Air quality 2008/09

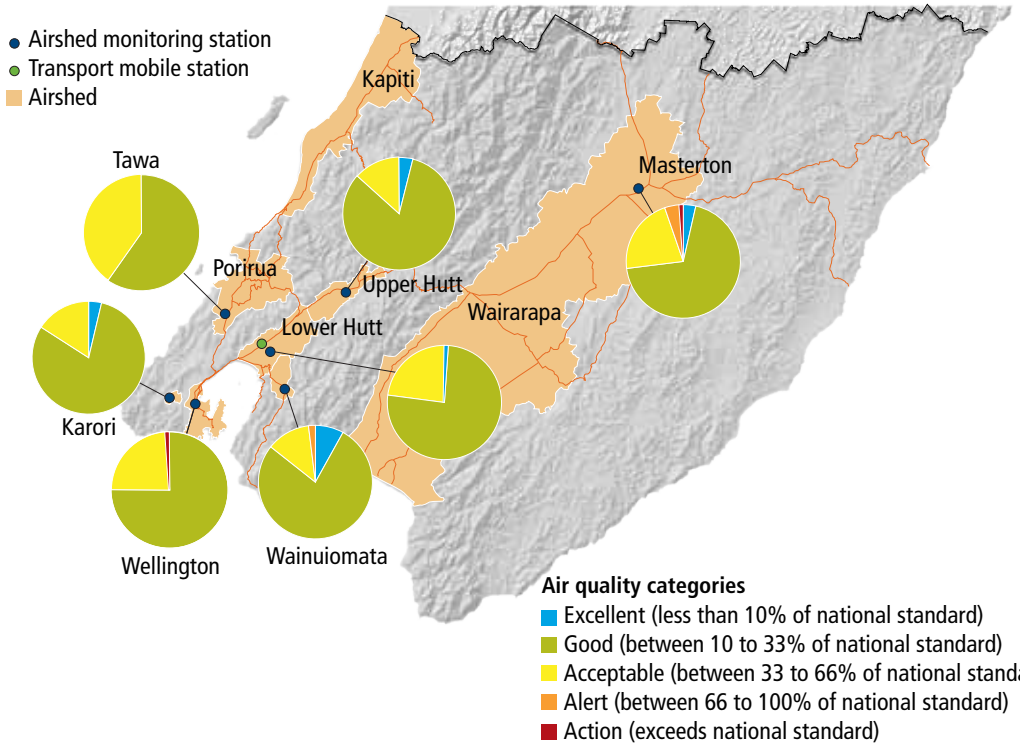
Key points:

- The region had low air pollution levels – there were three nights in winter 2008 and one night in winter 2009 when high air pollution was recorded in Masterton.
- Particulate matter (PM_{10}) was the only air pollutant measured to exceed the national environmental standards for air quality.
- Roadside air quality continues to be "acceptable" or better with only one high pollution day measured in central Wellington in 2008.
- Air quality is worst during cold, clear and calm weather, especially in valleys where pollution from domestic fires can become trapped overnight.

What happened in 2008/09?

Regional air quality in 2008

Greater Wellington monitored air quality at selected sites in the region. Three key pollutants were measured – particulate matter (PM_{10}), carbon monoxide and nitrogen dioxide - and the results compared against the national environmental standards and guidelines set to protect public health.



The pie graphs show the percentage of time during 2008 that PM_{10} levels fell into the five different air quality categories. The "excellent" category has the lowest level of risk to human health and the "action" category the highest risk. An "action" result also means that the limit for PM_{10} in air set by the national environmental standard has been exceeded. The national standard is breached when there are two or more exceedences within an airshed in a year.

Monitoring during the 2008 calendar year showed that air pollution levels in the region were low. Carbon monoxide concentrations were mostly "excellent" and reflect the national trend towards more modern, lower emission petrol vehicles. Nitrogen dioxide levels were generally "excellent", except for the central Wellington site where levels were mostly "good".

