

**REPORT FOR THE DEPARTMENT OF CONSERVATION SOUNDS
OFFICE**

*Habitat assessment and conservation dog team survey for whio (*Hymenolaimus malacorhynchos*) in the Upper Wakamarina River and tributaries, March 2023.*

Species Conservation Dog Tui surveying for whio, Doom Creek, Wakamarina River, March 2023.



13-15 March 2023.

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Introduction

Whio were once widespread across much of New Zealand but predation, primarily by stoats, and habitat modification have now greatly limited their abundance and distribution. Whio inhabit river and stream systems with high water quality, stable stream banks, good riffle feeding areas, low sediment loading and native riparian scrub or forest. In the South Island remnant whio are now typically only found in less accessible high-country catchments. Four high priority 'security sites' with intensive predator control have been set up to secure the population: two in Kahurangi, one in Central Westland, and one in Fiordland. Outside of these security sites there are several 'recovery sites' with whio where some form of management is undertaken. Some of these sites are adjacent to existing security sites while some are geographically isolated. New recovery sites for whio management need to be identified within under-represented parts of their former range (Glaser *et al.* 2010).

Whio were once present in the Richmond Range/Bryant Range but appear to have declined with only infrequent reports over the last 20 years. The last records obtained from the local Department of Conservation (DOC) Sounds Office were from goat hunters working in Te Hoiere and Wakamarina catchments in the early 2000's (Phil Clerke, DOC, *pers. comm.*). The only records on the DOC whio forever database are a lone male on the Upper Motueka River in 2016 and a lone female on the Maitai River in 2022. Additional records from the Nelson City Council are for single birds in the Roding River in 2021 and the Brook Waimarama Sanctuary in 2014 (Leigh Marshall, NCC, *pers. comm.*). No whio were found during a survey of Te Hoiere River in 2022 (Newton 2022).

I have been contracted to:

- 1) undertake habitat assessment of the Upper Wakamarina River and its tributaries to assess their suitability for whio.
- 2) survey the Upper Wakamarina River and its tributaries to identify any remnant whio.

Method

Habitat Assessment

Areas of accessible riffle feeding habitat were surveyed at 1-2km intervals using a standardised Fresh Water Stream Habitat Assessment protocol to allow comparison with other catchments already assessed (see Appendix 1 taken from Pellowe 2015). This included assessing ten 'A5' sized cobbles by removing them from the stream and identifying the family and total number of invertebrates observed. The total number of invertebrates were averaged across the 10 rocks per site giving the average number of invertebrates per rock sampled (inv/rock).

Whio Dog Survey

A Department of Conservation fully certified and experienced whio dog (Tui – 9-year-old Golden Labrador Retriever) was used to make either a single or double pass search along waterways and banks in the Upper Wakamarina Catchment. Where possible the actual riverbed was searched but often travel in the riverbed was not practicable and detours were taken. When the handler was unable to follow the dog through a section of river (often deep water that the dog had swum), the dog was commanded to "wait" while the handler sidled around on the bank before re-joining the dog.

Whio that were located in full view on the river could be observed with binoculars (Swarovski EL Range 10x40) to determine age and sex. Age would be categorised as adult, juvenile or duckling based on eye, bill, and plumage

colour. Ducklings would be further categorised into one of five development stages. If two adult birds were found together, they were assumed to be a male – female pair. (Whio Best Practice Manual). If whio were located under the cover of banks an attempt would be made to determine age and sex without disturbing the bird. A small headlamp (Fenix HL26R) would be used in aiding the identification of birds under cover.

A track log was used to record the actual search path and any whio observed would be marked with waypoints using handheld GPS (Garmin GPSMAP66i). The search was conducted when the water was at normal autumn-time base flow.

Results

Habitat Assessment

Table 1. Summary of habitat assessment data, Wakamarina River

Site	# Sites Assessed	Invert (av/rock)*	Invert Range
Wakamarina	6	5.3	3.8-8.1
Johnson	2	5.7	4.6-6.7
Doom	2	5.5	5.1-5.8
Fosters	1	7.4	n/a
Devils	2	5.2	5.0-5.3
TR Tributary	2	6.4	4.4-8.4
Total/Average	15	5.5	3.8-8.4

