

# UNDERSTANDING LAND USE EFFECTS ON THE HEALTH OF WĀNAKA'S URBAN STREAMS AND LAKE WĀNAKA – SUMMARY

Following an urban stormwater workshop in 2018, the Wānaka Water Project funded two research projects. One of these was completed by Melanie Vermeulen who has a Bachelor of Science (Hons) majoring in ecology.

Melanie's project, '**Understanding land use effects on the health of Wānaka's urban streams and Lake Wānaka**' focusses on Bullock Creek, Stoney Creek and the Water Race Drain.

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Summarised by Ash Rabel  
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## PURPOSE

The purpose of this study was to quantify the effects of changing land use and increased urban development on the water quality of Wānaka's main urban waterways.

## METHODOLOGY

20 Sites of testing in three creeks (see map of sampling sites on page 3):

- Stoney Creek (2)
- Water Race Drain (6)
- Bullock Creek (12)

Compared **Stream Health** to two land use characteristics:

- 1) Land use type (*affects water retention qualities*) and
- 2) Residential density (*increased impervious surfaces and decreased green space*)

Tested three **Physiochemical Properties** of the water and compared them to ANZECC guidelines:

- Dissolved oxygen (*DO - % Saturation*)
- Conductivity ( $\mu\text{S}/\text{cm}$ )
- pH

**Sediment** samples taken and tested for contaminants:

- Ammonium-N, Total Organic Carbon (*TOC*)
- Escherichia coli (*E. coli*)
- Total recoverable heavy metals (*arsenic, cadmium, chromium, copper, lead, nickel, and zinc*)
- 16 different polycyclic aromatic hydrocarbons (*PAHs*)

Quantity and quality of deposited **Fine Sediment** tested – suspended inorganic sediment and suspended organic sediment.

National **Rapid Habitat Assessment** carried out to look at instream and riparian habitats: (*covers 10 parameters*)

- 1) deposited sediment
- 2) invertebrate habitat diversity
- 3) invertebrate habitat abundance
- 4) fish cover diversity
- 5) fish cover abundance
- 6) hydraulic heterogeneity
- 7) bank erosion
- 8) bank vegetation
- 9) riparian width
- 10) riparian shade

**Taxonomic Richness of Macroinvertebrates** was assessed, and semi-quantitative results of water quality inferred from the numbers of individuals of tolerant or sensitive species present.

A **Fish Survey** was carried out in Bullock Creek – 100m of the lower and upper reaches were electric fished and individuals caught were identified and measured before being returned to the stream.

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## RESULTS

**Physiochemical Parameters** were for the most part outside the 80th percentile of ANZECC (*oxygen and pH were up*) guidelines, however, temperature was well below upper limits. Bullock Creek had good conductivity, the other two were not great – indicates pollution starting to creep into these streams.

Water Race Drain and Stoney Creek had relatively low **Rapid Habitat Assessment** scores. Bullock Creek was fairly good – however it was only able to be compared to its own baseline as there was no area that gave a 100% score. This indicates that there has been anthropogenic change to the bank structure and riparian vegetation as well as degradation of the stream beds.

