

# Whakapapa & Whanganui River Angler Use Monitoring Study

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## EXECUTIVE SUMMARY

In response to concerns of increased angling pressure caused by mountain bike and ATV tracks, Auckland/Waikato Fish and Game staff conducted an extensive angler monitoring programme on the Whakapapa and upper Whanganui rivers from October 2014 to October 2016. Camera traps were placed at a total of 25 locations and successfully recorded for a total of 8,441 monitoring days. Of the 498 river users recorded, 87% were anglers 88% of whom were male fly fishermen. The majority of the non-anglers recorded were Department of Conservation staff (11%). The remaining 2% of river users were not carrying fishing equipment and were presumably either hunters, rafters or hikers.

Overall fishing pressure was extremely low with a pooled average of only two anglers per month. Additionally only four anglers (1% of anglers) were recorded carrying dead fish including three spin fishers (6% of spin fishers documented), indicating further rule changes to enhance the fishery (e.g., fly fishing only areas) would achieve very little in terms of reducing fishing pressure or improving fishing. Fishing pressure declined as total travel distance increased but usage was highly variable. One of the highest use sites was relatively remote but was frequented by a guide with clients due the availability of farm tracks and accommodation.

The study had a secondary goal of determining if additional public access was needed on the upper Whakapapa River. This section of the river has public access on the riparian margin that is not easily accessible because it is landlocked by private property and can only be reached by a long hike up or down the river. The three sites monitored within the landlocked area had less than half ( $1.2 \text{ anglers month}^{-1}$ ) the angler use that was recorded on the other more accessible sites ( $2.5 \text{ anglers month}^{-1}$ ). The camera data indicates that despite guides accessing the landlocked area via private land, this section of the river is underutilized and purchasing land to open access would be warranted.

The Whakapapa and upper Whanganui rivers are important strongholds for the endangered blue duck (*Hymenolaimus malacorhynchos*). Excessive human traffic is seen as a potential threat to blue duck breeding success. However the low level of river use recorded during this study is unlikely to impact blue duck breeding success.

Predators were documented on the camera traps including a cat stalking the shoreline at night and a swamp harrier (*Circus approximans*) attacking dabbling ducks. Due to land use change and an abundance of road kill, the current swamp harrier population is likely to be far greater than the pre settlement population and could pose a significant threat to the survival of young blue ducks. A New Zealand falcon (*Falco novaeseelandiae*) was also documented perched above a pool on the upper Whanganui River.

## INTRODUCTION

Anglers cherish backcountry fisheries because of the high fish numbers, solitude and the chance of encountering a trophy fish. Trout in backcountry rivers are also relatively easy to catch as they are far less likely to be fished for by anglers (Young & Hayes, 2004). Traditional methods of estimating angler use such as phone surveys are notoriously inaccurate due to false reporting, biased sample group (only licensed fishers are called), and misidentification of place names. Traditional methods also lack the ability to assign angler use to sub-reaches making the data of limited use to managers. Field based angler surveys tend to work well in high-use areas, but are impractical to conduct in remote or backcountry fisheries that are highly valued by anglers.

Camera traps offer a low cost method of directly monitoring anglers use in both easily accessible and remote fisheries. Camera traps are commonly used to study animal behavior and are well suited for remote field use (Rovero, Zimmermann, Berzi, & Meek, 2013) and detecting large mammals (Coltrane & Sinnott, 2015; Duke & Quinn, 2008). Anglers are ideal subjects for camera traps due to their large size and relatively slow speed. Additionally, the nature of fishing relatively swift or deep rivers restricts anglers to travelling along the river's edge where they are easily detected.

Maintaining quality fisheries requires a range of regulatory tools backed up by accurate monitoring data. Fish and Game carries out annual drift dives on two reaches of the Whakapapa to monitor fish numbers and size over time. Unfortunately the upper Whanganui, despite running parallel through the same forest as the Whakapapa, is too turbid for drift dive surveys (Daniel, 2016). The National Angler Survey provides information about angler use on a broad scale from telephone interviews (Unwin & Rouse, 2016). The upper Whakapapa is currently managed as a trophy rainbow trout fishery and bait fishing is not allowed on either river.

Angler use has been studied in terms of the accessibility of fisheries and the population of anglers within driving distance (Post, Persson, Parkinson, & Kooten, 2008) and the travel cost from the residence of urban anglers (Hunt, Arlinghaus, Lester, & Kushneriuk, 2011). However, direct uses of fisheries or the use in relation to multi-use trails has not been studied in New Zealand or abroad.