*see Appendices 2-4 for full details

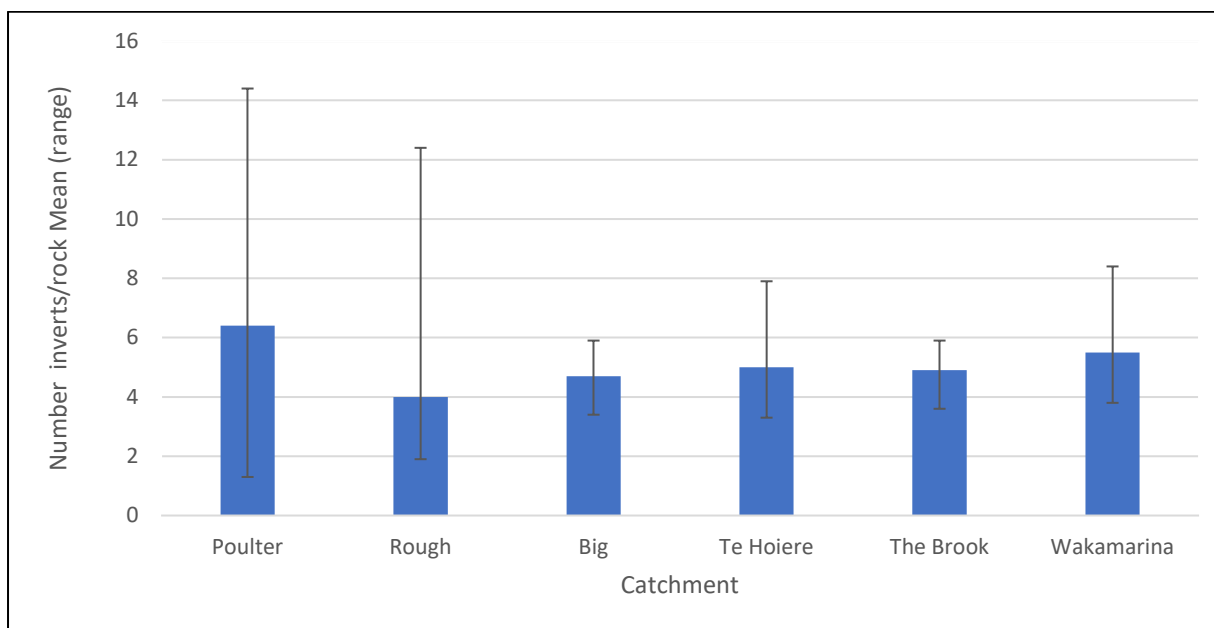


Figure 1. Comparison of average number of invertebrates observed by catchment, error bars represent the lowest and highest scores recorded for sites assessed in each catchment (pers. obs)

Wakamarina

Six sites were assessed in the main stem of the Wakamarina River. Travel in the upper section above Devils Creek was generally challenging with alternating sections of large boulders and gorges with deep pools. This combined with sections of cobble/gravel substrate and lack of feed riffles didn't make for good whio habitat. Increasingly steep gradient made travel into the upper reaches impracticable. An exception was the section of river adjacent to the goat hunters camp which appeared very good. It had smaller, stable boulder substrate, was relatively open and had the highest invertebrate numbers of the sites assessed in the main Wakamarina (8.1 inv/rock, Waka2).

Unfortunately, about 250m below this section and adjacent to a tributary entering on the on the TL, a series of deep, impassable gorges were encountered meaning a ~2km sidle out of the river to the next side creek on the TL. After this section (Waka3) which had slightly below average invertebrate numbers the main streambed was abandoned again as the next ~1km had appeared the most difficult when flown by helicopter that morning. This meant a climb to join the Mount Royal Track bypassing the worst section and ensuring Devils Creek hut was reached in a timely manner. The remaining sites assessed adjacent to, and above Devils Creek hut (Waka4&5) had lower invertebrate numbers. The main stem between Devils Creek and Butchers Flat was bypassed as it was deemed unsuitable being mostly slow-moving runs and deep pools.

The lower section surveyed downstream from Butcher's Flat to the Johnson Creek Confluence appeared stable with open areas dominated by a cobble/small boulder substrate and stable box shaped bedrock banks. Numerous small riffles were interspersed with slow-moving pools/runs which limited feeding areas. Water velocity is never very fast reflecting the low gradient of the catchment at this point. Invertebrate numbers were relatively low (Waka6).

Johnson

Two sites were assessed in Johnson Creek. Once a route was found through the lower gorge Johnson Creek opened out into an easily negotiable and stable stream bed. The upper site tested at a stream confluence had relatively high numbers of invertebrates (Johnson1) whereas the lower site just above the bottom gorge had lower numbers (Johnson2). Typified by a mix of bedrock pools, riffles, rapids, and occasional runs Johnson Creek is boulder dominated, stable, partly shaded and has better riffle feeding areas than many of the other sites assessed making it nice whio habitat.

Doom Creek

Two sites were assessed in Doom Creek. Much of the section between the bottom bridge and the upper Doom track ford was bypassed on the walking track due to a steep inaccessible gorge with very large boulders making travel impractical. Once above the ford a short section of relatively enclosed flat cobble and boulder was negotiated for 600m. Cutting of banks, slips and fine sediment were apparent suggesting instability. The lower section that was surveyed above the Doom Bridge for 500m until an enclosed gorge was relatively stable and typified by bedrock pools and riffles. Invertebrate numbers were average with lower numbers at the top site (TopDoom) and above average numbers at the Doom Bridge with mayflies dominating.

Foster Creek

One site was assessed in Fosters Creek. The ~800m of streambed from the Doom track ford up until a tight slot gorge which stopped further travel upstream was some of the easier terrain encountered in the survey. The stream bed was open with algal covered, angular cobble/boulder substrate and stable banks. Invertebrate numbers were high with 7.4 inv/rock reflecting the observed stability and a high proportion of riffles made it nice whio habitat.

Devils

Two sites were assessed in Devils Creek. Like Doom Creek much of the middle section was steep and confined making survey impracticable. A very short section (60m) was surveyed above the Wakamarina Confluence and about 800m in the head either side of the Stone Huts track ford. Invertebrate numbers were better at the bottom site (Devils) with the top site having large debris deposits and signs of slips and recent flood activity (Devils2).