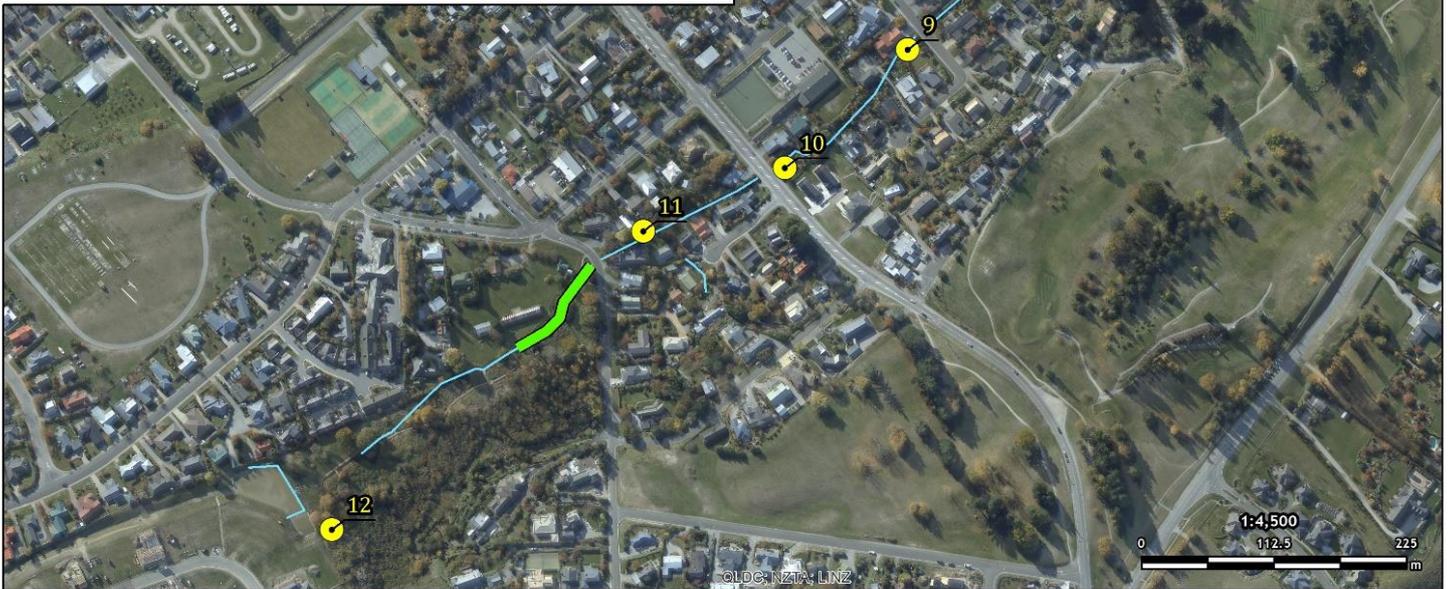
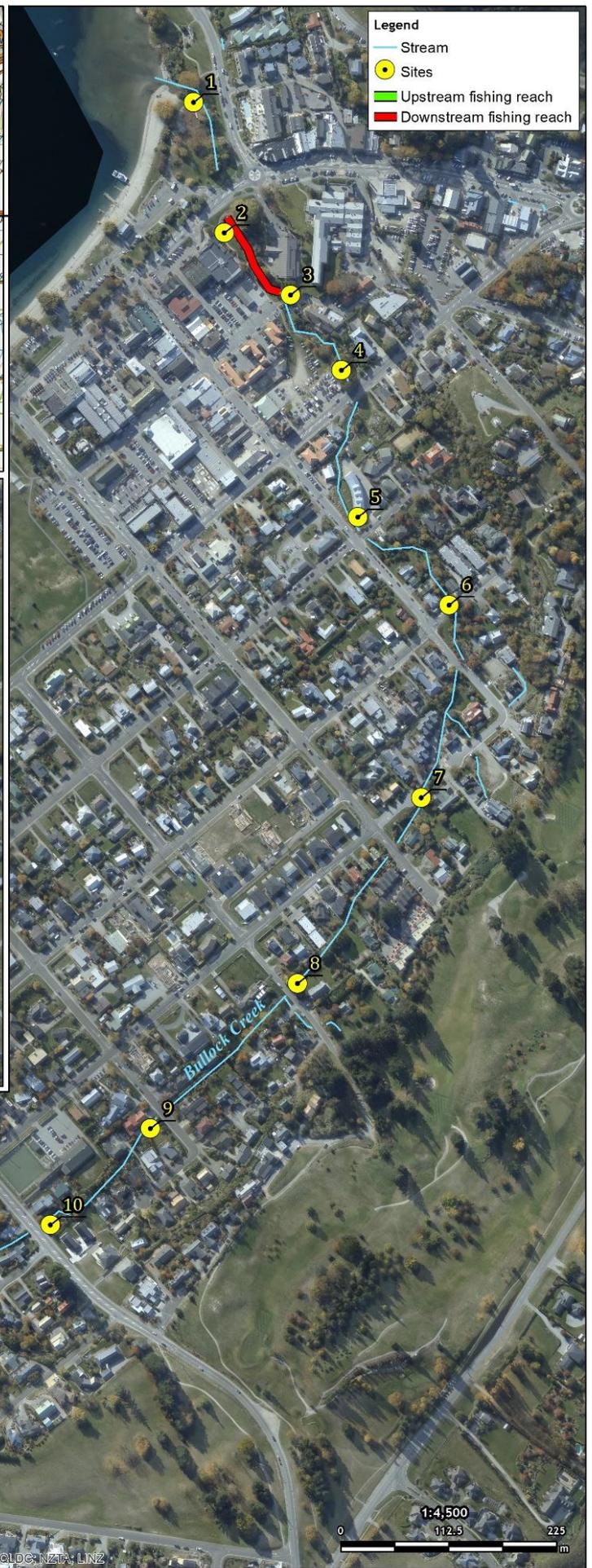
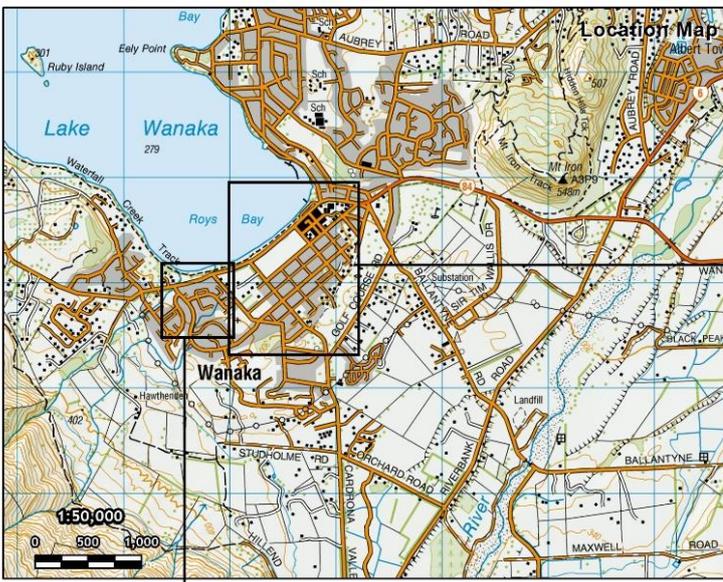
**Heavy Metals and PAH's** were generally below threshold values, with the exception being arsenic, which the Wānaka basin is naturally high in. This indicates we haven't had any problems as yet. We've also seen higher values present in true stormwater drains.

