, and a lot more make use of the water, especially boaters – potentially due to an increase in launching options. It has become more difficult to water ski in some parts of the Lake as new navigation bylaw restrictions reduce the amount of water than can be used, and with an increase in the number of boats and the introduction of a swimming bay where water ski slalom was normally held.
- Easy boat access is important due to the risk of conditions changing and vessels needing to be retrieved in difficult conditions.
- There are currently two commercial operators on Lake Tekapo, and commercial use is expected to increase. Local and private recreational lake users will have to become increasingly careful. The low level of commercial activity appeals to recreational boaters as there are fewer operators on the water to be aware of.
- Paddleboarders are a new and increasing use. When lake levels are low, paddleboarders come in towards the centre of the lake and get very close to boats that are coming in to pick up and drop off people. Low lake levels can also cause the area able to be used for recreational swimming and kayaking to reduce in size, so these users have to move closer to the centre of the Lake.
- A paddle-only area was introduced over the 2019 summer along the Lake Tekapo shoreline for the safety of users by the harbourmaster. Before this there was no paddle-only area, and the paddleboards and kayaks were on the water with larger crafts. At its highest level, buoys mark a 300-metre wide and kilometre long area. This is located on the left-hand side of the boat ramp on Lakeside Drive. This paddle-only area can as much as halve in width when lake levels are low, depending on the season and rainfall.
- There is a perception that lake levels are more variable and tend to be held lower for longer since Genesis has been operating it. This impacts negatively on watersports and boat launching, along with exposing more sub-surface hazards. High lake levels are preferred. For example, between the 18th and the 19th of February 2021, the lake level went down 20-30cm, resulting in the lake shoreline being a metre further down the shore. As lake level

decreases, boats can no longer be launched off the sandy beach and gravel and rocks are exposed.

- Low lake levels early in the season has been a common occurrence over the past few summers: in the 2017/2018 summer lake levels were low all summer, and in the 2019/2020 summer the lake was at a low level in the beginning of the season and then became full, spilling water after a big storm in December.
- When the lake level gets very low, large rocks, which haven't been cleared since the Lake was developed for hydro, come very close to the surface of the water. This poses risks to safe navigation and their removal could be considered (Figure 12).

Figure 12: Rock at low lake levels. Photo: Lake Tekapo Powerboat and Water Ski Club

- Low lake levels make the lake more difficult to access. At its lowest level, boat ramps start to come out of the lake and are unusable, especially if the ramps are not well maintained. If using a 2-wheel drive car, low lake levels made it impossible to launch boats from the ramps. Over the past two years, there was one month when Lake Tekapo could not be used at all for this reason (September 2019). A 4-wheel drive removes this problem, but many lake users do not own 4-wheel drives, especially people outside of the region. Sediment on ramps after rain and north-westerlies can also cause problems (December 2019 a good example).
- Access at Lake Tekapo is adequate for the Mackenzie Coastguard, which has 4-wheel drive vehicles. Boats can be launched at low levels at the club boat ramp (although the final section of access can be beyond the end of the ramp) or at the old riverbed area, although care must be taken to avoid the rocks of the local rip rap to prevent vessel damage (a floating pontoon here would assist).
- Recreation on the Lake in summer is more appealing when lake levels are high. It is easier to access the Lake, especially when water skiing and boating, when you can park at the top of the beach as there is more space and fewer hazards (when launching from lower down on the beach there are potential hazards such as rocks). Recreation when lake levels are low is possible but less appealing.
- Access to the water for launching is critical for boating.

- The largest issue concerning Lake Tekapo is maintaining a reasonable level. Any attempt to lower the minimum lake level would be objected to strongly. The current minimum allowed level is 702 metres but ideally over the summer for Paddle Tekapo the minimum would be 706-708 metres.

5.1.5 Scenic values

- Lake Tekapo has very high scenic values, due to the colour of the water, the surrounding mountains and the scale of the setting.
- Lake levels affect the scenic value of Lake Tekapo. For example, for aerial flights, a drop of two to three metres in the water level means the Lake looks drastically smaller. The operator of Paddle Tekapo considers that fewer people come to his business when the Lake is low, as paddling does not look as attractive.
- There have not been large changes to Lake Tekapo for a long period of time. However, the Lake is considered to be lower more frequently at certain times of the year. Additionally, maximum lake levels have become less frequent, although the exact frequency of this is difficult to determine.
- Dust is occasionally an issue for Air Safaris Lake Tekapo and residents. At the tops of lakes Tekapo and Pūkaki glacial silt is exposed and corresponding periods of westerly weather can cause fine dust to become airborne, which can potentially impact the ability of the planes to fly as the dust can enter the engines. However, this happens rarely and has a larger impact on the township than Air Safaris Lake Tekapo. Additionally, when the aircraft does fly above the dust the effect can create a spectacular view.
- As a pilot, Justin Sturrock of Air Safaris Lake Tekapo feels the lake has more scenic appeal when full. However, a number of aspects factor into the scenic appeal, such as the time of day and weather, and play a larger role than the lake level itself does – there will always be water in the lake. Most of these aspects are out of Justin's control. Justin has not noticed significant long-term changes in Lake Tekapo, other than seasonal fluctuations. Justin has not noticed any long-term changes at Lake Benmore. At the moment, the water at Lake Tekapo is the clearest he's ever seen it, potentially because of a lack of floods stirring up sediment.
- In the future, there are potential opportunities for nature watching in and around Lake Tekapo (e.g., black stilts, grebes, ducks, wrybills) that could be nurtured for future tourism opportunities. Lake Alexandrina is already a wildlife refuge, but a lot of wildlife also comes to Lake Tekapo.
- Variability in lake levels would be more acceptable if the community understood the rationale behind lake management. For example, if spillage is followed by a period of low levels, residents can get quite upset. However, this might be for a good reason, and residents would be more accepting if they knew.

5.2 Tekapo River

5.2.1 Angling

- The Tekapo River was one of the most productive fisheries in NZ prior to didymo. It has since diminished in value and angler use, but still has reasonable levels of activity, especially at the opening of the season. Freedom camping along its bank adds to this attraction. Between 50 and 150 anglers might be there on opening weekend in November – and there would have been more pre-didymo.

- Gate 16 on Lake Tekapo gives the River a high level of stability, and Lake Benmore provides a reservoir of fish. Didymo has smothered much of the food source and reduced the aesthetic appeal of the River, as well as catching on lures and lines and reducing angling efficiency.
- Fishing in the River occurs wherever there is water, but Fork Stream is the normal upper limit for activity – and Fork Stream is a fishery in itself. Spills from the George Scott weir can deposit fish in the pond directly below it, and these can require rescue before it dries out. Some fishing occurs there but is discouraged. Grays River is also an important fishery. Pattersons Ponds also fish well when there has been a spill into the River and water has overflowed into the ponds.
- All of the controlled rivers in the Waitaki catchment, such as the Tekapo, suffer from algal build-up during periods of low- and no-flow below the dam structures. In comparison, a lot of unimpeded rivers don't have algal and didymo build-ups as high-water flows keep the water quality at an acceptable level. Intensive farming in the Waitaki catchment is correlated with increased periphyton levels.
- Flushing flows have been debated amongst anglers – but would require very careful timing to avoid nesting birds, spawning fish and preferred fishing times.
- The decline in water quality in these rivers is probably what has caused the decrease in fish numbers. A decrease in water quality has impacted macroinvertebrates. The reduction in macroinvertebrates due to the suffocation of didymo has probably also caused a reduction in birdlife in these areas.
- The Tekapo River and the rivers that flow into it also don't experience the variation in flows it used to, which may impact tourism and recreation.

5.2.2 Hunting

- Game bird hunting – mallards, paradise shelduck and Canadian geese – occurs in the riverbed.

5.2.3 Kayaking

- The use of the upper Tekapo River for guided kayaking is not for the scenery but rather for the instruction opportunity, as well the convenience of having recreational releases down the river.
- Since the summer of 2019/20, flood flows, likely caused by new projects such as refilling the canal and tunnel for Tekapo A, have caused erosion along the banks of the upper Tekapo River, leading to large amounts of sediment entering Lake George Scott. This has resulted in Lake George Scott reducing in size. 20 to 30 years ago, Lake George Scott was an attractive place to spend the day and a good spot for picnics and kayaking. This has changed since Genesis Energy took over from Meridian.
- The recent headrace upgrade work meant there were significantly fewer recreational paddling days on the Tekapo River in 2020/21. Because water has been diverted down the river, flows have often been too high for recreational paddling.
- Didymo is a deterrent for kayaking.

5.2.4 Jet boating

- At high flows the NZ Jet Boating Association (JBNZ) has boated the River from the Haldon Arm of Lake Benmore at the time of kayakers' recreational releases. The river is open and

has good visibility and kayakers generally pull over until the jet boats pass and then continue downstream.