TR Trib above Goat Camp

Two sites were assessed in the tributary entering on the true right just below the old Goat Hunters Campsite. This was notable for ease of travel and a surprisingly nice section of streambed was able to be travelled for 2km up to an impassable gorge (about 2km) unlike most of the other side creeks. Invertebrate numbers were better at the bottom site which was the most productive site of all sites assessed with 8.4 inv/rock (TR side trib).

Overall average invertebrate abundance ranged from 3.8 to 8.4 inv/rock for sites assessed.

Whio Dog Survey

Monday March 13th 2023

Doom and Foster Creeks from Doom Creek/Fosters Creeks upstream of track fords, total 1.4km (double pass).
1300hrs Walked from Butchers Flat up to Doom Creek track.
1500hrs Started survey at the Doom Creek ford and surveyed upstream for ~600m until creek became impassable.
1600hrs Surveyed ~800m up Foster Creek until creek became impassable.
1800hrs Walked down to Doom Creek bridge to completed habitat assessment.
1900 Back at Butchers Flat, no indication from Tui of any whoio being present.

Tuesday March 14th 2023

Wakamarina from Old Goat Hunters Camp up main stem to E1644615 N54144165 (double pass), then up true right side creek to impassable gorge (double pass), then down main stem to Devils Creek Hut (single pass), Total 7km (first pass).

0800hrs Helicharter Nelson pickup from Butchers Flat and flight into Old Goat Cullers camp.
0839hrs Survey mainstem upstream from Goat Camp ~1.5km to impractical boulder section.
1045hrs Survey up TR side creek by goat camp for ~2km until impassable gorge.
1405hrs Survey down main stem to Devils Creek Hut ~ 3.5km
2000hrs Finish survey at Devils Creek hut with no indication from Tui of any whoio being present. Camped overnight.

Wednesday March 15th 2023

Wakamarina from Devils Creek Hut up main stem to gorge (double pass), then up Stone Huts Track to **Upper Devils Creek** (double pass), down mainstem from Butchers Flat to Johnson Creek and them up **Johnson Creek** to confluence, Total 9km (second pass)

0800hrs Survey up mainstem from hut ~1km. (double pass)
0900hrs Walk up Stone Huts Track to Upper Devils and survey 750m section. (double pass)
1130hrs Walk down to Doom Creek and survey 500m creek up from bridge. (double pass)
1300hrs Walk to Butchers Flat then survey down mainstem to Johnson Creek confluence. (double pass)
1500hrs Survey up Johnson Creek to forks at E1648142 N5420319 (double pass)
1845hrs Finish survey at Butchers Flat, no indication from Tui of any whoio being present.

Overall result: Total River length surveyed was **13.5km**, no whoio or whoio sign was observed.

Discussion

Much of the Upper Wakamarina River and its tributaries appear to be suitable whoio habitat. They are enclosed with stable vegetated riverbanks, relatively gradual in gradient, have water filling much of the boulder dominated stream beds, typical of good whoio habitat found in other regions. One limiting feature resulting from the catchments low gradient and bedrock gorges are localised areas of gorges featuring deep, cobble dominated pools that aren't suitable feeding areas for whoio. It should be noted that large sections of river couldn't be surveyed due to difficult terrain. This leaves uncertainty about these areas in terms of whoio habitat.

Closer inspection of the areas able to be surveyed when undertaking habitat assessments revealed consistently good numbers of invertebrates present at most sites. While no sites assessed had high invertebrate numbers a feature of the catchment was consistent invertebrate numbers throughout, very similar to that found in the Te Hoiere (Newton 2022). This is in the context of a one in a 100-year flood occurring across the Richmond Range in early February 2022 followed by an even larger flood event in August 2022 (Marlborough District Council Environmental Data, '*Pelorus River at Bryants*'). The lack of obvious damage apart from occasional gravel deposits and slips (mostly in the upper Doom and Devils Creek tributaries) indicates the catchment's inherent stability. Invertebrate numbers compared favourably with other catchments assessed with known whoio populations (Figure 1; Poulter, Big, and Rough rivers, *pers. obs.*)

The historic presence of whoio in the Wakamarina catchment shows the habitat was once suitable and the current survey findings confirms that this is still the case. Unfortunately, in the absence of sustained predator control, stoat predation has likely caused local extinction of the whoio population across the wider Richmond/Bryant Range. The Richmond/Bryant Range appears geographically isolated from both the Nelson Lakes and Kahurangi whoio populations and this may limit natural dispersal of whoio back into the range. The lower Wairau, Motueka and

Waimea river valleys are open, with developed areas of pasture, housing and forestry in their lower reaches limiting their ability to sustain whio. This in turn may limit the potential dispersal of whio up into the headwater tributaries which drain the Richmond Range. This is supported by whio sightings with only occasional birds recorded in the greater Richmond/Bryant Range. These birds are likely juveniles, dispersing post breeding season, potentially from the Wangapeka/Fyfe security site. Large scale landscape-based predator control targeting stoats would need to be implemented and shown to be successful before reintroduction of whio could be considered.