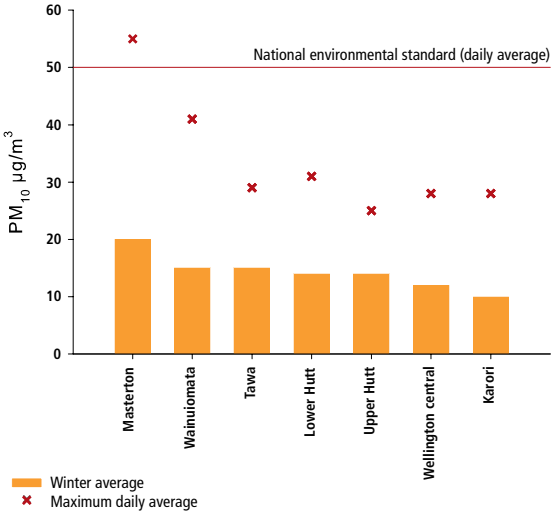
Levels of PM_{10} measured throughout the region were mostly "good". However, air quality reached the "alert" level on 15 days in Masterton and seven days in Wainuiomata. There were also three days in Masterton and one day in central Wellington where the national environmental standard was exceeded.

Roadside air quality

The air in heavily trafficked city areas has higher levels of some pollutants than suburban and rural areas. The pie charts show the proportion of time during 2008 that levels of air pollutants measured in central Wellington (corner of Victorian and Vivian streets) were "excellent" (blue), "good" (green) or "acceptable" (yellow). Air quality was well within the national environmental standards apart from one allowable exceedence of the PM_{10} national standard (indicated in red).

Winter air quality in 2009

Masterton and Wainuiomata are susceptible to pollution from domestic fires and were the only two towns this winter where the 'alert' level for PM_{10} was reached. On still, cold and clear nights, smoke containing particulate matter (PM_{10}) accumulates and is not dispersed until the following morning when the ground heats up and the air starts to circulate.



The bar graph shows average concentrations of PM_{10} during May to August 2009 with the maximum daily average shown by the red cross. There were 15 "alert" days in Masterton and four "alert" days in Wainuiomata. The national standard was not breached as there was only one exceedence day in Masterton.

Air pollution investigations

Sources of air pollution in Wainuiomata

We worked with GNS Science to identify the sources of particulate pollution in Wainuiomata. Samples of PM_{10} were collected as two size fractions – fine particulate matter ($PM_{2.5}$) and coarse particulate matter ($PM_{2.5\text{-}10}$) – over a two year period. Fine particulate sources are domestic fires and vehicle emissions. Coarse particulate originates from road dust and natural sources, such as sea-salt and soils. $PM_{2.5}$ causes the most harm to people's health because smaller particles can penetrate deeper into the lungs.

For much of the year natural sources make up most of the PM_{10} in Wainuiomata's air. The study found that $PM_{2.5}$ produced by domestic fires is responsible for the higher PM_{10} concentrations in winter. Domestic fires were also found to be a source of arsenic in air, most likely arising from the burning of timber treated with copper-chrome-arsenic preservative.

Our 2008 survey of household heating methods in Wainuiomata predicts that domestic emissions will decrease and air quality is likely to meet the national environmental standard for PM_{10} by 2013. More work is needed to confirm whether or not concentrations of $PM_{2.5}$ and other toxic pollutants in wood smoke will also be reduced to acceptable levels.

Air quality in Wairarapa towns

We have good information on the levels and sources of air pollution in central Masterton, but little is known about air quality in some of the other Wairarapa towns. A pilot study, looking at air quality in Featherston, Carterton and on the outskirts of Masterton (Solway) was carried out in winter 2009. Elevated levels of fine particulate matter ($PM_{2.5}$) were found on five days in Carterton and on two days in Featherston. There was also one day in Carterton when PM_{10} concentrations reached the "action" level. Further monitoring is planned to find out more about Carterton's air quality.

Mobile air quality monitoring station located at Featherston School during June 2009.

What is Greater Wellington doing?

- Monitoring air quality at selected sites around the region, including Wellington, Lower Hutt, Upper Hutt, Wainuiomata, Karori, Tawa and Masterton.
- Carrying out screening studies to identify any areas that may have poor air quality and need further monitoring or investigations.

What can you do?

- Insulate your house effectively and burn only dry untreated wood in your fireplace. After starting the fire, leave the air vent open for at least half an hour to create a hotter, cleaner burning fire.
- Keep your vehicle tuned and serviced to reduce smoke and fumes.