- For many jet boaters, the appeal of jet boating on the catchment is jet boating itself. Jet boating also has a social aspect and enjoyment may be increased by jet boating with friends or family. For many other jet boaters jet boating offers the ability to take part in other recreation activities on the catchment, such as fishing, tramping or camping (jet boating acts as a means of transport). Jet boating also facilitates water-skiing in the catchment.
- The whole Waitaki region has huge scenic value. This contributes to jet boaters' choice to jet boat in the region as opposed to elsewhere (although all of New Zealand has places with high scenic value for jet boating). The Waitaki catchment offers challenge to jet boaters while still being safe to jet boat on.
- The Waitaki catchment is well serviced with launching points and related assets. While the dams resulted in some places being lost to jet boating, other places to jet boat were gained with their introduction.

5.2.5 Scenic

- The dry upper Tekapo River riverbed is an eyesore. Ideally there would at least be a negative flow going through the river. Every time there is an extended release or flow, birds and fish enter the river, which have to be collected by Fish and Game when the flow is turned off. The upper Tekapo River is not a healthy system and when water levels are low or flow stops the river can be smelly as well as unattractive. Ideally at least 5 cumecs would flow through the upper Tekapo River at all times. This would also result in a more attractive Lake George Scott.

5.3 Tekapo Whitewater Course

- Between 1,000 and 3,500 annual kayaker days have been recorded by the Tekapo Whitewater Trust on the Course.
- When Meridian owned and operated the Tekapo A and B power stations along with the other stations in the Waitaki Network they had much more flexibility to accommodate releases and absorb outages than Genesis Energy Ltd has, only having direct control of the top two stations in the network. A consequence of this over the years is that more recreational releases have been lost during their tenure than what were lost with Meridian. This is not a criticism, more the reality if the arrangement forced on both companies by the government of the day.
- From the Trust's perspective, their working relationship with both companies over the years has generally been very good, with both companies supportive of improving the Tekapo Course as a recreational facility.
- Every release at the course, as well as river recreational releases are available for use by the general public, canoe and kayaking clubs, rafters, pack rafters, schools polytechnics and the national sporting bodies like Canoe Slalom NZ and Freestyle Kayaking NZ. On average 10 to 15 release weekends / events are conducted annually. These vary from club weekends slalom and freestyle events and training camps, school recreational releases for students and college groups, annual events such as the South Island Slalom Championships, and The Tekapo Throwdown a freestyle and river safety event. Every year Canoe Slalom NZ run a five-day national training camp at the course, and the Canoe Slalom National Championships are held there on a biannual basis, normally at Easter weekend. The NZ Secondary Schools National Slalom Champs and NZ Nationals were held in March 2021.

- A problem the Trust experienced in the early days was difficulty securing funding to improve and develop the venue. Grants were hard to compete for on a participant-numbers-basis and major sponsors hard to secure for similar reasons. The Trust and White Water NZ discussed these issues with Meridian Energy and developed an agreement where the Trust could remit some of its water allocation in exchange for funding. This was a catalyst for great improvements at the course. These improvements have developed the venue which, in turn has seen huge increase in demand for use and significantly increased attendance. The reputation in recent years has seen international athletes travel to NZ to train and race at the venue over the northern winter. It is common to see World Cup Champion athletes attend releases and training camps at the Tekapo Course.
- The last two years have seen the most disruption of access to the course as a result of the headrace upgrade which effectively closed the venue for six months each year. This is considered part of the operational environment that the Trust must work within.

5.4 Tekapo Canal

- The Canal is one of the most popular sports fisheries for trophy trout and salmon. It is highly productive and has high scenic value. While some may consider the salmon farms ugly and smelly, they underpin the productivity of the fishery. The quality of the fishery is probably more an attraction than the scenery. It is popular year round and has a national reputation.
- Ease of access is very important – with anglers able to fish from their car – and so any road closures are felt keenly. (Genesis has closed thoroughfare access for public cars on the canal road due to excessive speeding, and it remains open for public vehicles at its upper 7km and lower 4km, and is fully accessible along its length to cyclists and pedestrians.)
- It is not clear if the fishery is sustainable considering the angling pressure. Anglers' perceptions are often that the angling pressure is too high, but there is no data to support this, and it appears that spawning capacity is exceeded in the Canal (the fish dig up the redds of other fish) and there is constant supply of new fish from Lake Tekapo (spilling Gate 17 or surviving the turbines) and releases and escapees from the salmon farm (which is a boom and bust exercise). Rainbow are the main target species. Fish & Game has taken a precautionary approach this winter and has closed the spawning area on the upper section of Canal to angling during the spawning season for three months. It is not clear if this will make a difference, as the Canal could be achieving maximum spawning regardless.
- Catch and release is becoming the norm in all the fisheries – a habit adopted from US anglers late last century. In winter – when the more specialised anglers are active – probably 95% of the catch is released, and in summer it is probably closer to 50%.
- Nothing compares to the canals in terms of the size and quantity of the fish. However, fishing has gotten trickier due to the increased pressure from the number of people fishing. Kiwis are a bit complacent but overseas anglers recognise how amazing the fishery is. Covid has resulted in more anglers from Auckland and the North Island fishing the area.
- Trout don't really get big except in the canals. The trout in the natural waterways average is 4-5 pounds. Most people, prior to fishing in the canals, would have never caught trout that are 10 pounds.
- Fishing on the canals is more about catch and kill than sport.
- Salmon escapes used to last about a month as the fish were slowly picked off, but the involvement of social media means that escapes result in cars parked everywhere and many anglers – might have 500 people in a small area fishing to their heart's content. Escapes are gone within 4-5 days now.

- The canal area needs to be treated as a treasure. Regulations haven't kept up with demand and fishing has become more difficult. Five years ago people could easily catch lots of fish – 5-30 fish per day; that same person today would be lucky to get one fish. Skilled anglers might get 5-6 fish per day. This could be due to overharvesting, and any measure of protection is seen as a good thing
- As long as big fish are being promoted on social media and people are having success, the popularity of the canals won't diminish.
- The canals are the only angling settings in the Waitaki that suffer from littering. The lines that hold up the salmon pens are covered with nylon and other rubbish. Also lots of beer bottles up there – people like to drink and fish all night. Stronger regulations about rubbish are required.
- A huge increase in fisherman numbers on the hydro canals is probably related to a small decrease in the number of people fishing on the waterways. Although there are more people fishing the hydro canals, people are still interested in fishing lakes and rivers in the area.
- The Alps 2 Ocean cycleway would have been very difficult to develop in the area if it was not for the canal due to the dominance of private land and lack of public access.

7 Summary of changes since 1990

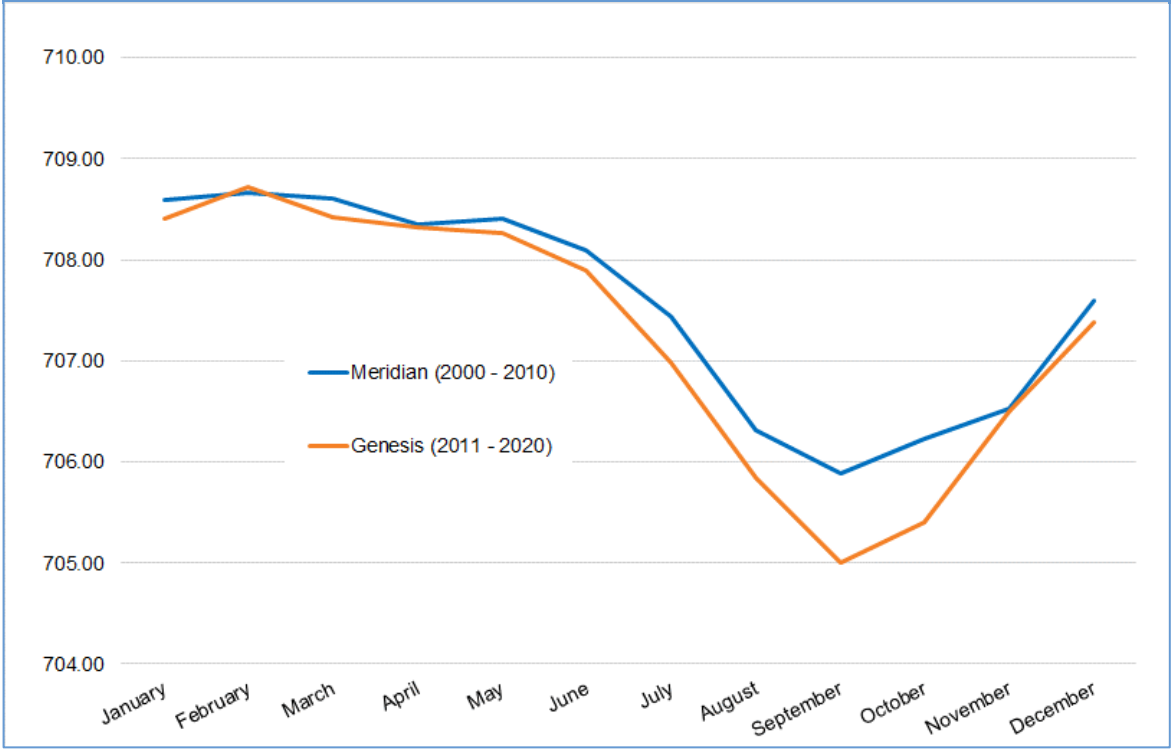
This section reviews the changes in recreation patterns since 1990, based on the limited available quantitative trend data, and the perceptions of interviewees.