An estimate of the home range needed per whio pair in a typical South Island catchment is between 1-2km/pair. Considering the size (relatively small), available habitat (pretty consistent apart from some large pool sections), altitude (low), the frequency of periods of instability due to weather events (infrequent), and observed invertebrate abundance (the Wakamarina has similar invertebrate abundance to other catchments surveyed containing whio populations) tributaries in the Wakamarina River are likely to have larger home ranges of 2km/pair. By dividing the habitat able to be surveyed and assessed as suitable for whio (1km Wakamarina, 1.5km Johnson, 0.8km Foster, TR trib 2 km=**5km total**) by the estimated home range carrying capacity would be 2-3 pairs. This excludes potential habitat found across the wider catchment not surveyed during this visit so carrying capacity would likely be higher.

Recommendations

1. Discuss the report findings with the whio recovery group and make an assessment of the site in relation to other recovery sites (e.g. habitat, geographic location, existing predator control, funding options...)
2. Complete surveys of the Nelson City Council catchments draining the Bryant Range and identify if any birds are present, and the suitability of habitat found.
3. Assess the wider Richmond/Bryant Range as a potential whio recovery site.

References

Andrew Glaser, Paul van Klink, Graeme Elliott and Kerri-Anne Edge 2010. Whio/blue duck (*Hymenolaimus malacorhynchos*) recovery plan, 2009–2019. Department of Conservation. Internal Report.

[Marlborough District Council Environmental Data \(marlborough.govt.nz\)](http://marlborough.govt.nz)

Newton, Glen (2021) Habitat assessment and conservation dog team survey for whio (*Hymenolaimus malacorhynchos*) in the upper Poulter River and tributaries. Contractor Report for Department of Conservation Rangiora Office.

Newton, Glen (2022) Habitat assessment and conservation dog team survey for whio (*Hymenolaimus malacorhynchos*) in the upper Te Hoiere/Pelorus River and tributaries, March 2022. Contract Report for Department of Conservation Sounds Office.

Pellowe. 2015. Assessment of stream characteristics that influence whio presence and abundance December 2015 - DOC-2700287

Whio forever online database. Department of Conservation.

Whio Best Practice Manual. 2004. Blue Duck (Whio) Recovery Group Department of Conservation.

Appendix 1

Fresh Water Stream Habitat Assessment – Field Sheet

Location (GPS)	Easting – Northing -	Date	
		Time	
Waypoint Name		Observer	
Stream Name		Photos	Upstream Downstream

Stream Characteristics / Water Flow Type / Water Flow Conditions (see Appendix 1 for definitions)

% Pool		Wetted Width	
% Riffle		Depth (m)	
% Run		Velocity (m/s)	
% Rapids		Flow Conditions	Low Base High

Substrate (Rock) Characteristics (% Tally)

BR (>4000mm)		B (>256mm)	
C (32-256mm)		G (2-32mm)	
SS (<0.06-2mm)		Wood / Logs	

BR = bedrock B = boulder C = cobble G = gravel SS = silt and sand

Water Quality Characteristics

Water clarity/colour	
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Riparian Vegetation Characteristics

Width (m)	TLB		TRB	
Bank vegetation cover /100m	% TLB		% TRB	
Overhead Cover (%)	Open	Partially Shaded	Heavily Shaded	

Vegetation Type	% of Vegetation	Dominant Species
Grasses/Tussocks/Ferns		
Shrub (<2m) / Exotic / Native		
Sub-Canopy (2-5m) / Exotic / Native		
Canopy (>5m) / Exotic / Native		

Bank Stability

Stable	Mostly Stable	Highly Unstable	Undercutting
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Adjacent Land Use Characteristics (on map)

Native Forest	Exotic Forest	Farming	Urban
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Catchment Land Use Characteristics

Native Forest	Exotic Forest	Farming	Urban
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Comments / Observations

(Bank modification, artificial (eg car tyres) or natural (eg stumps) objects? Cobble packing, odours, surface oil sheens?)

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Flora and Fauna of Rocks Submerged

Periphyton	Percentage Cover	Comments
No Mat		
Thin Mat / film (<0.5mm)		
Medium Mat (0.5 – 3mm)		
Thick Mat (>3mm)		

Site Diagram

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Invertebrates

Invertebrate	Rock 1	Rock 2	Rock 3	Rock 4	Rock 5	Rock 6	Rock 7	Rock 8	Rock 9	Rock 10
Stonefly										
Mayfly										
Cased Caddis										
Uncased Caddis										
Other										

Site Assessment Protocol

This protocol is designed to be conducted from the edge of the stream or river. The assessor is not required to measure anything, so all parameters are percentage estimates only. The sample site is what can be seen up to 100m upstream and 100m downstream from where the assessor is standing

1. Record site details such as the GPS location (Easting and Northing), waypoint name, stream name, date, time and assessors name. Take photos up stream and downstream which include the floodplain, riparian vegetation and in-stream channel and circle on the sheet.
2. Estimate the percentage of water flow present. **Runs** are fast flowing, but unbroken water. **Rapids** usually include portions of broken flowing “white” water. **Pools** have deep water with a smooth surface. **Riffles** are reasonably shallow with moderate to fast water flow and a rippled but unbroken surface. Appendix 1 has further details to assist with assessment.