## STUDY SITE

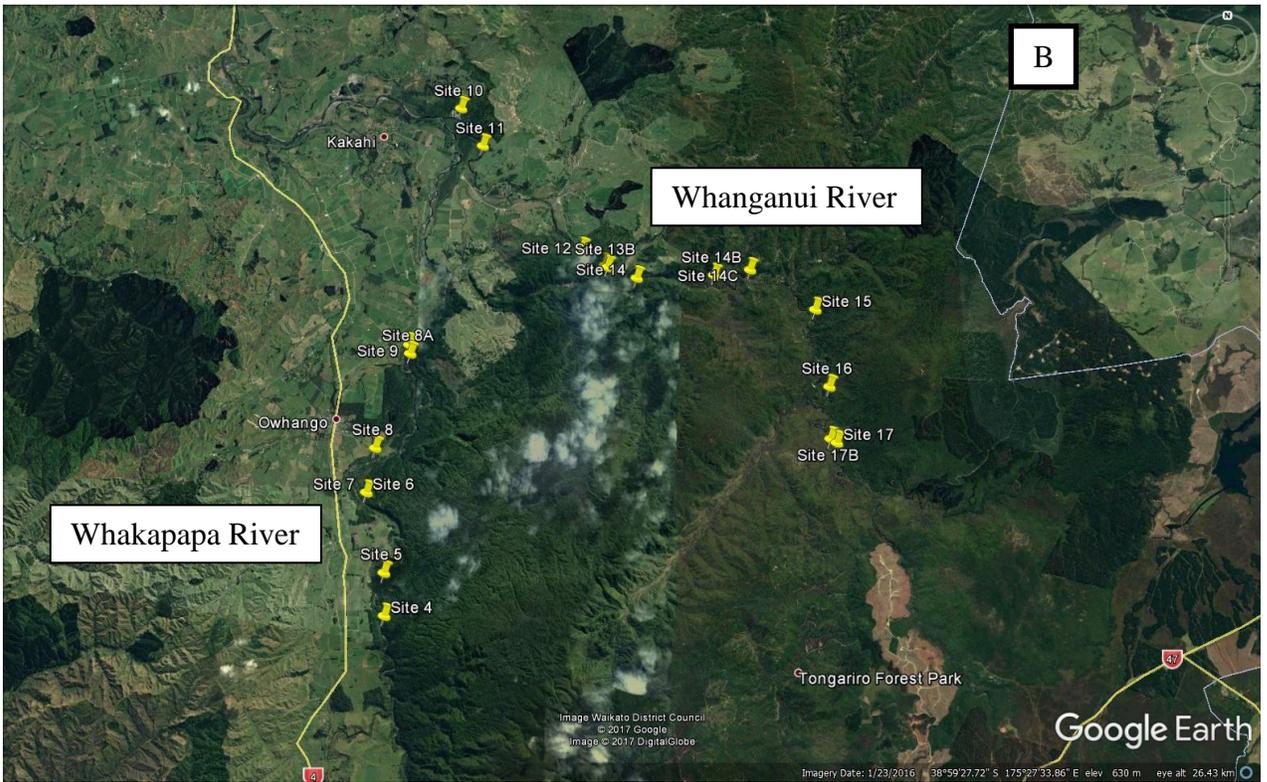
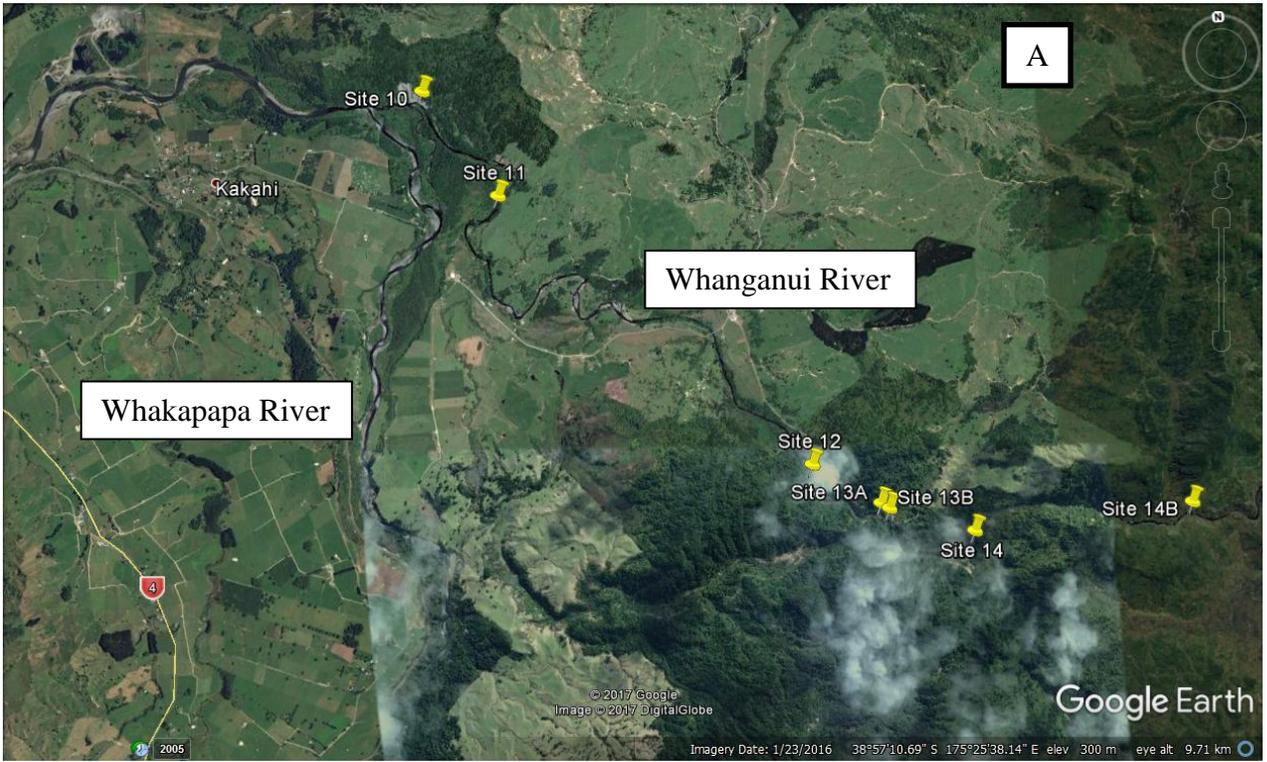
The upper Whanganui and the Whakapapa are large backcountry rivers in the southern Auckland/Waikato Fish and Game Region. Both rivers were highly regarded in the mid-20th century for producing trophy trout in excess of 10 lbs. but the fisheries declined after the Tongariro power scheme diverted much of their flows into the Waikato catchment. The 1995/96 Mt. Ruapehu eruptions further devastated the fisheries due to heavy volcanic ash flow. However, minimum summer flows have been raised and most of the ash has flushed from the system. Annual drift dives indicate the Whakapapa fishery is in prime shape compared to 20 years ago (Daniel 2016).