7.1 Past scheme operation

Scheme operation has been considered consistent up until the past three to five years. These include perceptions of more frequent and lower levels at Lake Tekapo, attributed to environmental factors and an alternative operational regime adopted by Genesis (in comparison to Meridian). Several interviewees opined that this may be the inevitable result of dividing the hydro generation assets within the Waitaki scheme between the two operators. However, Leisure Matters (2004) reported very much the same opinions more than 15 years ago, coinciding more closely with the transfer of scheme ownership from ECNZ to Meridian.

Since 2000, Meridian operated Lake Tekapo in summer on average in the +709.14 range approximately 21% of the time. In the last 10-years, Genesis in summer on average operated in +709.14 range approximately 20% of the time. On average, the level of Lake Tekapo in December and January has been 0.11 meters lower under Genesis' ownership than under Meridian's. Over the full 10-year period, Genesis has operated the Lake 0.295m compared with Meridian's tenure. Average differences in lake level management are most apparent in September and October (Figure 13).

Figure 13: Comparison of Meridian and Genesis operating regimes on Lake Tekapo 2000-20 (masl)



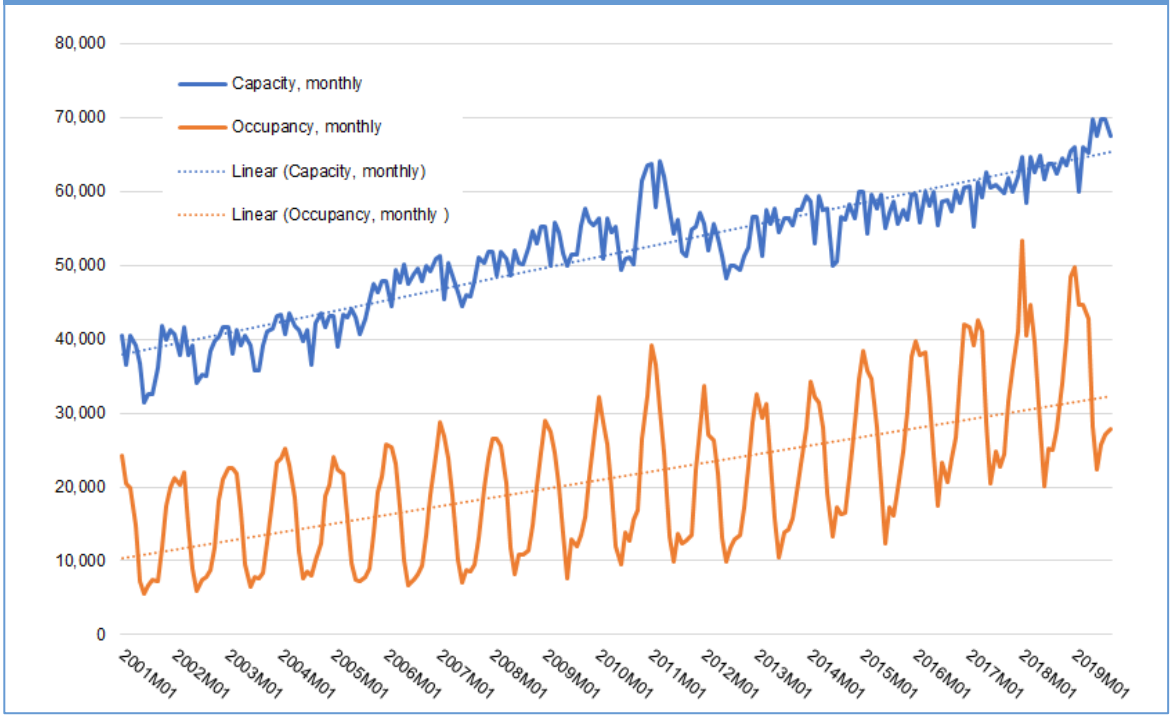
Construction of the intake gate for the Tekapo A Power Station and canal re-lining works has been associated with short-term loss of kayaking opportunities on the Tekapo White Water Course and the Tekapo River. It has also been associated with increased siltation in Lake George Scott.

Otherwise, the study area has been viewed as stable, besides major weather-related events causing site-specific erosion events.

7.2 Past recreation trends

Figure 14 shows Ministry of Business, Innovation & Employment monthly commercial accommodation survey data for the Mackenzie District from 2001 to 2019.[14] Commercial accommodation capacity in the District has grown from an annual monthly average of 37,470 beds in 2001 (and an average monthly occupancy of 13,582 – 36% occupancy) to an annual monthly average of 66,878 in 2019 (and an average monthly occupancy of 34,784 – 52% occupancy) (nine months to September). Occupancy between June 2020 and April 2021 has been at just over 33%.[15] This indicates both considerable growth and greater utilisation, and durability during Covid-19 (with a core domestic market). Seasonality is also obvious, with peak visitor periods over summer.

Figure 14: Commercial accommodation capacity and occupation, Mackenzie District 2001-19M



Angling on the Tekapo Canal experienced substantial growth from 870 (±240) angler-days in 1994/95 to 22,680 (±1,990) angler-days in 2014/15. This is the most marked change in recreation participation in the study area. However, interviewees report a general increase in recreation activity in all parts of the study area apart from the Tekapo River, where the advent of didymo has been associated with a reduction in angling amenity and activity – from a high of 4,910 (±700) angler-days in 2001/02 to a low of 1,390 (±370) angler-days in 2014/15.

These growth figures match the perceptions of increased recreation activity on Lake Tekapo and the Tekapo Canal reported by interviewees. Increases in recreational boating activity on Lake Tekapo are potentially increasing recreation conflict levels. Commercial on-water services have also been developed on the Lake.

Annual patronage of the white water course has depended on the number of events held and the number of releases of water – the latter dependent on the number of releases remitted by the Tekapo White Water Trust in exchange for cash to develop the course, and the coincidence of adverse weather and lake level events with planned releases. Construction of the intake gate for the Tekapo

[14] See: https://www.stats.govt.nz/information-releases/accommodation-survey-september-2019. These data do not include Air B&B accommodation or Department of Conservation huts.
[15] Data collection methods changed post 2019, and the MBIE information is reported in separate sets.

A Power Station has temporarily adversely affected patronage in the past two seasons. Otherwise, kayaking patronage of the course remains consistent.

7.3 Positive scheme effects

Operation of the Tekapo Canal, and the location of salmon farms within it, has resulted in a nationally significant trout and salmon fishery. The scale of the canal fisheries in the Waitaki hydro schemes well exceeds that of all angling activity in all other waterbodies in the catchment.

The operation of the Tekapo White Water Course has created a relatively reliable and predictable kayaking resource which is attracting national and international attention for its training opportunities and events.

Walking and cycling options – notably the Alps to Ocean (A2O) cycleway – have been developed adjacent to hydro infrastructure.

7.4 Adverse scheme effects

The loss of the original fishery and kayaking resource in the Tekapo River predates the 1990 consent period.

High lake levels are preferred on Lake Tekapo. Low levels – which are perceived to have been more persistent and frequent in the past three to five years, although they were perceived in the same way in 2004 (Leisure Matters 2004) – are considered adverse and are associated with:

- Reduced scenic value and the visual scale of the Lake;
- Reduced tourism patronage due to poorer visual amenity (one interviewee);
- Exposure of navigation hazards in late winter and early spring;
- Greater difficulty in launching and retrieving boats;
- Increased conflict between on-water activities as shoreline navigation safety zones shrink and the scale of the Lake generally reduces;
- Decreased access for anglers to more productive fisheries;
- Isolation of spawning rivers from the Lake; and
- Dust effects on visitors and residents.

8 Trends to 2060

This section considers likely changes in recreation participation during the proposed renewed consent period for the Tekapo Power Scheme.

8.1 Proposed scheme operation

Genesis has no plans to modify the current operation of the Tekapo Power Scheme.

8.2 Recreation trends

Demand for recreation opportunities is unlikely to abate in the future. Current trends are for increased participation in outdoor recreation and diversification of activities, and an increase in the number of commercial recreation and tourism operators.