More information

Some of the information on this card is a summary of the 2008 annual air quality monitoring report, which is available on our website at **www.gw.govt.nz/envreports**

If you would like to know more about air quality, visit our website or contact:

The Environmental Scientist (Air Quality)
Phone: 04 384 5708 (Wellington office)
Email: environmentalscience@gw.govt.nz

Groundwater 2008/09

Key points:

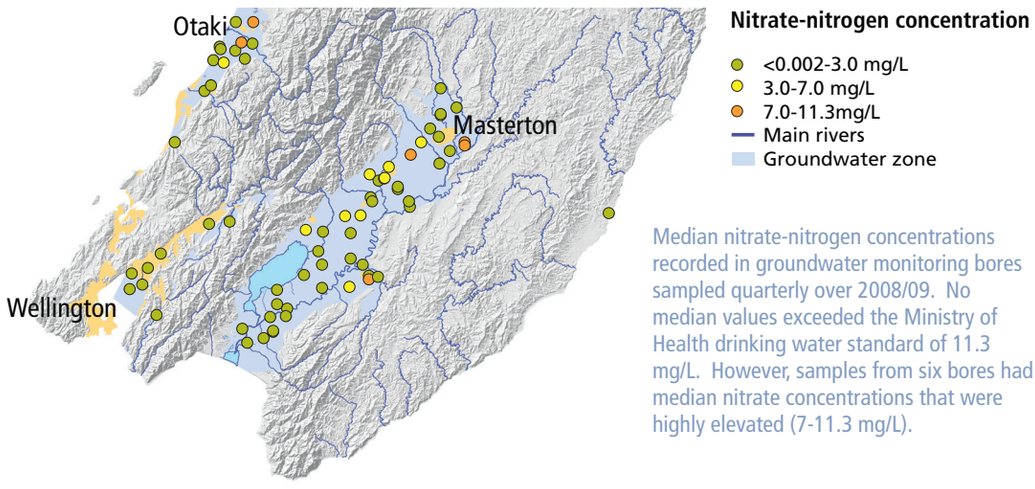
- Elevated nitrate-nitrogen levels continue to be measured in some of the region's aquifers. Contamination levels are generally highest in shallow aquifers associated with more intensive landuse.
- A relatively wet winter in 2008 resulted in a partial recovery of water levels in some of the region's aquifers.
- Alternating wet and dry months through spring 2008 and summer 2008/09 resulted in fewer extreme low groundwater levels compared to recent years.
- Computer models of the Wairarapa Valley groundwater system have been developed to assist with determining sustainable water allocation limits.

What happened in 2008/09?

Groundwater quality

Three-monthly testing of groundwater quality across the region during 2008/09 showed that *E. coli* bacteria counts met the Ministry of Health drinking water standard (<1 cfu/100 mL) in most of the 71 bores monitored. Ten bores had bacteria counts above the standard on at least one sampling occasion, with the highest count being 3,000 cfu/100 mL in a non-potable bore at Te Horo Beach. Median concentrations of nitrate-nitrogen were high (between 7 and 11.3 mg/L) in six bores located in Kapiti and Wairarapa – samples from three of these bores exceeded the drinking water standard (11.3 mg/L) on one sampling occasion.

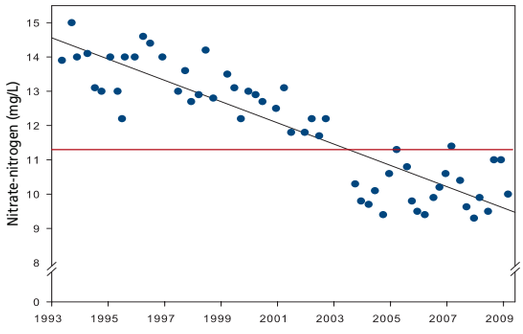
In March 2009 we carried out one-off testing for metals in groundwater. Arsenic – which can occur naturally in groundwater – was detected in samples from 20 bores, with concentrations above the Ministry of Health drinking water standard (0.01 mg/L) in three samples. Concentrations of other heavy metals were below drinking water standards.



Median nitrate-nitrogen concentrations recorded in groundwater monitoring bores sampled quarterly over 2008/09. No median values exceeded the Ministry of Health drinking water standard of 11.3 mg/L. However, samples from six bores had median nitrate concentrations that were highly elevated (7-11.3 mg/L).