Both rivers originate on the slopes of Mt Ruapehu and are cold, swift and clear within Tongariro National Park. Water clarity in the upper Whanganui catchment is impacted by current and historical forestry with a mix of second growth shrub and plantation forestry. The Whakapapa River is impacted by agricultural runoff, primarily from the Piopioea catchment, and volcanic activity continues to be a threat to the river.

## METHODS

The goal of the study was to monitor angler use on the Upper Whanganui and Whakapapa rivers using trail cameras. Sites were randomly selected by dividing the study area into 0.5 km reaches including 55 on the Upper Whanganui (27.1 km) and 68 on the Whakapapa (33.7 km). Each of the 123 reaches were assigned a whole number (1-123) and a web based random number generator (<http://www.random.org>) was used to select 30 sites (15 on each river) with two spare sites in case a suitable location could not be found on a randomly selected location.

Each reach was inspected on foot to select a fishable pool, with a tree within triggering range of the trail camera. Locations that were not physically accessible (gorges or private property) were excluded due to the inability to set cameras. Camera traps were placed on the largest pool within selected reaches with restricted bank access so anglers were unable to walk outside the camera trap detection range. Although in some cases, anglers could potentially walk behind cameras anglers who were actively fishing were highly likely to be detected. As rafters could float beyond the range of the cameras, there was a potential for underestimating rafting use. However, due to the distance covered by rafters, their chance of detection was high compared to an angler (e.g., rafters can travel  $>15$  km day<sup>-1</sup> and anglers travel  $< 5$  km when fishing). Rafters detected on one camera were normally picked up on multiple cameras during their journey indicating a reasonable detection rate. Cameras were tested during each download to ensure operation and range. It was assumed that because the rivers are only accessible by raft or kayak that there was no fishing from boats. If cameras were stolen an alternative site within the same reach was used to prevent further theft. Several locations were excluded due to inaccessibility, mainly due to access being denied to private land. In total 24 sites, 12 on each river, were successfully monitored (Figure 1; Table 1).