Mackenzie District Council growth projections to 2050 estimate that the District's resident population will rise from 4,950 in 2020 to 9,050, and peak day visitors[16] will rise from 17,378 in 2020 to 61,253, and average day visitors[17] from 3,113 in 2020 to 10,974, taking into account recovery from Covid-19 (Rationale Ltd, 2020).

This suggests a concomitant doubling in outdoor recreation participation by residents and a tripling in participation by visitors over a 30 year period. This will result in significantly increased pressure on recreation facilities, the potential for increased recreation conflict, and the need for additional recreation infrastructure, management and regulation. It will also shift the market and non-market values of hydro-electric resources (lakes, rivers and canals) along the spectrum from generation towards recreation and tourism (although it is also likely that the value of low-carbon electricity generation will increase simultaneously).

Some interviewees noted the use of larger boats on Lake Tekapo – in some cases to generate larger wakes for wakeboarding – and this may have implications for launching ramp design. Significantly increased use of the A2O trail as a result of Covid-19 and the popularity of e-bikes has been reported anecdotally.

It is not feasible to estimate future changes in participation in specific activities (paddle boarding versus jet skis for example) or the emergence or growth and impact of new forms of participation (foiling electric surf boards for example). However, all activities will continue to rely on access to the water for launching vessels, and access along the water's edge for, for example, angling, swimming, picnicking and sightseeing. White water activities will continue to rely on moving water and hydrological features. Angling will continue to rely on the maintenance of habitat for salmonids. All activities will benefit from clean water, the management of periphyton, and the maintenance of landscape values. Participants will continue to depend on the provision of a wide range of infrastructure, such as tracks and trails, launching ramps, toilets, rubbish disposal, information services, parking and accommodation.

8.3 Positive scheme effects

The scheme will continue to provide venues for recreation participation on the Tekapo Canal (for angling) and water releases for jet boating and rafting (the Tekapo River and the Tekapo White Water Course). Cycling and walking opportunities will remain beside hydro infrastructure.

These opportunities will continue represent a significant contribution to recreation participation in the District, with increasing demand and participation. Maintenance of release flows and habitat for salmonids will be critical, along with the provision of public access.

[16] The number of visitors that are within an area at any time in the day, on the busiest day within in a 12-month period
[17] The mean number of visitors that are within an area at any time in the day, within in a 12-month period

8.4 Adverse scheme effects

Low levels on Lake Tekapo have been identified as the most significant perceived adverse effect of the scheme on recreation participation (via effects on access and opportunity[18]) and on tourism (via effects on access, opportunity and landscape values, as well as via the effects of dust). Growing recreation participation will increase the scale of sensitivity to the scale and duration of low lake level events, although they occur mostly in the shoulder season of late winter and early spring. Demands for the improved ease of boat launching and for the management of recreation conflict will continue.

Angling on the Tekapo River was highly popular due to operation of the scheme until the introduction of didymo in 2007. Although angler days on the River have declined since then, it has retained reasonable levels of activity (in the words of an interviewee), especially at the opening of the season. This situation is likely to persist.

[18] Essentially scale of the setting – a smaller setting reduces the ability to carry out recreation via, largely, increases in recreation conflict (intra and inter-activity)

9 Conclusion

This review identifies the existing recreation values of the Tekapo Hydro Scheme, perceptions of change over time in those values, and how likely future changes in participation patterns will relate to the operation of the Scheme.

While the Scheme has clearly created a significant recreational angling opportunity within the Tekapo Canal, it has also significantly modified the recreation values of Lake Tekapo and the Tekapo River, although both settings maintain quality recreation opportunities. Walking and cycling options – notably the A2O cycleway – offer significant opportunities for visitors and residents.

Angling on the Tekapo River was highly popular until the introduction of didymo in 2007. Although angler days on the River have declined, it has retained reasonable levels of activity (in the words of an interviewee), especially at the opening of the season. Freedom camping along its bank adds to this attraction. Kayaking is provided for via the Tekapo White Water Course and in-river, and jet boating is also popular. Both activities are also affected by didymo.

Lake Tekapo supports a wide variety of on-water recreation activities and is the scenic backdrop to tourism in Tekapo township and the various tourism operations there, including scenic flights over the Lake. The consistent message from interviews is the effects of frequent and/or sustained periods of low lake levels, affecting access, the scale of the setting (and so the scale of recreation conflict), scenic values, the presence of navigation hazards, and dust in strong north-westers.

There is no evident trend in scheme-induced change in the study area, beyond the perceived increase in frequency and duration of low lake level events. Other changes in the setting are related to increased participation in recreation activities, and more diversity in the type of activities undertaken, particularly on Lake Tekapo, and the advent of didymo. Some interviewees referred to increased periphyton levels in rivers in the Waitaki catchment generally – attributed to more intensive agriculture – but in the case of the Tekapo River, didymo is the primary driver of dissatisfaction.

In the future, trends and modelling suggest that there will be increasing pressure on the waterbodies in the study area from recreation and tourism. Over the new consent period, activity levels have the potential to double, and will require focus on the delivery of recreation infrastructure (such as ramps, toilets and carparks) and on recreation management tools (such as fishing and navigation rules).

Overall, the scheme has provided significant recreational opportunities for angling, and the operation of Lake Tekapo for hydro generation maintains its traditional recreational and scenic values. Walking and cycling opportunities have developed around generation infrastructure and now provide significant activity opportunities for visitors and residents.

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Appendix 1: Recreation studies

Upper Waitaki Catchment Recreation Survey 2014

The following figures provide relative activity participation data for upper Waitaki catchment from Harris & Taylor (2014). Their study, undertaken for Environment Canterbury (ECan), did not include the lower Waitaki River and included Lake Tekapo. The results were gained via an online survey portal with respondents sought via advertising on the ECan website (front page), from recreational organisation websites, direct search, and from advertising on Google. A total of 562 responses were gained (60% directed from the ECan website and 20% from recreation organisations), and respondents referred to the use of 904 sites within the survey's study area (respondents could name more than one activity location, as well as more than one activity by location). The respondents were all self-selected and so do not represent a random sample of users of the survey's study area, and the results can therefore only be viewed as indicative of actual activity patterns.

The online tool relied on respondents identifying their activity locations on a map, and so the results appear as latitude and longitude coordinates. These have been converted into heatmaps showing high (red) and low (blue) levels of activity for the location identified. These location data can be tabulated by the activity identified by the respondents for that location. The following tables show results for all activity locations and for specific activities. The base data has been provided by the original report authors (for location and activity only) and reanalysed for this assessment.

Table 3 identifies all the activities identified by respondents. The following figures show the locations for relevant activities for this assessment. It appears from the data that many respondents have identified one base location for their visit and then named more than one activity for that setting – for example, canal fishing where there is no canal, or boating at Omarama. The three forms of fishing (lake, river and canal) have been combined into one figure, and also boating and water skiing. Interpretation of the results is necessary, and the results cannot be taken at face value (for example, not assuming that there is a boating facility at Omarama, but that activity is likely to have been undertaken by a respondent based at the township; and swimming at Lake Tekapo is likely to have been largely at Tekapo Springs).

Table 3: Activities by responses - Harris & Taylor (2014)

Activity	Count	Activity	Count
Sightseeing	419	4WD	63
Relaxing	406	Kayaking or canoeing	58
Hiking or tramping	224	Water skiing	45
Photography or painting	217	Climbing	38
Walking or running	211	Hunting	37
Picnicking	196	Rowing	19
Camping	176	Feeding the ducks	15
Fishing - lake	149	Sailing	10
Cycling	136	Ceremonial use (e.g. baptism)	9
Fishing - canal	128	Jet skiing	7
Boating	124	Customary activities	6
Night sky viewing	124	Eeling	3
Swimming or paddling	123	Collecting shellfish, watercress	1
Bird watching	102	Dragon boating	0
Fishing - stream	84	Waka ama	0
Skiing	66		

Figure 15: All activities by location - Harris & Taylor (2014)