3. Estimate the **wetted width** of the channel as the zone currently under water (this also includes non-flowing water. If you can estimate the depth and velocity of the water do so.
4. Visually compare the current water level with any plants or algae growing on the rocks to note **flow condition**. Indications of past or current high flows may be seen as bent or broken bank vegetation and debris deposited along the edge of the river. During low flows, dried plant and algal material may be visible on the rocks on the non-wetted river bed.
5. Estimate the percentage of substrate (rocks) present at the site. **Silt and sand** are very small coarse particles. **Gravel** is 2-32mm. **Cobbles** are 33 – 255mm. **Boulders** are 256mm – 4000mm. **Bedrock** is >4000mm. If there are any logs/wood in or around the river, estimate the percentage.
6. Observe if the water is clear/cloudy/dirty. Note the colour.
7. Estimate the width of the **riparian vegetation** of the left and right banks of the river. This is the zone which has different land cover or management than the wider catchment. If there is no difference (i.e. all forest), then note this as continuous. The true left bank (TLB) is the left bank looking downstream. The true right bank (TRB) is the right bank looking downstream. Looking at a map might be necessary to estimate this value.
8. Estimate how much of the river banks are covered in vegetation. Estimate how much cover the vegetation provides for the river. Open is where there is no vegetation growing over the river and sunlight reaches most of the river. Partially shaded means parts of the river have vegetation growing over it. Heavily shaded is where the river is covered by plants.
9. Estimate the types of vegetation along either side of the river and if known, note the dominant species.
10. Circle the dominant types of bank cover.
11. Circle the type of bank stability. Unstable banks may have bank undercutting, slumping, livestock tracks, obvious erosion, fallen trees and exposed soil or stony substrate. Highly stable banks will often be covered in vegetation and have few exposed soils or gravels. Record the present of bank undercutting separately in the comments/observations section
12. Circle the types of adjacent land use evident at the site if known – you may need to refer to a map for this
13. Circle the types of catchment land use evident at the site if known – you may need to refer to a map for this
14. Estimate the abundance of periphyton or visible algae on the wetted stream bed/rocks. Refer to Appendix 2 for photos of algae.
15. Draw a site diagram (bird's eye view) and mark where the photos were taken from, significant landmarks, access points, North direction, direction of stream flow, location of roads, rough scale.
16. Choose ten partially submerged rocks approximately 20cm by 15cm (~A5 sheet of paper or A4 folded in half). One at a time turn the rocks over and count how many invertebrates are present. If you can record them according to the types (stonefly, mayfly, cased caddis, uncased caddis and other). Refer to Appendix 3 for Invertebrate identification.

Definitions

Rapid – shallow to moderate depth, swift flow and strong currents, surface broken with white water.