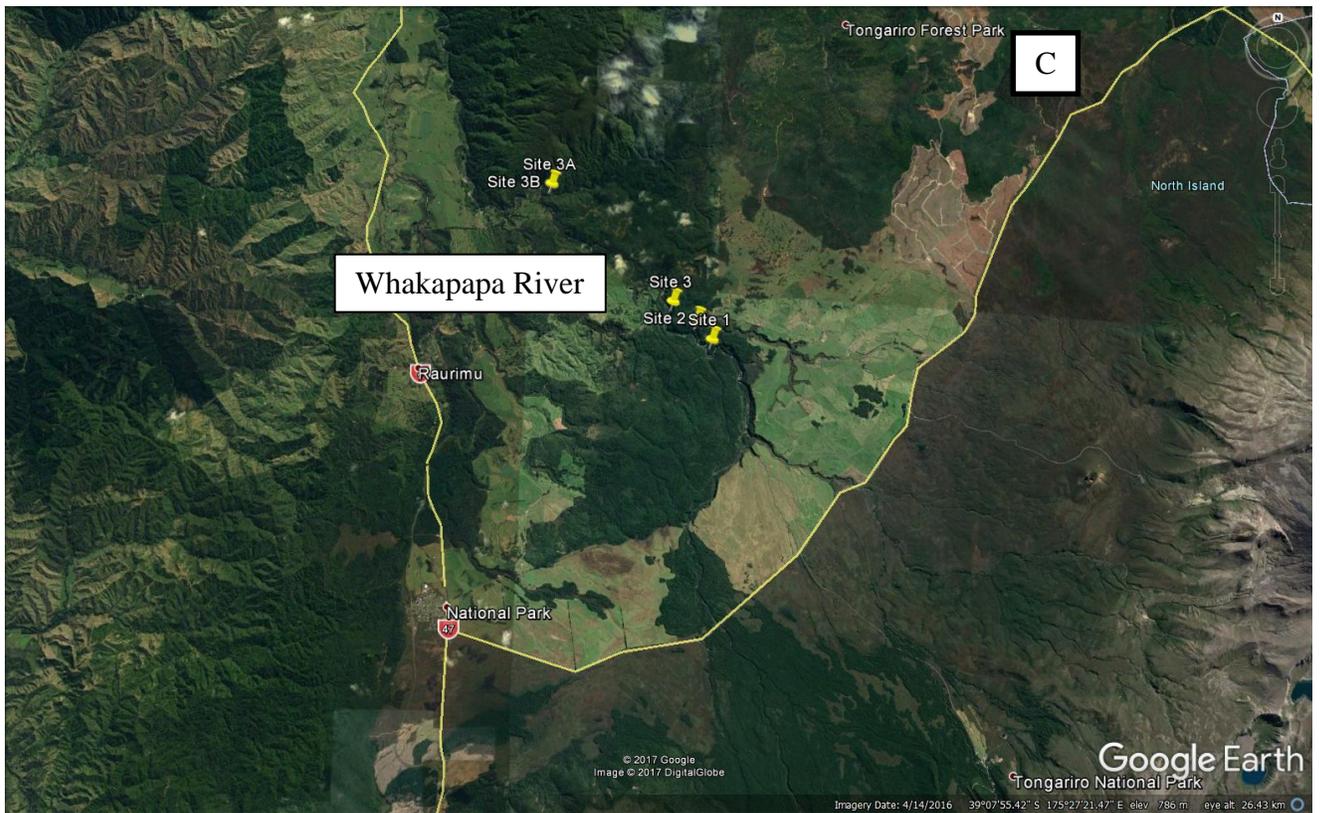


Figure 1. Locations of cameras on the Whakapapa and upper Whanganui rivers (A-C). Site names and locations are shown in yellow.

Table 1. Study sites successfully monitored including the river, site identification and coordinates of the site.

River	ident	Latitude	Longitude
Whakapapa	Site 1	-39.1193	175.4688
Whakapapa	Site 2	-39.1153	175.4648
Whakapapa	Site 3	-39.1114	175.4583
Whakapapa	Site 3A	-39.0867	175.4251
Whakapapa	Site 3B	-39.0867	175.4251
Whakapapa	Site 4	-39.0412	175.3922
Whakapapa	Site 5	-39.0322	175.3917
Whakapapa	Site 6	-39.0153	175.3859
Whakapapa	Site 7	-39.0103	175.3824
Whakapapa	Site 8	-39.0058	175.3879
Whakapapa	Site 8A	-38.9852	175.3965
Whakapapa	Site 9	-38.9833	175.3962
Whanganui	Site 10	-38.9301	175.4084
Whanganui	Site 11	-38.9386	175.4149
Whanganui	Site 12	-38.9615	175.4437
Whanganui	Site 13A	-38.9650	175.4502
Whanganui	Site 13B	-38.9654	175.4510
Whanganui	Site 14	-38.9678	175.4592
Whanganui	Site 14B	-38.9670	175.4809
Whanganui	Site 14C	-38.9656	175.4910
Whanganui	Site 15	-38.9742	175.5092
Whanganui	Site 16	-38.9910	175.5131
Whanganui	Site 17	-39.0031	175.5151
Whanganui	Site 17B	-39.0023	175.5134

Ltl Acorn 12 mega pixel trail cameras (model 5010A) with 0.8 second trigger time set off by dual 100° and 35° PIR sensors were used during the study. Cameras were set on medium sensitivity and took three consecutive pictures. Each camera trap had a maximum range of 20 m and was tested to ensure that anglers could not under normal circumstances pass the camera without being detected. Cameras were equipped with an IR flash capable of illuminating large objects at distances of up to 20 m in complete darkness. All photos were taken with the permission of the Department of Conservation and all camera sites were on public land located at least 0.5 km from carparks.

Cameras were downloaded every three to five months and pictures were sorted manually by viewing each photo as a thumbnail. A secondary check of 50% of the files was conducted to ensure quality control. Individuals were only counted once at a site per day (angler-day) but may have been counted on multiple days at the same site. Individuals counted were placed into four user groups: fly fishers, spin fishers, hunters and other (hikers, rafter and DOC staff).

Analysis of river use was performed by dividing the number of individuals sighted

(angler-day) at a camera site by the days the camera successfully operated during the fishing season (October 1-June 30). Photos stored by the cameras were automatically time and date stamped. Total use included all users regardless of the fishing season. Travel distance was calculated from the nearest accessible road (paved or unpaved). Travel time was determined by calculating the distance from the nearest track or road plus the walking distance multiplied by the travel speed. Travel speed was added using the average travel speed of staff during the study when able to travel by ATV ( $10 \text{ km h}^{-1}$ ) and on foot ( $3 \text{ km h}^{-1}$ ). Travel speeds were based on the actual time to reach sites within the study area and are relatively slow reflecting the difficult nature of travelling on the rugged terrain. Travel time and distance were then compared to monthly angler use based on a 30.4 day month.

## **RESULTS**

Cameras successfully monitored a combined total of 8,493 days (6,509 in the fishing season October 1-June 30) between October 2014 and October 2016. Cameras did not have uniform coverage due to battery limitations, theft and camera failure. Monitoring periods of each site are displayed in Appendix A. Camera traps recorded over 23,000 images including 498 river users (259 at Whakapapa sites; 239 at Whanganui sites). The overall mean and the mean for each river individually were 2.0 anglers per month during the fishing season. Angler use per month varied from 0.0-5.0 (Table 2) at individual sites. The highest use locations were generally closer to access points or those with short walking tracks. The vast majority of river users were anglers (87%) and of the anglers 88% were fly fishermen (Figure 2). Excluding DoC staff and individuals that accompanied fishing parties (guides and partners) only 12 (<2%) of the 487 river users were not involved in fishing activities.