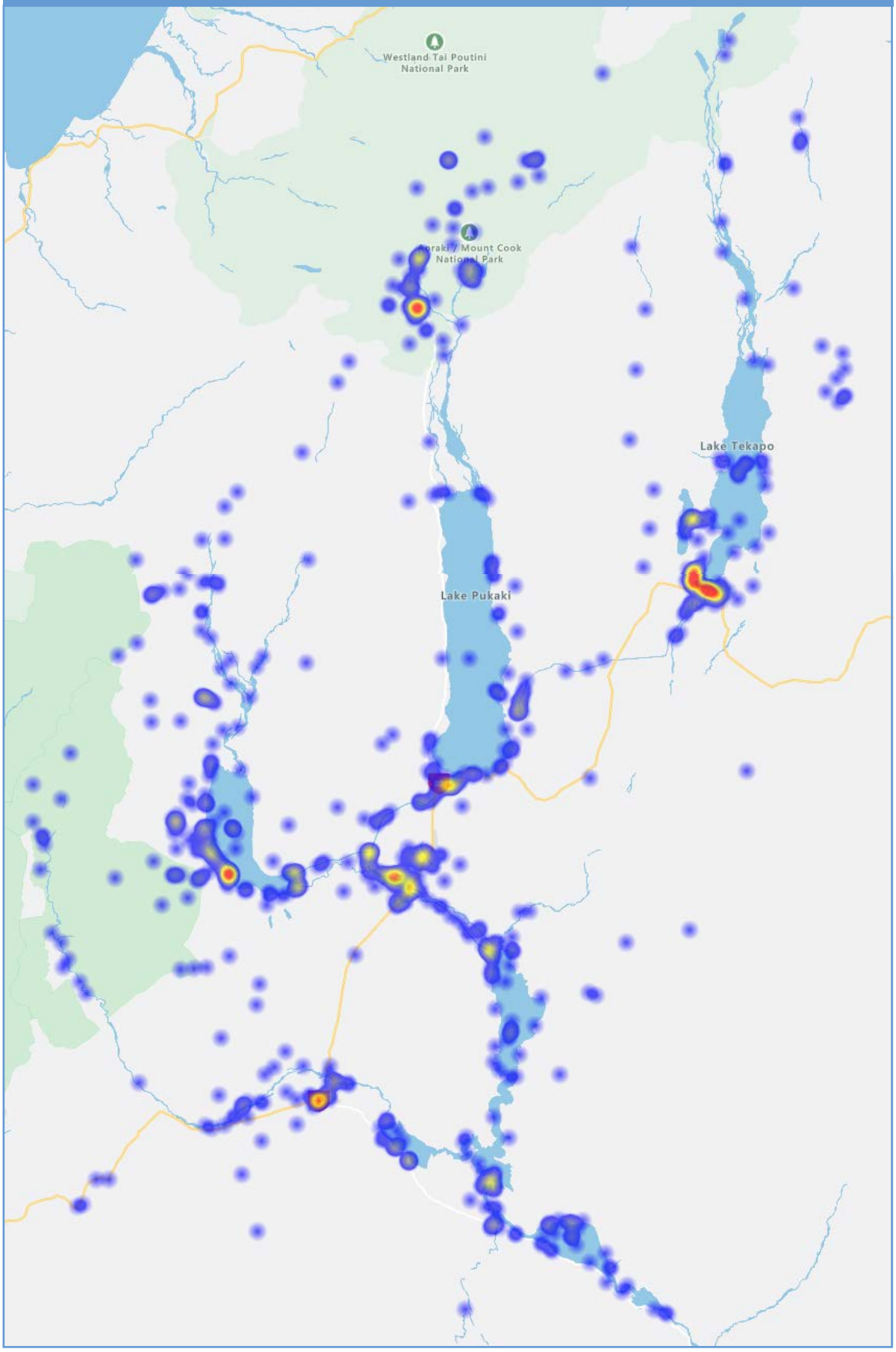


Figure 16: Lake, river and canal fishing - Harris & Taylor (2014)

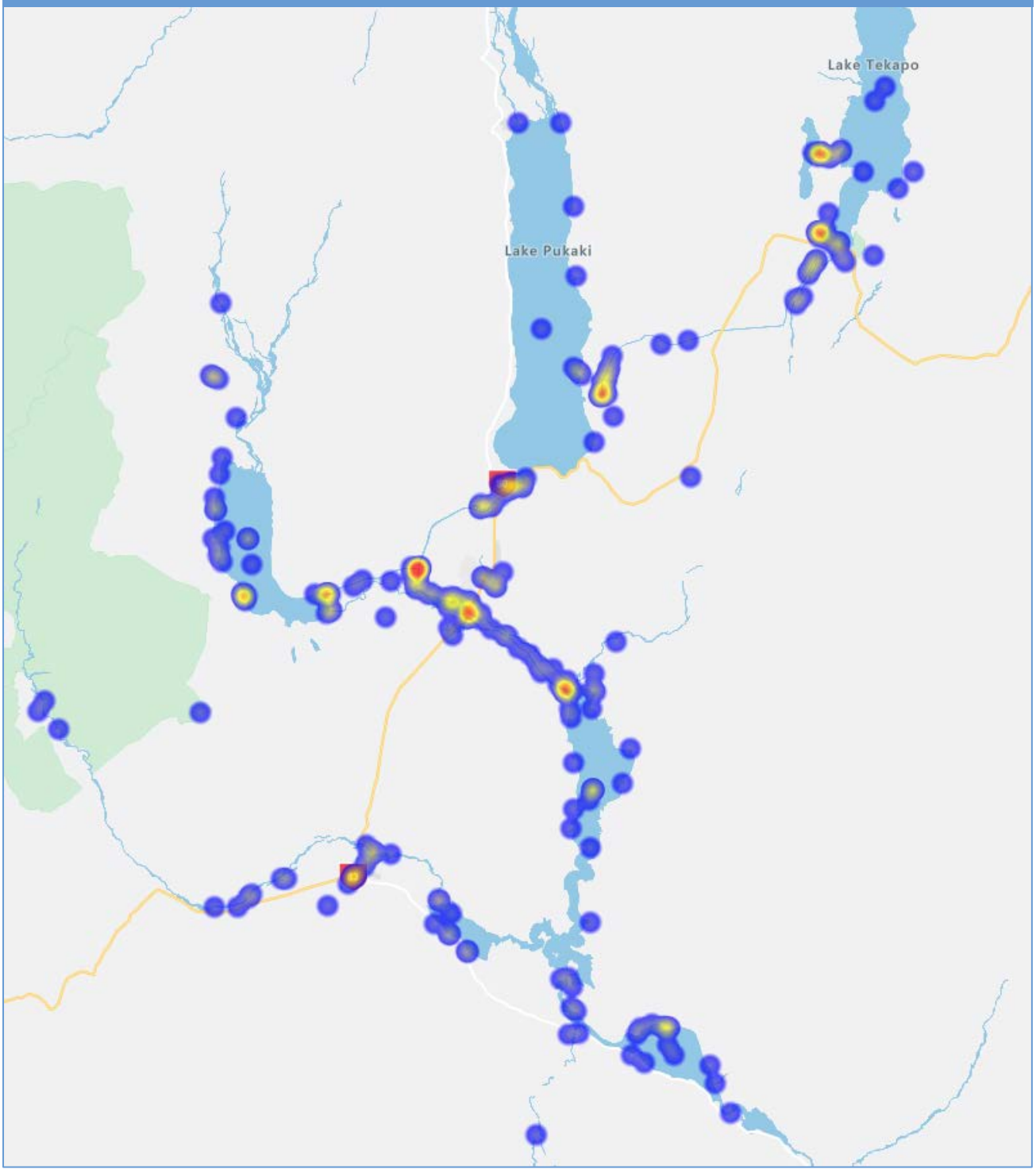


Figure 17: Boating and water skiing - Harris & Taylor (2014)

