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Report to the Environment Committee
from Gretchen Robertson, Surface Water Quality Scientist

Targeted Investigation of Ecosystem Health within the Waitohu Stream

1. Purpose

To inform the Committee of the findings of a targeted investigation into the health of the Waitohu Stream.

2. Background

The Wellington Regional Council's baseline freshwater monitoring programme indicated degradation of stream health within the lower reaches of the Waitohu Stream. During the 1998/99 sampling year, the Norfolk Cresent baseline monitoring site had amongst the highest median turbidity, biochemical oxygen demand, and ammonia levels of the 50 freshwater sites sampled throughout the Region. The guidelines for turbidity were exceeded every month during that 12 month period.

However, whilst there is physico-chemical evidence of poor health within the lower Waitohu Stream, the baseline site located in the upper catchment below the Tararua Ranges conservation estate is in good health.

Although the baseline data has provided information on the Waitohu Stream at two points, little was known about the health of the middle reaches and the processes leading to the degradation of the lower site. There was a lack of knowledge about the health of the main tributary, the Mangapouri Stream. This stream flows through the township of Otaki and also drains lands used for both agricultural and horticultural purposes. It was worthy of investigation to determine its health and how its water quality could affect the lower Waitohu Stream.

A current issue within the catchment is the application by Wellington Regional Council Flood Protection Department to renew the consent for cutting the stream mouth. As well as the modification to the stream mouth, river works have been frequently undertaken in the Waitohu Stream to reduce the intensity and impacts of flooding. Many sections are now highly modified, the most extreme being the lower channel, which was originally cut from duneland and swamp.

The objectives of this investigation were to determine why the lower Waitohu Stream is polluted and how the problems can be addressed.

As well as aiding the WRC with its own management of the Waitohu Stream, the finding will aid local community 'River-Care' initiatives. Local concern for the health of the river has led to the formation of the Waitohu River-Care group whose initial interests centred on the cutting of the stream mouth, resulting loss of lagoon bird habitat, erosion of the coastal dunes, and the lowering of the riverbed. If the group is to establish their own monitoring scheme and undertake riparian plantings, knowledge of where best to concentrate their efforts will be essential.

3. Key Findings

This investigation revealed many water quality problems within the Mangapouri Stream which are likely to be contributing to the degradation of water quality in the main Waitohu Stream channel. These problems were:

* Oxygen levels (%saturation and dissolved oxygen) breached aquatic ecosystem guideline levels at sites 1 and 2 (both sites being within the Mangapouri Stream).

* Turbidity guidelines were breached within the Mangapouri Stream at sites 1 and 5.

* Water samples taken from the Mangapouri showed the presence of ammonia and nitrate yet concentrations of these nutrients were negligible within the main channel.

* Nitrate concentrations, conductivity, temperature, and BOD were higher within the Mangapouri sites than the main channel.

These problems were attributed to human influences within the Otaki urban area of the catchment.

Baseline sampling showed that the guideline values for turbidity in the lower Waitohu Stream were breached on all 12 sampling occasions during the 1998/98 sampling season. It is likely that the muddy bottomed nature of the Mangapouri Stream and lower Waitohu Stream channel is contributing in part to its coloration as a result of staining, but other streams within the Region have similar substrate and have lower turbidity readings. The lack of riparian vegetation and resulting instability of the steep banks within the Mangapouri Stream catchment result in high turbidity readings. This erosion is heightened during high flows resulting in increased sedimentation rates downstream.

Mininimum flow levels set for the Waitihu Stream in the Regional Freshwater Plan were breached for 17 days of the year prior to sampling. These low flows occurred as the combined effect of low rainfall and abstarction of water from the stream. From an ecological perspective low flows have many negative impacts on stream health. Increases in temperature may extend beyond the tolerances of some biota and decrease the ability of the water to hold oxygen. Increases in light to the substrate result in increased in periphyton biomass and as a result the water becomes difficult to live in for many faunal species due to oxygen fluctuations. High oxygen levels occur during the day

when plants photosynthesise transpiring oxygen. Low oxygen levels occur at night when plants do not actively photosynthesise and instead produce carbon dioxide. Furthermore, low flow volumes mean that dilution of contaminants is less and impacts on the stream health are higher.

4. Implications for Management

Water quality within the Waitohu Stream has been shown to be relatively good until it reaches the confluence of the Mangapouri Stream where the stream bed changes from shingle to muddy substrate. The Mangapouri Stream is in poor health and water quality problems disperse through to the lower Waitohu Stream. Tests undertaken by Caleb Royal of Te Wananga o Raukawa indicate that faecal coliform levels are particularly high within the Mangapouri Stream. This information and the recorded presence of relatively high nutrient concentrations, suggest that stream contamination is occurring. A possible explanation for faecal and nutrient contamination is cross-connection problems between sewer and stormwater pipes. A further study into the bacteria concentrations of the stream is warranted. If this reveals high concentrations of faecal coliforms or E. coli, a sanitary survey should be conducted to determine the cause of this contamination. Overall, initial efforts to improve the health of the Waitohu Stream should be directed toward the Mangapouri Stream.