Table 2. River site and anglers detected per month for all sites on the Whakapapa and Whanganui rivers. Note that site data is only for general comparison as data was not collected during the same time period at all sites. “Days monitored” are the number of days cameras operated during the fishing season, “Visitors” is the total number of people counted at a site regardless of user group: “Fly” fly anglers, “Spin” spin anglers, “Anglers month” means the number of anglers photographed based on a 30.4 day month.

River	Site	Days monitored	Visitors	Fly	Spin	Anglers month
Whakapapa	Site 1	203	7	6	1	1.05
	Site 2	574	70	51	0	2.70
	Site 3	94	8	8	0	2.59
	Site 3A	112	4	2	0	0.54
	Site 3B	232	5	4	0	0.52
	Site 4	349	35	27	8	3.05
	Site 5	469	13	13	0	0.84
	Site 6	261	4	4	0	0.47
	Site 7	482	55	50	4	3.41
	Site 8	188	35	29	2	5.01
Whanganui	Site 8A	15	7	0	0	0.00
	Site 9	492	16	12	2	0.87
	Site 10	522	91	52	24	4.43
	Site 11	201	12	5	4	1.36
	Site 12	521	23	20	1	1.23
	Site 13A	71	5	2	0	0.86
	Site 13B	311	23	20	0	1.95
	Site 14	545	15	14	1	0.84
	Site 14B	116	8	4	0	1.05
	Site 14C	127	4	4	0	0.96
Site 15	246	22	19	0	2.35	
Site 16	152	18	11	3	2.80	
Site 17	112	17	15	0	4.07	
Site 17B	114	1	1	0	0.27	

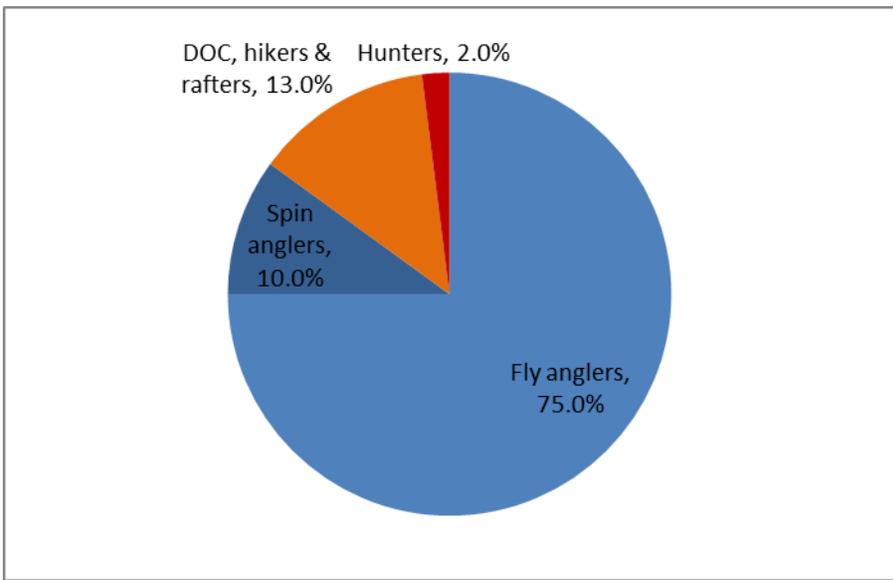


Figure 2. Pie chart showing the percentage of users assigned to each category of river users including fly anglers, spin anglers, hunters and other users (DOC staff, hikers and rafters).

To access many of the camera sites anglers had to travel off road by ATV or bike and then walk from the track to the river. Angler use declined during the first 1.5 hours travel time with a distinct peak at sites with travel times of more than 1.5 hours (Figure 3). Similarly angler use declined with total travel distance up to the 6.4 km mark where there was an increase in use (Figure 4). The higher use at sites with extended travel times or distance are inflated by sites near camps or huts where anglers were observed making day excursions on multi-day trips.