**Suspended Inorganic Sediment** in Water Race and Stoney Creek were generally above guidelines, as was the deposited sediment. Bullock Creek was fairly good. Sediment is a physical toxicant as it clogs up gill and other respiratory structures, as well as carrying other ecotoxicants e.g. metals, herbicides and pesticides, excess nutrients etc.

**Taxonomic Richness of Macroinvertebrates** ranged across sites. Lowest was 0 species present in Stoney Creek, and highest was 7 in Bullock Creek which indicated poor to fair water quality. The exceptions being only two good areas and one excellent (*all in Bullock Creek – still over 75% not so good in terms of density but Bullock Creek is a bit odd in that it's both a spring feed stream [which naturally tend to have different assemblages of Macroinvertebrates] and that most of the species present in the stream are "Lake" species, so have different population dynamics*). This means we are starting to lose some of the more sensitive species of inverts which tends to indicate that there are problems starting to occur in our streams.

Looking at things like inverts gives us a good picture of how things are in the water whilst taking into account the very complex interaction between pollution, organic matter, physical and chemical properties of the water, and habitat availability.

Some **Fish** present in the stream – not great but not bad. As expected, it was mostly invasive predatory species (*i.e. Salmonids*) with a couple of native Koaru.



**Data Acknowledgment**  
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 Client:  
 Ref: 04 0451  
 Paths: E:\gis\Wanaka\_UrbanStreams.mxd  
 File: Figure Sites\_Wanaka.mxd

**Figure 1. Location of sampling sites**

**Wildlands**  
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