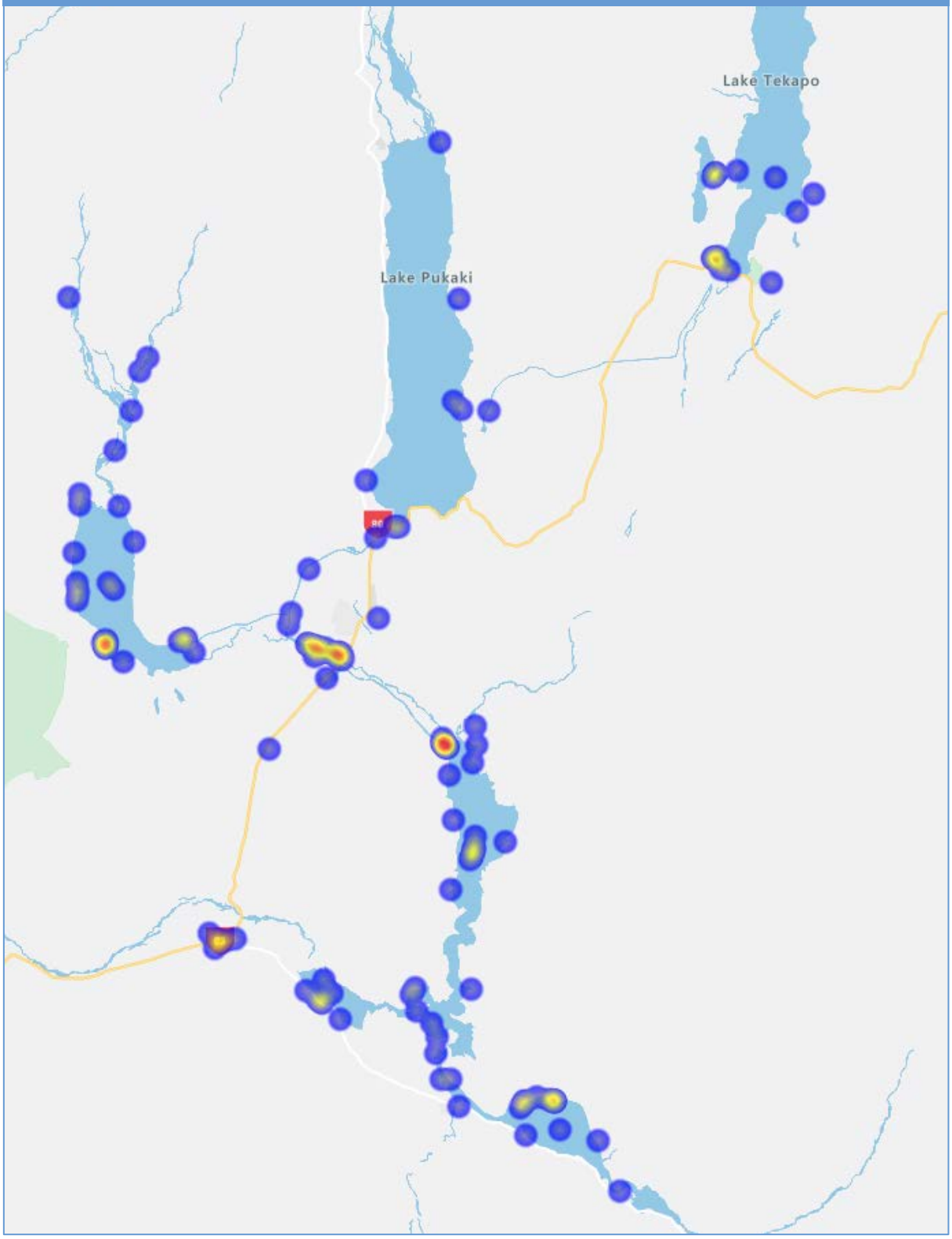


Figure 18: Bird watching - Harris & Taylor (2014)

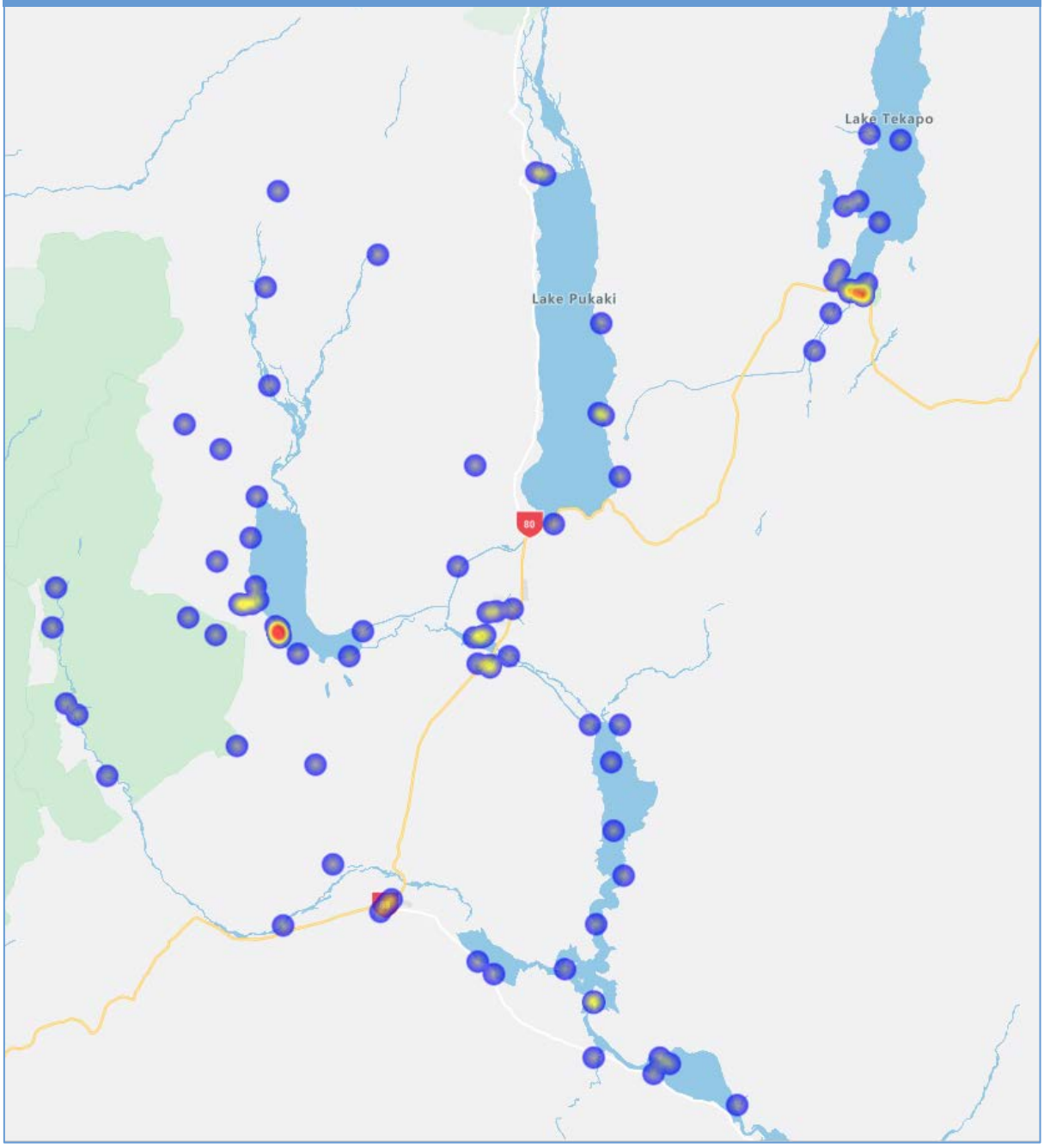


Figure 19: Canoeing and kayaking - Harris & Taylor (2014)

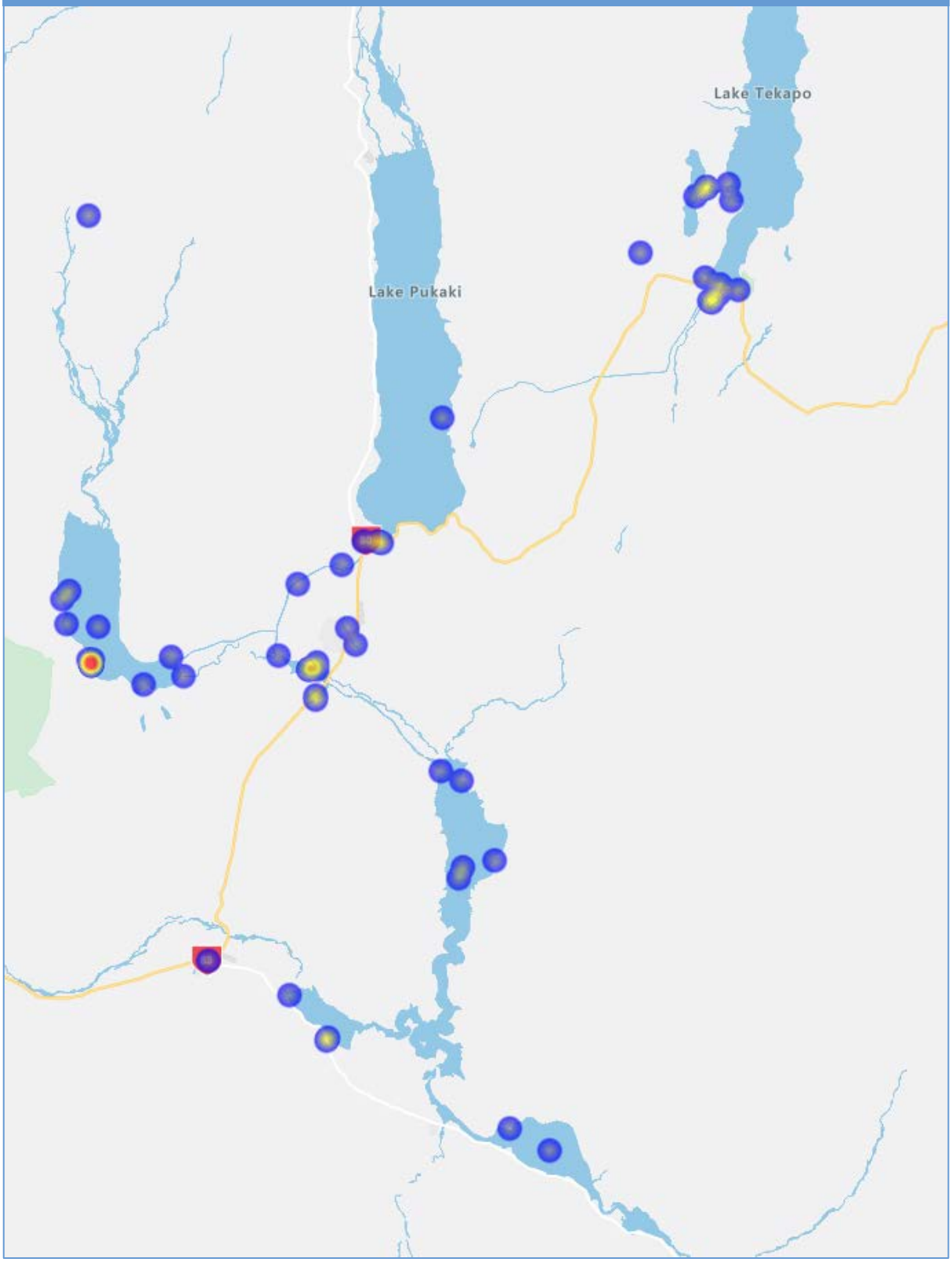


Figure 20: Sightseeing - Harris & Taylor (2014)