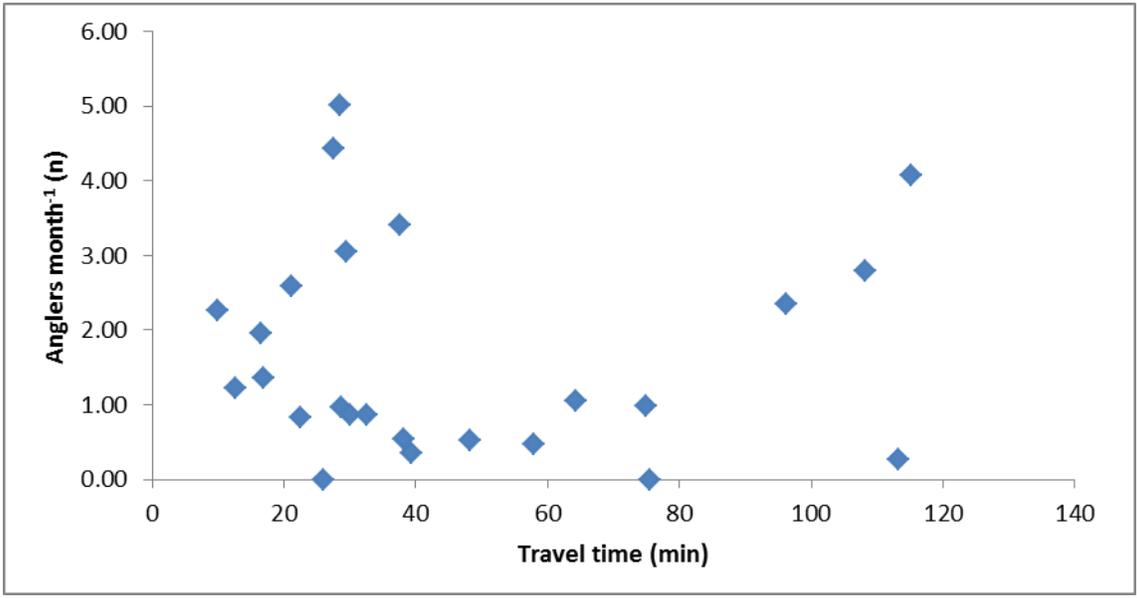


Figure 3. Relationship between angler use and estimated travel time from the nearest carpark.

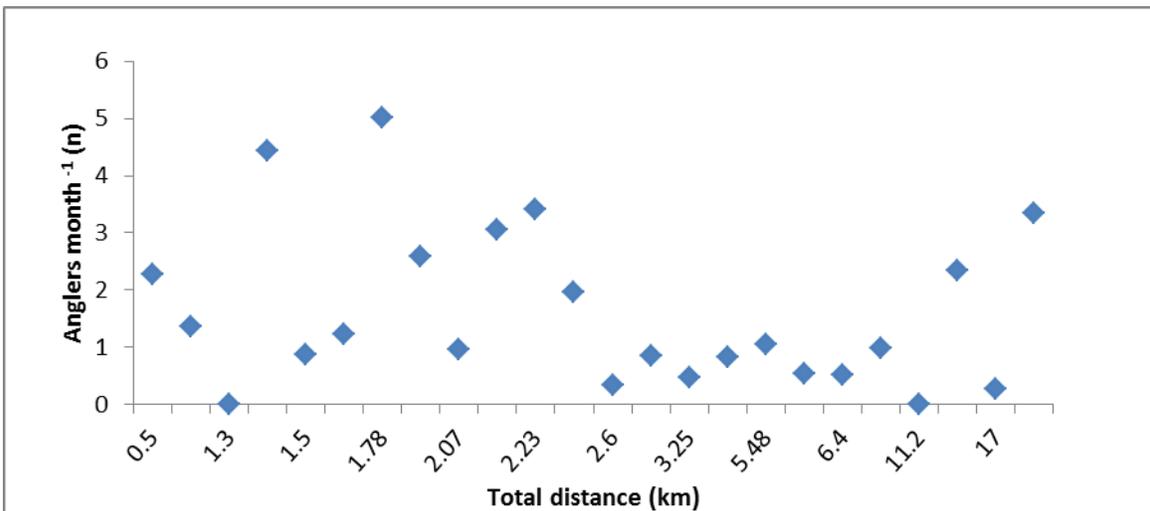


Figure 4. Relationship between angler use and estimated total distance travelled (km) from the nearest carpark.

Angler use in terms of walking distance (ATV or biking distance excluded) generally declined as walking distance increased (Figure 5). It is important to note that sites with a total travel distance of less than 0.5 km from carparks were not monitored.

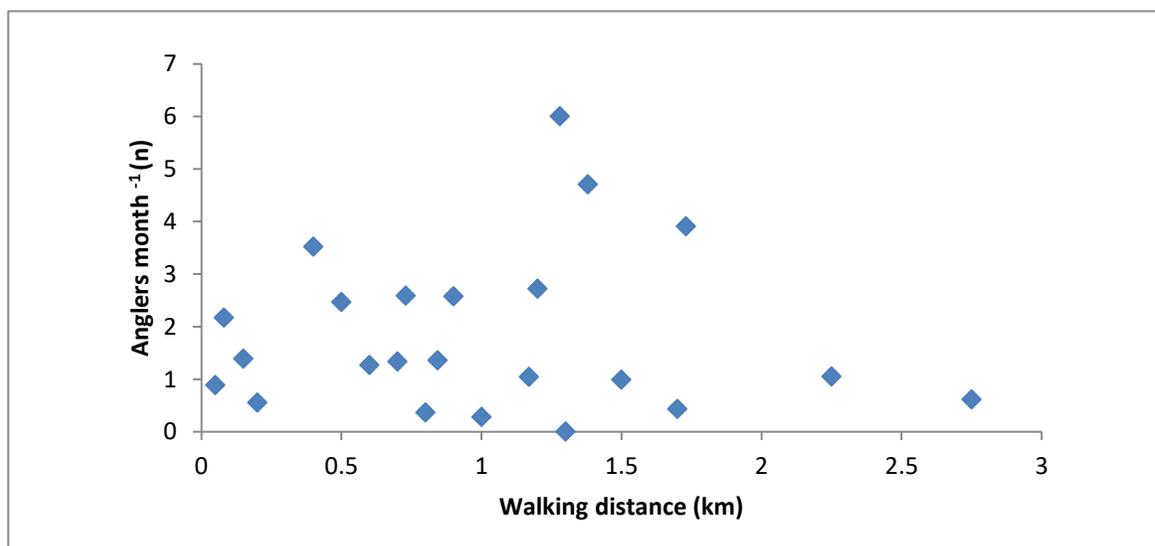


Figure 5. Relationship between angler usage and walking distance. This figure excludes the distance traveled on ATV or bike.

