WORKSHOP REPORT – Te Pahū Catchment Water Quality Field Day

Venue: Te Pahū Hall and Linda Evens and Sam Fears Limeworks Loop road farm

Date: 29th June 2010 10.00am – 2.30pm

Context

A natural fit for the BMP workshop was to combine with the local Te Pahū farm discussion group and the Te Pahū Landcare Group who had organised an opportunity to talk directly with scientists from NIWA on farm hydrology and sustainable dairying. A practical component exploring the local stream, learning how to monitor the water quality and electric fishing rounded out the day.

Purpose

To raise awareness of best management practices farmers can utilise on their farms to minimise the potential environmental impact farming can have on water quality within shallow lakes catchments and beyond.

Teach participants to monitor water quality themselves. Raise awareness of what lives in local streams and have fun exploring the stream itself.

Outline of the day

Upon arrival, participants were welcomed with name badges and morning tea very generously supplied by the local Te Pahū Women's Institute. Introductions were made and the agenda for the day was reiterated. The main group split in half for two 40 minute workshops on farm hydrology and sustainable dairying with the NIWA scientists. A general question and answer session was conducted once everyone was back together again.

An overview of the current status of the soil and water quality in Waikato including rules, compliance and support was given from an Environment Waikato perspective. We then had a break for lunch supplied by the The Vet Centre and Ballance Agri Nutrients.

The practical session of the day was preceded by the theory behind water quality monitoring and alternative places to go to get water tested. Participants then car pooled to the farm and walked to the stream and partook in the water quality monitoring session.

Unfortunately, the demonstration of the 'Visual Soil Assessment' technique was unable to go ahead due to the weather conditions, but this will happen at a later farm discussion group day.

Electric fishing was carried out at the Kaniwhaniwha Reserve by volunteer local ecologists.

Summary:

Presentations from NIWA:

Lucy McKergow is a Land and Water Scientist at NIWA and for over a decade has been researching farm hydrology and water quality. She is currently working with DairyNZ to develop a framework to match an individual farm's hydrology with water quality attenuation tools.

Lucy's presentation focused on attenuation tools, (wetlands, tile drains, surface drains, flow attenuation etc) landowners can use to help improve water quality once pollutants (N, P, faecal microbes, sediment etc) are in water. She stressed that these tools were quite specific to different locations and different contaminants. She drew attention to a report some of her colleagues had recently published "Tile drain wetland guidelines" available here

Participants at Lucy McKergow's presentation. Photo: Nardene Berry

Her final take home message was that it was easier to keep pollutants out of water than it was to clean the water once pollutants had entered it.

Bob Wilcock is a Principal Scientist at NIWA with research interests in land-water interactions, water chemistry and oxygen transfer over the air-water interface. He has worked with the dairy industry on sustainable farming since 1995 and currently manages the "Best Practice Catchments for Sustainable Dairying" project throughout New Zealand. Bob was a Ballance Farm Environment Awards judge for 4 years.

Bob Wilcock presents his findings to the participants. Photo: Nardene Berry

Bob outlined the sustainable dairy farm projects and how each was improving water quality. The sites are Toenapi in the Waikato, Waiokura in Taranaki, Waikakahi in South Canterbury and the Bog Burn catchment in Southland which have been monitored since 2001. Monitoring of a fifth catchment (Inchbonnie) located on the West Coast commenced in 2004. A report of this study is available here

Bala Tikkisetty, the Sustainable Agriculture Coordinator from Environment Waikato gave an overview of the current status of the soil and water quality in the Waikato Region.

Bala Tikkisetty outlining the state of soil and water in the Waikato Region. Photo: Nardene Berry

He presented some sobering statistics:

- Around 30 % of NI dairy farms have twice the level of soil nutrients
- 70% of nutrients in the Waikato River are sourced from non-point source discharges
- An estimate – waste generated by 3,000 dairy herds in the Waikato River catchment is equal to the waste from about 5 million people or nearly 50 cities the size of Hamilton
- Average N use in the region has at least doubled since 1998
- In the same period, N leaching from sheep & beef increased from 10 to 12 and for dairying from 32 to 40 kg/N/ha/year
- 16% of groundwater monitoring sites exceed the national drinking water guidelines. The largest increase in N levels have occurred in streams with the most farmland in their catchments.

In the past, pollution control focused on factories, sewage treatment plants and dairy effluent ponds. These are called 'point sources' because the pollution comes from a known single point (such as a pipe to the river from a factory). Through environmental regulation and new technology, major reductions in pollution from these sources have been achieved. For example, discharges of N from point sources to the Waikato River have decreased by 63 % over a period of about 10 years.

However, it is estimated that over a similar period of time, nutrient loads from non-point sources have risen by about the same amount that inputs from point sources have declined. Non-point sources now contribute a greater proportion of contamination to waterways, and include nitrogen, phosphorus, sediment and faecal matter containing bacteria and viruses.

Dairy farming is intensifying in the Waikato region. In the 10 years from 1994-2004, the number of dairy cows in the region increased by over 100,000 to a total of 1,092,841 (LIC figures). The average stocking rate rose from 2.8 cows/ha in 1997-98 to 2.96 cows/ha in 2003-04. This translates to an additional 16 cows for every 100 ha farmed, and an additional 1.6 tonnes of N leached every year from an average farm.

Participants during a question and answer session. Photo: Melinda Dresser

In general, as stocking rates increase on grazed pasture, so too does the potential for nitrate to be leached from urine patches through the soil and into groundwater.

There is a strong relationship between dairy stocking rate and nitrogen losses from catchments. This is a significant issue; more animals = more N in waterways.