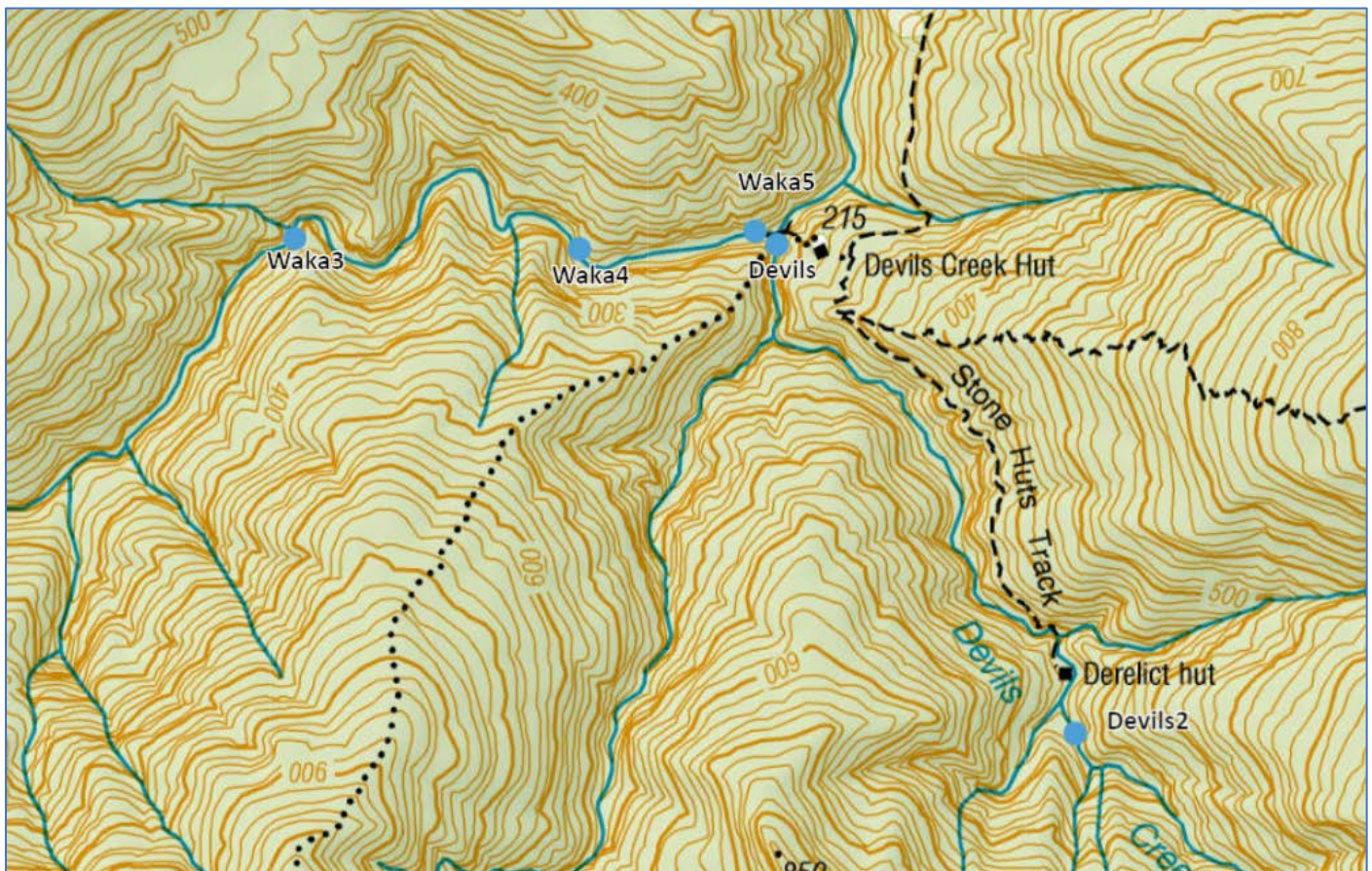
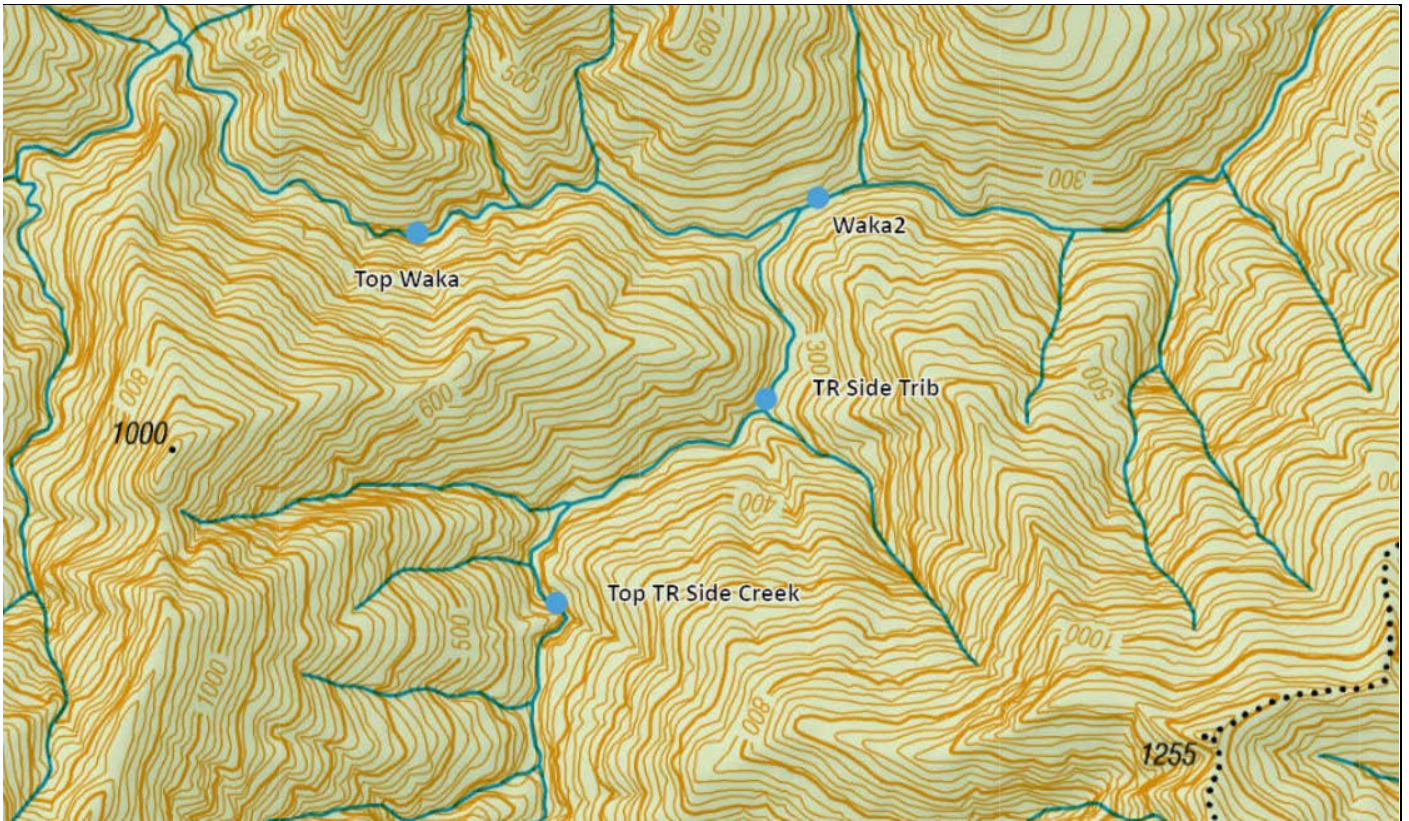
Riffle – shallow depth, moderate to fast water velocity, with mixed currents, surface rippled but unbroken.