Although spin fishers only represented 12% of all fishers, distinct differences in behavior were observed between spin and fly fishers. Spin fishers were more likely to be located closer to carparks than their fly fishing counterparts (Figure 5). Four anglers were seen with dead rainbow trout confirming a proportion (<1%) of the fishing community are retaining fish on both the Whakapapa and Whanganui rivers. Only one of the four fishermen photographed (Figure 6) with dead fish was a fly fisher (<0.03% of fly). Although a higher proportion of spin fishers were photographed with dead fish (6%), they still represent a very small number of anglers overall.

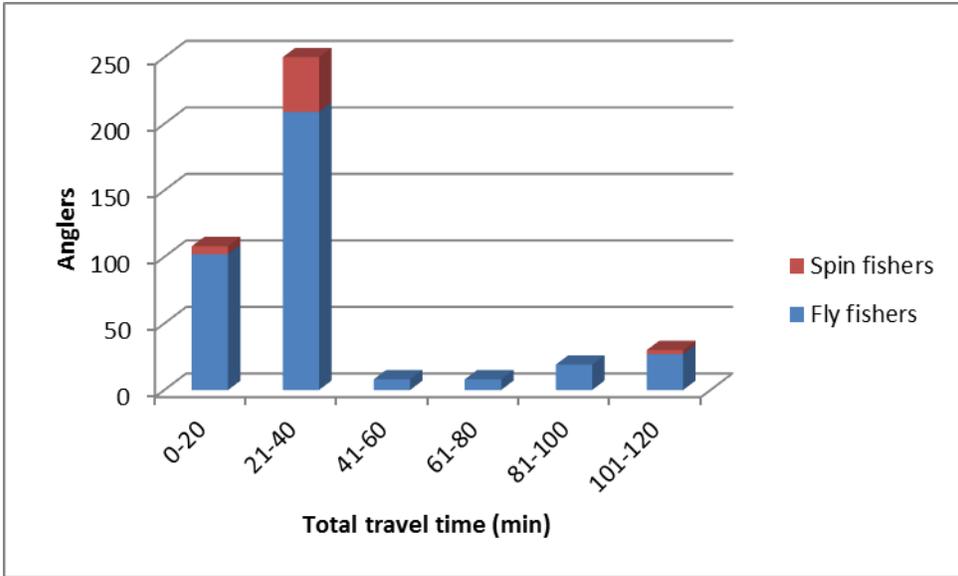


Figure 5. Relationship between angler method and total estimated travel time.

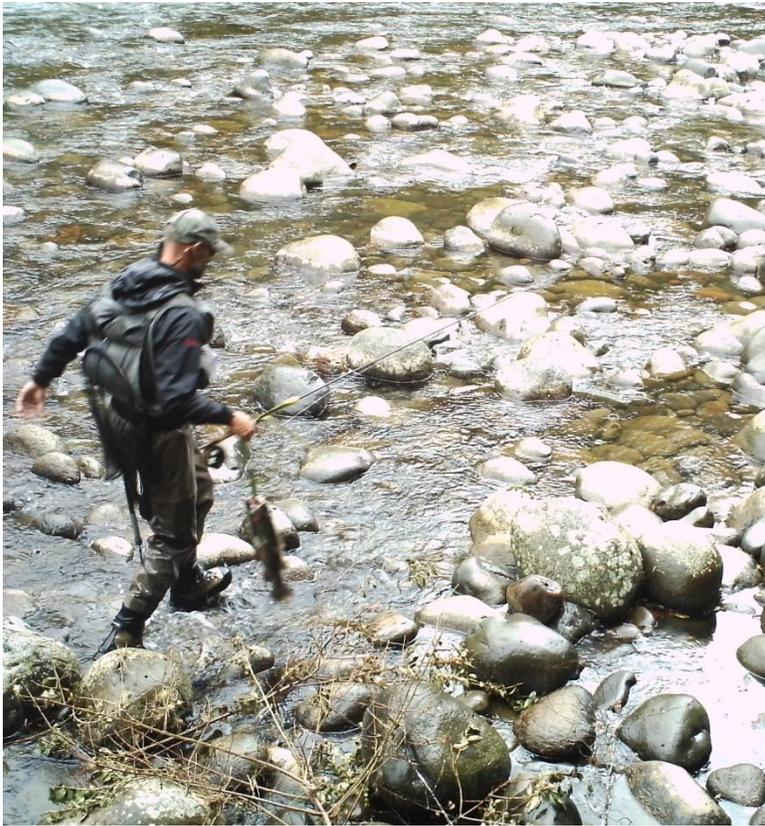


Figure 6. Fly fisher with a harvested rainbow trout.



Figure 7. Spin fisher with a harvested rainbow trout. The second angler just visible on the right is holding a spinning rod.

## DISCUSSION

The concept of using trail cameras to monitor angler use was highly successful resulting in high quality images with high detection rates based on blind checks from anglers unaware of the study (including two Fish and Game staff; Figures 8 & 9) and pre-download checks. Overall the study yielded ample data that has provided a good basis for future management of both the Whakapapa and upper Whanganui rivers. The ability to see anglers using the resource allows for a much better understanding of not only the fishers in the area but also the potential impacts of additional improvements in access.