Increased production (e.g. dairy industry targets of 4% growth) will affect water quality if not managed carefully.

Anne Lightfoot volunteered her time to show participants how to monitor the water quality in their streams. She highlighted the importance of using the same site each time, labelling them and marking clearly with a stake (as long as stock can't knock it over). Taking photos of a site as a visual record is worth doing too. Each site needs to be easily accessible and monitoring would be best if done around the same time of the day (though not early morning). To assess the water quality of a stream, regular monitoring of each site is vital and can be done weekly to annually, although Anne recommended quarterly monitoring and after any potential pollution event (such as fertilizer application)

Before we monitored the water, we considered the local stream bank conditions (riparian planting, stock access etc.), surrounding site and up-stream conditions and activities, weather and recent flooding, aquatic pathways (down-stream usage etc.) and steam bed conditions (substrate, vegetation etc.). These give a context for the monitoring.

At the Te Pahū stream, we monitored the water for a number of things including: pH, temperature, conductivity, clarity and potential pollutants, namely: nitrate and phosphate (ideally we would have tested for dissolved oxygen and total dissolved sediment, although we had limited time constraints).

We also checked the macro-invertebrates in the stream, some of which are sensitive to poor water quality or other stresses, so an inventory on what species are in the stream can give a good impression of the water quality. Mayflies and stoneflies were present (which generally means good quality water) as well as snails (if only snails were present, this could mean poor water quality).

Anne Lightfoot and helpers measuring pH of the stream. Photo: Nardene Berry

Linda Evens, landowner, was worried the recent heavy rain would have had a negative impact on the quality of the water, but surprisingly it didn't have too negative an impact. On the day, the stream was of quite good quality although a regular monitoring programme would be prudent to confirm this. Site water quality results from the day could be used as a benchmark site for other farmers in the area interested in monitoring their streams. The Rural Water Quality Monitoring Record from the day is below.

A Stream Health Monitoring Assessment Kit (SHMAK) kit is available from the NZ Landcare Trust for landowners to borrow if they would like to monitor their water quality. Contact either Nardene or Melinda. Phone: 07 859 3725.

Then participants went to the Kāniwhaniwha Reserve where Gerry Kessels and Britta Deichmann from Kessels and Associates volunteered their time to do some electric fishing. This involved Gerry getting into the stream and stunning fish with an electric current while Britta caught the stunned fish in a net. The Kāniwhaniwha stream comes from Mt Pirongia and the quality of the water is good given that it has

passed through a dairy farm before reaching the Reserve. The recent rain had made levels much higher than usual, so electric fishing conditions weren't ideal and it was a tricky procedure.

Gerry was pleasantly surprised to catch a lamprey – a nationally threatened species (more info about lamprey here), as well as longfin eels (also a threatened species), Cran's bully and freshwater crayfish (now a nationally threatened species as well!).

Gerry Kessels and Britta Deichmann electric fishing in the Kāniwhaniwha stream (photo Melinda Dresser)

Rural Water Quality Monitoring Record

Date / Time 29th June 2010	**Stream Bank Conditions** (e.g. riparian planting, overhead shade, stock access, bank erosion etc.) No riparian planting, grass to stream edge, little over head shade provided by willows, stock excluded via one wire electric fence, no discernable bank erosion	
Site Location Tributary of Te Pahū stream	**Surrounding Site Conditions** (e.g. adjacent / up-stream land usage etc.) Native bush (Mt Pirongia) upstream, via dry stock and dairy farms	
Weather (previous 24hrs to present, recent flooding) Heavy rain	**Aquatic Pathways / Conditions** (e.g. water source, down-stream usage, flow-rate, point source / diffuse discharges, odours etc.)	**Stream Bed Conditions** (e.g. boulders/gravel/silt, riffles, aquatic vegetation incl. periphyton etc.)

pH	**Temp**	**Conductivity**	**Clarity**
5 or less = Poor	<5^{0}C = Fair	<20-149 µS/cm = Good	Clear to bottom = excellent
5.5-6 = Fair	5-9.9^{0}C = Good	150-249 µS/cm = Fair	70-100cm = Good
6.5-7.5 = Excellent	10-14.9^{0}C = Excellent	250-399 µS/cm = Poor	55-69cm = Fair
9.5 or more = Poor	15-22^{0}C = Fair	400 µS/cm or more = Very poor	35-54cm = Poor

	>23^{0}C = Poor NB. *Max. temp. increase of +3^{0}C in 24 hrs*		
Score **5 – 7**	**Score** **12**	**Score** **61.6**	**Score** **60 - 70**

Nitrate	**Phosphate**	**DO (Dissolved O²)**	**TDS**	**Salinity**
<0.1mg/L good for fish NB. *>5.6mg/L unsafe for drinking*	>0.3mg/L can lead to eutrophication	<80% in breach of RMA Guideline, diurnal variation		
Score **<1mg/L**	**Score** **<0.1mg/L**	**Score** **N/A**	**Score** **N/A**	**Score** **N/A**

Rural Water Quality Monitoring Record

Sensitive to Poor Water Quality or other Stresses	**Mayflies / Stoneflies**	**Caddisflies**			
	present				
Moderate Tolerance	**Dobsonfly**	**Beetles**	**Dragonfly / Damselfly**	**Backswimmer / Boatman**	**Amphipods / Shrimps**
					present
Tolerant to Poor Water Quality	**Snails**	**Worms**	**Other**		
	present				

Biological Survey of Macroinvertebrates

NB; macroinvertebrates were taken from a culvert under Limeworks Loop road, at a different section of the stream than the rest of the water quality monitoring site.