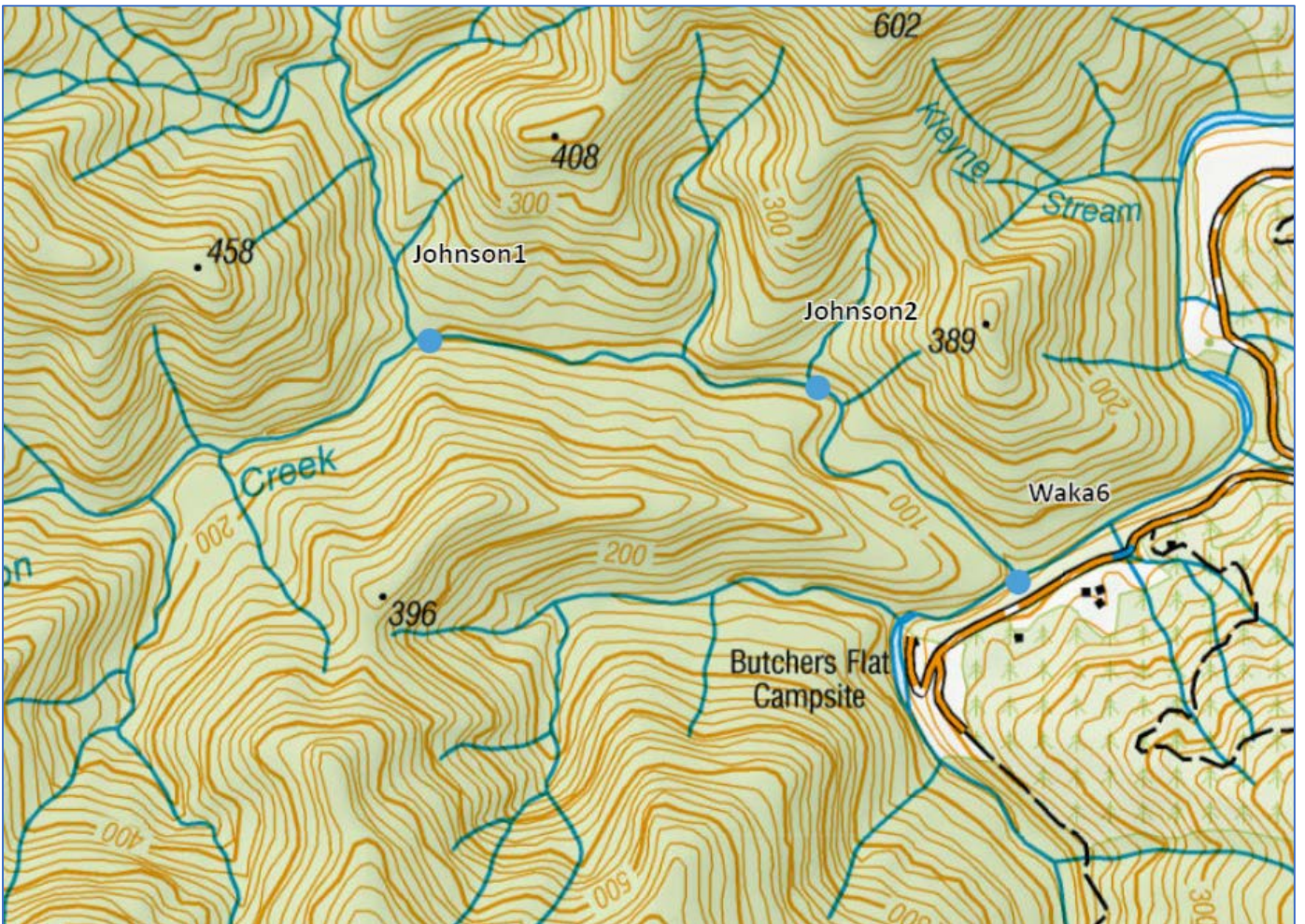
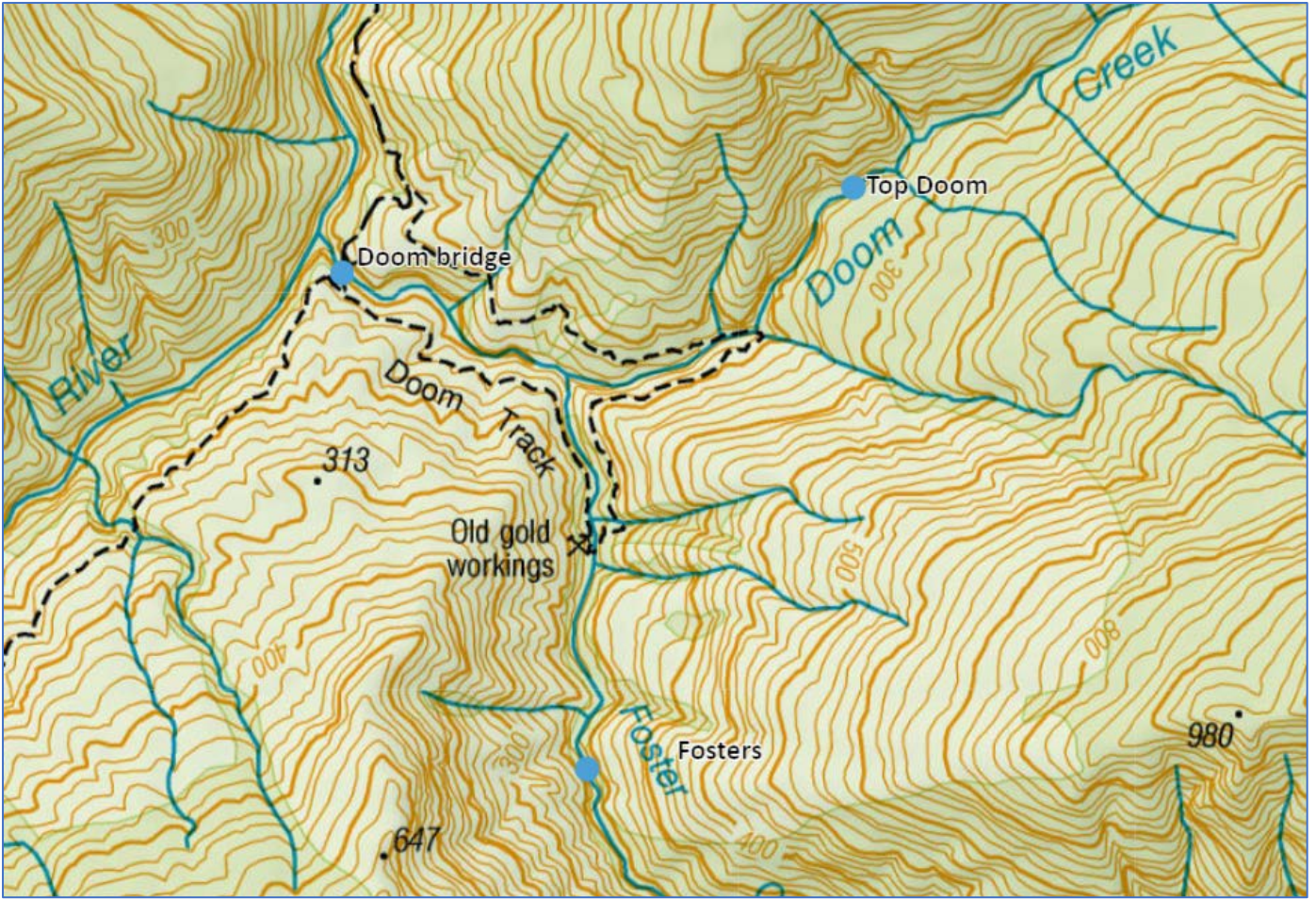
Pool – deep, slow flowing with a smooth water surface, usually where the stream widens and/or deepens.