Figure 8. Fish and Game staff member Ben Wilson photographed on the Whakapapa River.



Figure 9. Fish and Game staff member Glen Maclean fighting a fish on the Whakapapa River with a second angler waiting to net the fish.

Angler use was highly variable due to multiple modes of transport and access, with areas close to overnight accommodation (huts, camps or private accommodation) having high use despite being remote. Unofficial quad bike tracks cut away from existing multi-use tracks substantially increase the use of river reaches by reducing walking distances. Angler behaviour also impacted use. Two access points were monitored from both up and downstream sites providing the opportunity to look at angler preference. Anglers were far more likely (three and six times respectively) to travel in the upstream direction.

Areas where guides were operating on private land that provided drive up access via ATVs had amongst the highest angler use, excluding sites with direct access from carparks. Fishing pressure was up to twice as high as on public land accessed via private land where guides were operating, compared to public land with public access. Guides were located on both private and public land throughout the study area, and frequently used ATVs to bring clients into remote sites. Anglers often used modes of transport other than walking to access remote study sites and relied heavily on access via the 42nd Traverse Trail and farm tracks.

### **Management implications**

Information on the makeup of anglers (nearly all male fly fishers) is crucial to managing public relations, education and future rule changes on the Whakapapa and Whanganui rivers. Drift diving surveys on the Whakapapa River have documented similar numbers of large trout in both areas of high angler use and remote sites (Daniel, 2014). The low number of anglers photographed with dead fish (<1%) during this study would explain the similarity between sites in terms of fish numbers. Similarly the low number of spin fishers documented would severely limit the impact of further gear restrictions like designating fly fishing only waters. The low number of spin fishers documented in this

study and high number of people accessing the Tongariro Forest for other activities (hiking, hunting and biking) suggests that spin fishing is not being promoted enough amongst other groups of outdoor enthusiasts.

In terms of maintaining a positive angler experience in backcountry rivers most anglers base their satisfaction on scenery, not seeing other anglers (Beville & Kerr, 2008) and hooking large fish (Unwin, 2013). It is also widely accepted that fish sulk or change their behavior, including not feeding for up to 24 hr after a negative experience and becoming more susceptible to spooking (Young & Hayes, 2004). The low number of anglers overall is highly unlikely to impact angler satisfaction. However, it is possible that sites with walking access from carparks could be pushing the boundaries of reduced angler satisfaction. Management options for maintaining low angler numbers would be limited to using a permit system for the upper Whakapapa River as designating the area as “fly fishing only” or “catch and release only” would have little or no impact on areas more than 0.5 km from a carpark.

The impact of fishing pressure on blue duck (*Hymenolaimus malacorhynchos*) survival is unlikely to be an issue considering the low number of users detected in this study. However, it is apparent that in terms of educating the public on the risk of disturbing ducks with ducklings the fishing community is clearly the primary user group in blue duck habitat. Camera traps used in the Angler Use Study captured photos of multiple predators including a cat stalking the riverbank and looking into the river at night, and a harrier (*Circus approximans*) attacking ducks on the Whakapapa River. Although the trapping programme on the Whakapapa and Whanganui rivers is comprehensive, the lack of harrier control is a noticeable gap in the recovery programme. Due to habitat modification and road kill from invasive species like the possum (*Trichosurus vulpecula*), it is likely that harrier densities are far higher than historic levels. Also of note was a lack of dogs photographed in the interior of the park. The only dogs photographed in the study were being walked near the settlements of Kakahi and Owhango.

### **National Angler Survey**

Fish and Game’s National Angler Survey (NAS) is widely used to manage and prioritise New Zealand’s freshwater fisheries. But the survey has never been ground-trothed in the Auckland/Waikato region. Although an estimate of angler effort is useful, it does not give an indication of spatial distribution or of the impact on the fishery in terms of pressure on fish stocks. Phone based angler use studies are also prone to misidentification of river names or reaches leading to false estimates.

The estimated angler use on the Whakapapa (2,920 angler-days; SE  $\pm$ 690) and upper Whanganui rivers (2,090 angler-days; SE  $\pm$ 660; above the Whakapapa confluence) during the 2014/2015 angling season (Unwin & Rouse, 2016) gives a baseline to compare with the angler use documented during this study. The units used to describe effort are similar for both studies with the NAS reporting an angler-day as any time in a single day fished on a water body. However the current study was conducted from 2014-2016 and did not monitor the high use areas less than 0.5 km from public carparks. Because the current study has taken point estimates based on 0.5 km reaches, the overall reach estimate for each river was multiplied by the total number of reaches to give a similar metric to those reported in the NAS. However, the current study underestimates total angler use, because the areas closest to access points were excluded; therefore the total

angler usage estimates from the NAS are about 45% higher (Table 3).

Table 3. National Angler Survey (Unwin & Rouse, 2016) showing annual angler use on the Whakapapa River and the upper Whanganui River (above the Whakapapa) and similar metric derived from point estimates in the Angler Usage Study over the same area.

	National Angler Survey		Angler use study	
	annual angler days <sup>-1</sup>	anglers month <sup>-1</sup>	annual angler days <sup>-1</sup>	anglers month <sup>-1</sup>
Whakapapa R.	2920	3.6	1577	2.0
Whanganui R.	2090	3.2	1144	2.0

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# APPENDIX A