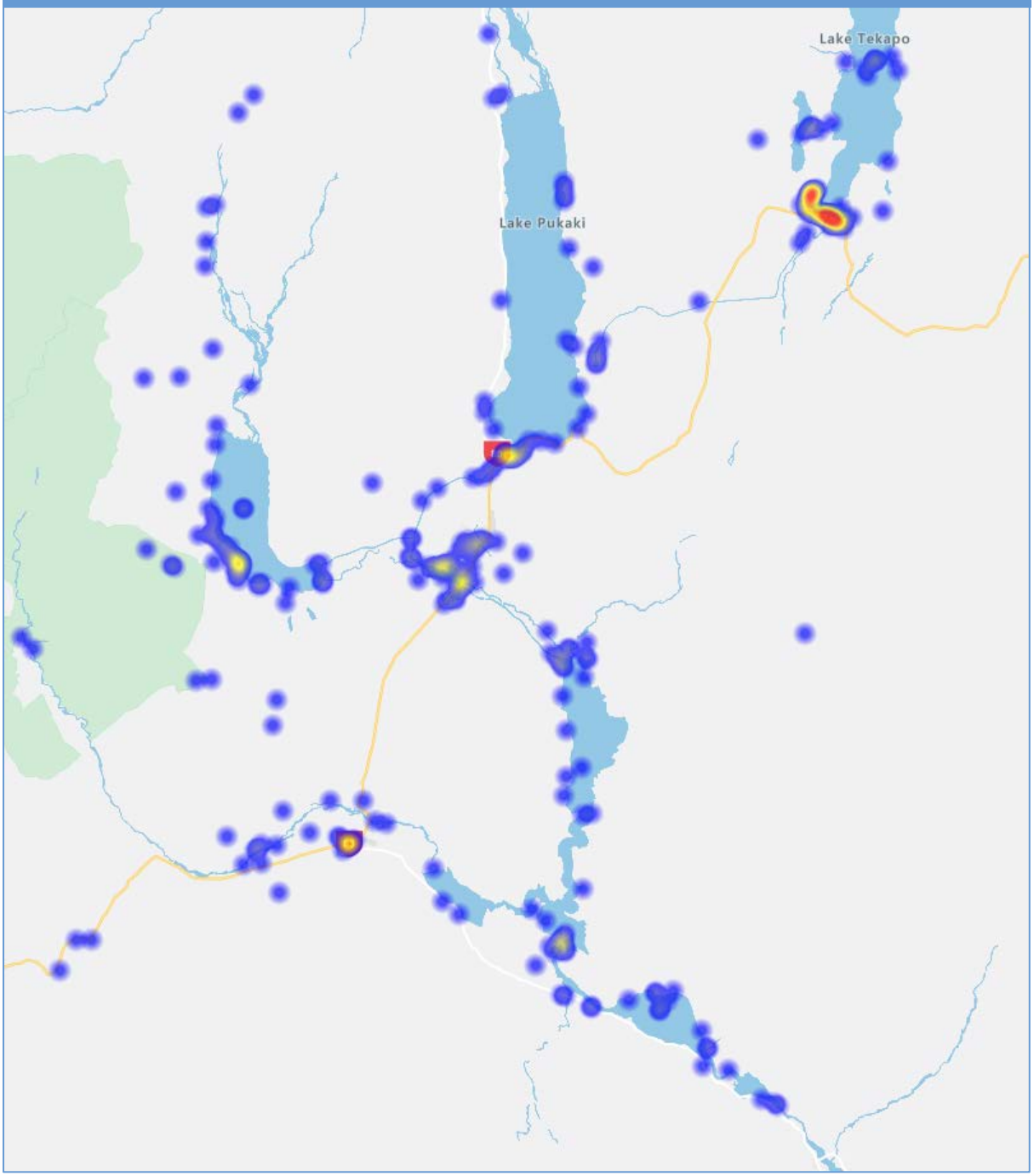


Figure 21: Swimming and paddling - Harris & Taylor (2014)