Run – habitat in between that of riffle/rapid and pool, slow–moderate depth and water velocity, uniform–slightly variable current, surface unbroken, smooth–rippled.

Backwater – slow or no flow zone away from the main flowing channel that is a surface flow dead-end; although flow could down well or upwell from the groundwater zone.

Appendix 2 Habitat Assessment Sites





Glen Newton, Conservation Dog Handler

Wakamarina Whio

Appendix 3 Habitat Assessment Site Photos

Photo 1 Waka1 Downstream

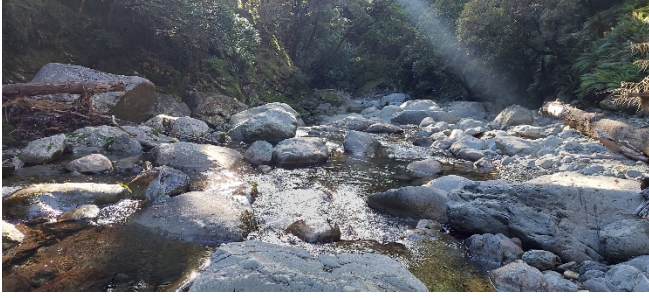


Photo 2 Waka1 Upstream



Photo 3 Waka2 Downstream



Photo 4 Waka2 Upstream



Photo 5 Waka3 Downstream



Photo 6 Waka3 Upstream



Photo 7 Waka4 Downstream



Photo 8 Waka4 Upstream



Photo 9 Waka5 Downstream



Photo 10 Waka5 Upstream



Photo 11 Waka 6 Downstream



Photo 16 Devils2 Upstream



Photo 12 Waka6 Upstream



Photo 17 Johnson1 Downstream



Photo 13 Devils1 Downstream



Photo 18 Johnson1 Upstream



Photo 14 Devils1 Upstream



Photo 19 Johnson2 Downstream



Photo 15 Devils2 Downstream



Photo 20 Johnson2 Upstream



Photo 21 Fosters Downstream



Photo 26 Doom2 Upstream



Photo 22 Fosters Upstream



Photo 27 TR Trib1 Downstream



Photo 23 Doom1 Downstream



Photo 28 TR Trib1 Upstream



Photo 24 Doom1 Upstream



Photo 29 TR Trib2 Downstream



Photo 25 Doom2 Downstream



Photo 30 TR Trib2 Upstream



Appendix 4 Habitat Assessment Data

See excel spreadsheet

Appendix 5 Dog survey areas.