The lower sections of the Waitohu are slow flowing and as a result sediment and organic matter has the potential to accumulate. This deposition of organic matter reduces the oxygen levels of the stream as it biodegrades. Similarly, slow flows result in less turbulence and aeration of water. The lower sections of the Waitohu are distinct from the turbulent, shingle-bedded upper reaches of the stream, and will always support tolerant, less diverse macroinvertebrate communities. Turbidity will be high due to the substrate characteristics and oxygen levels are reduced with the slow flows experienced in these sections. Riparian plantings within the lower Waitohu will not only improve the aesthetics of the area but are also likely to improve water quality. Stabilisation of the stream banks through riparian planting and fencing from stock will help to reduce turbidity and siltation within the stream itself. Shading provided by the vegetation will also benefit the fauna of the river. This will include the rare native mudfish (Neochanna apoda) found to inhabit this stream (NIWA Fish Database). This fish has only been found at two other sites within the Region (both in the Wairarapa).

Low flows also have the effect of raising water temperatures within the stream. The two month period of low flow conditions prior to sampling had enabled temperatures to extend beyond 20 degrees C at sites 7 and 8. Generally temperatures were lower in the smaller Mangapouri stream than the main channel. This is likely to be due to the narrow channel and deeper flows found in the Mangapouri Stream. Although temperatures did not breach the fisheries guideline (25 degrees) they were above the tolerance levels of some invertebrates and may also have sublethal effects on native fish. Laboratory studies have shown that temperatures between 20.9 and 23.5^{O}C caused 50% of test animals (a stonefly and two mayfly species) to die within 96 hours (Collier et al., 1995). Clearly the temperatures recorded at sites 6 and 7 especially, have the potential to reduce the abundance of some species or eliminate them altogether.

5. Recommended Action Phases

Step One: Mangapouri Stream

Initial efforts to improve water quality in the lower Waitohu Stream should focus on the Mangapouri Stream and involve further investigation into the possible source of nutrient and faecal contamination. A study of the contaminants present within this stream should be conducted over a period of time so that temporal variations can be taken into account. If problems are identified it would be useful to conduct a sanitary survey within the catchment to determine the source of the problems. It is possible that stormwater and other direct inputs may be impacting upon the water quality.

Step Two: Catchment Scale Investigation

A catchment scale investigation into agricultural waste and resource use in the Waitohu is planned during 2000/01. This will provide an inventory of aspects such as groundwater bores, discharge points, offal pits, and sheep dip sites. Once an understanding of the catchment is gained and potential pollutant sources are identified, riparian management priorities can be assessed.

Step Three: Riparian Assessment and Planting Program

High turbidity has been shown to be a problem within the lower Waitohu Stream and the Mangapouri Stream. Although some staining of water draining muddy/peaty soils is inherent, the turbidity within these reaches breaches guideline values and indicates erosion/resuspension problems within the catchment. An assessment of the riparian vegetation within those reaches with steep, muddy banks should be undertaken so that an understanding of these erosion prone areas is gained.

Once the state of the riparian zone is established, prioritisation for revegetation can be conducted. When dealing with private land ownership, many practicality issues must be considered when planning a restoration program. It is suggested that the publication 'Managing Riparian Zones' (Collier et al, 1995) is a good starting point for establishing a program.

Step Four: Minimum Flow Assessment

Flows within the Waitohu Stream breached the minimum flow levels for 17 days (March 1999 – Feb 2000) and stepdown levels for 50 days. Low flows can have many detrimental effects on stream biota. Temperature increases to 19-24^{O}C eliminate many sensitive aquatic species (Waicare Manual 7, 2000). It is suggested that a more detailed study on the minimum allowable flows within the Waitohu Stream be undertaken. This should be ecologically based and could utilise Jowett's 'Instream Flow Methods and Minimum Flow Requirements' (1996) model. An assessment of the consented water takes within the catchment should also be undertaken. Subject to the results of the minimum flow analysis, a review of consent conditions and allowable takes may be appropriate.

Step Five: Community Monitoring

It would be extremely useful to gain an further understanding of the stream and assess changes with time and following restoration action, through community stream monitoring. The Wellington Regional Council would be happy to provide a kit to the Waitohu Stream Care group for the purpose of conducting such monitoring. Useful sites for periodic monitoring would include the Mangapouri Stream, and the lower Waitohu channel below and above the Mangapouri confluence. Some sites within the upper catchment would also be useful but are of lower priority than those stated above.

6. Communication

Copies of this report will be distributed to the Department of Conservation, Kapiti Coast District Council, the Waitohu Stream Care group and members of the Otaki community who have registered interest in the results. Copies will also be available for other members of the public requesting information on the Waitohu Catchment.

7. Recommendations

That the report be received and the contents noted.

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