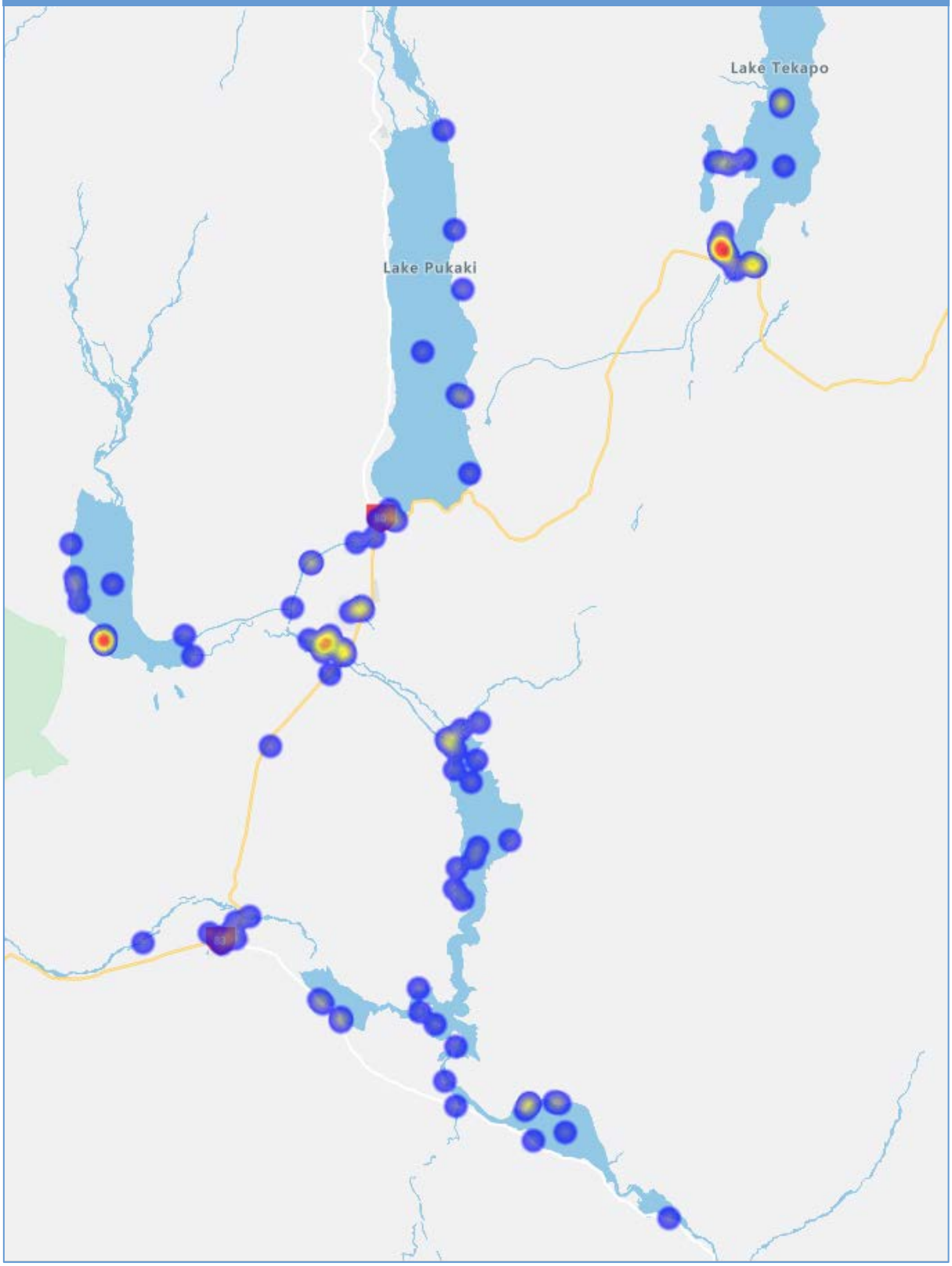
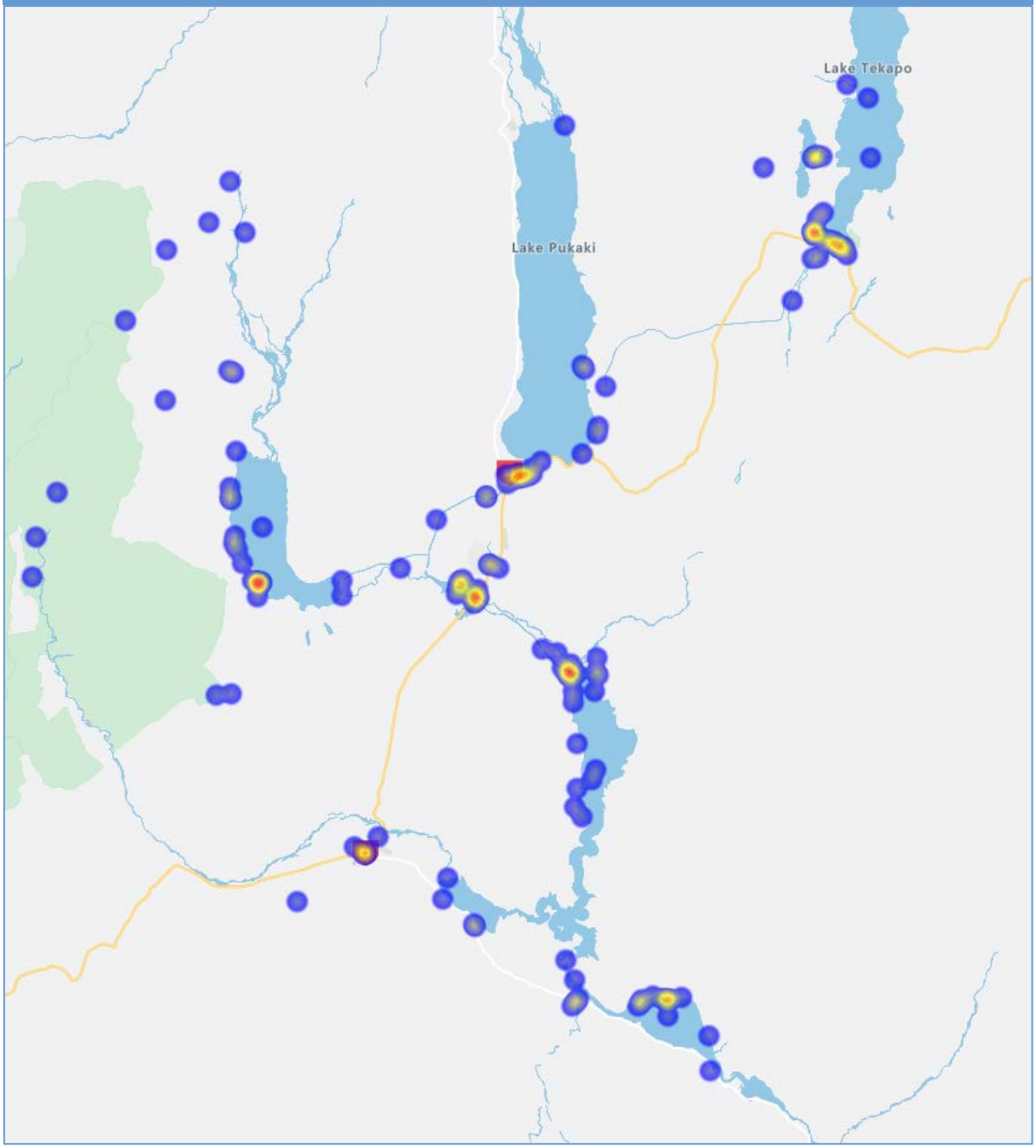


Figure 22: Camping - Harris & Taylor (2014)



Quantified Literature Review 2005

Noting that no quantitative research method had been applied to evaluating the recreation values of the entire Waitaki catchment, Greenaway (2005) – in evidence presented to the Waitaki Catchment Water Allocation Board – completed a quantified review of relevant popular guides to recreation and tourism in New Zealand (103 texts, with 374 references to recreation activities within the catchment), with a count of individual references to recreation activities and opportunities within the catchment. The objective of the study was to identify where activities occur, and which destinations were most heavily recommended for specific activities. While the results cannot be used to directly reflect user numbers per site and activity, they offer guidance when assessing the significance of a site for recreation generally, and the occurrence of specific activities.

Figure 23 presents the findings for activities which gained five or more references, by location.

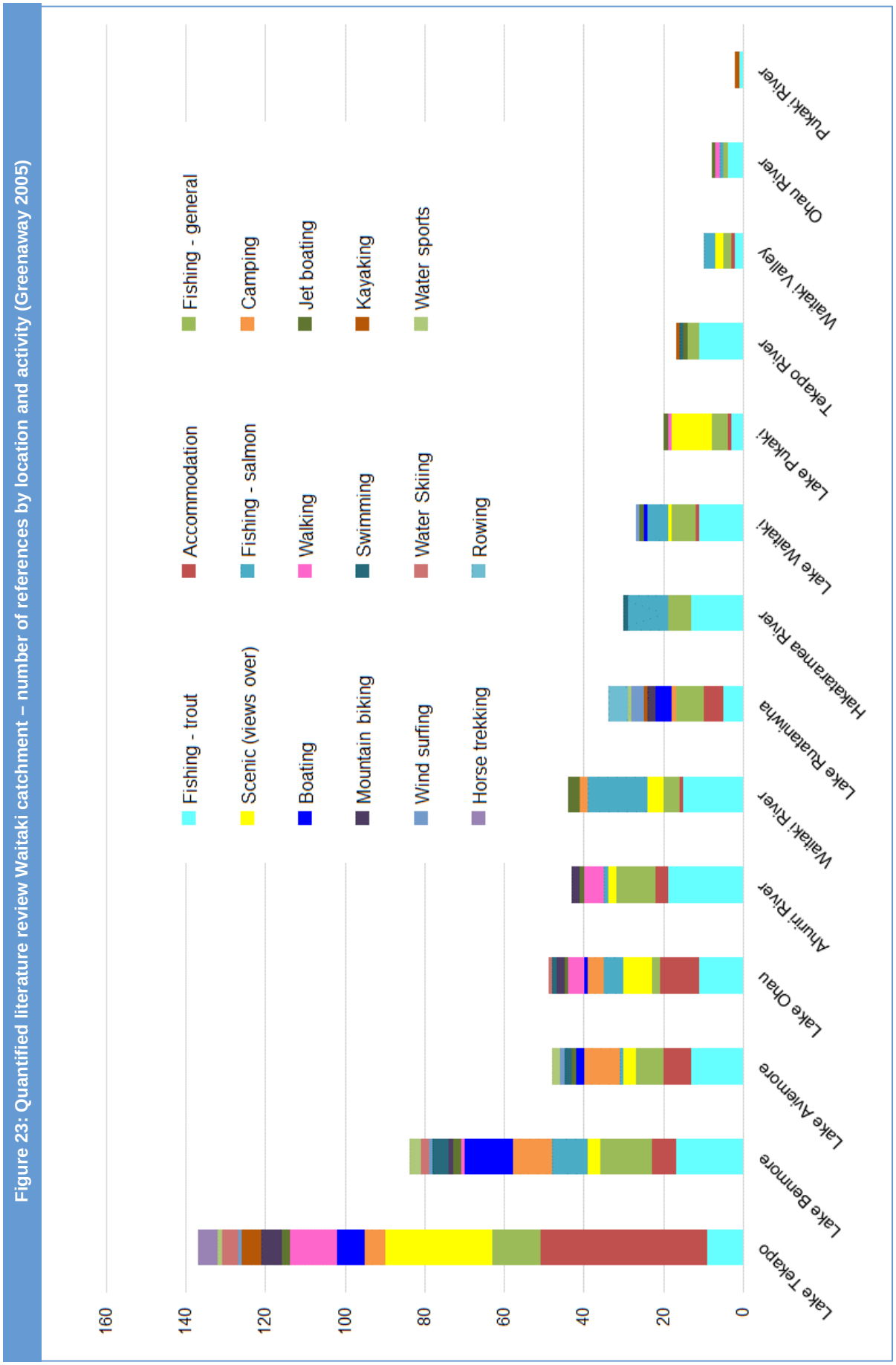


Figure 23: Quantified literature review Waitaki catchment – number of references by location and activity (Greenaway 2005)