Kapiti groundwater quality investigation

Greater Wellington carried out a targeted groundwater quality investigation of 31 bores on the northern Kapiti Coast in late 2008. Results of the investigation suggest that concentrations of nitrate-nitrogen in groundwater have decreased since 1996 but in many areas still remain elevated (7-11.3 mg/L). The highest nitrate-nitrogen concentrations are present in shallow groundwater in the intensive land use areas of Hautere and northern Otaki.

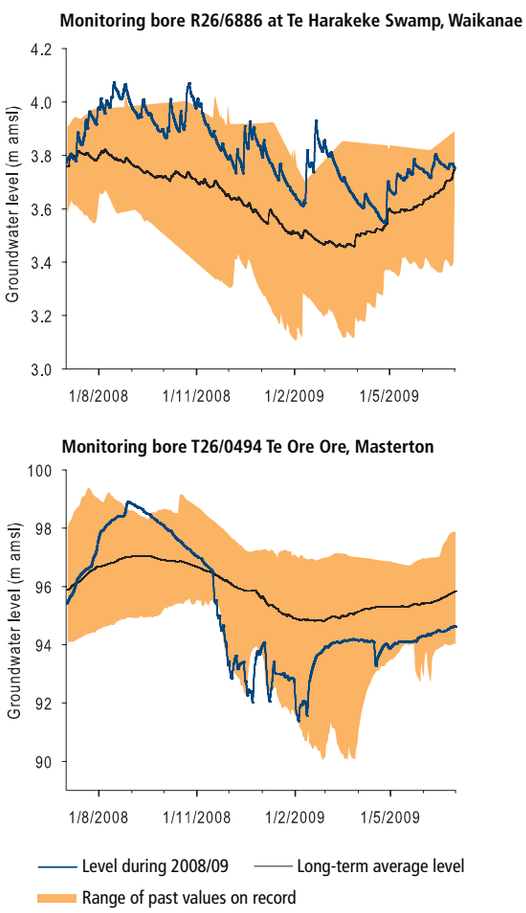


Nitrate-nitrogen concentrations measured over time in a bore north of Otaki. The black line indicates the overall decreasing trend in concentrations. The red line indicates the national drinking water standard (11.3 mg/L).

Groundwater levels

During 2008/09 groundwater levels were generally above average on the Kapiti Coast, fluctuated around average in the Hutt Valley and were average to below average in the Wairarapa. A relatively wet winter in 2008 resulted in significant recharge to the region's aquifers, with above average groundwater levels recorded for this period. Alternating wet and dry months through spring 2008 and summer 2008/09 resulted in fewer extreme low groundwater levels compared to previous years. November and December 2008 were particularly dry in the Wairarapa and this was reflected in lower groundwater levels in this part of the region in early summer.

Overall, a partial recovery in water levels was observed in some aquifers, which in recent years had been trending downwards. It is likely that the wet winter of 2008 played a major role in this. High rainfall in February 2009 may also have reduced groundwater abstraction and therefore contributed to less seasonal decline than normal. However, our monitoring in "stressed" aquifers in the Wairarapa Valley shows water levels are still below long term averages.



Groundwater levels at Te Harakeke Swamp, Waikanae (left) show the effects of a wetter than average year on groundwater levels on the Kapiti Coast. The wet winter in 2008 and then an early start to summer is evident in the Te Ore Ore monitoring bore near Masterton (right). Water level recovery around March 2009 is probably the combined result of recharge through summer/autumn and reduced irrigation demand.

Greater Wellington staff member hand drilling a groundwater level monitoring bore at Te Hapua Wetland at Te Horo on the Kapiti Coast. As outlined in the *Rainfall and river flows* report card, we installed monitoring equipment in the Te Hapua Wetland on the Kapiti Coast to better understand how the wetland system works. The project included drilling two groundwater monitoring bores.

Wairarapa groundwater investigation

Significant progress has been made over the last year with the Wairarapa groundwater investigation, with computer models developed for the lower, middle and upper sections of the Wairarapa Valley. The models, which simulate the groundwater and surface water environment, are in their final calibration and reporting phase.

The models will allow us to test a range of water abstraction and climatic scenarios that will help to determine sustainable groundwater limits in the upcoming review of our Regional Freshwater Plan.

What is Greater Wellington doing?

- Monitoring groundwater quality at quarterly intervals at 71 sites across the region.
- Targeted monitoring of nitrate levels in the areas of the region most vulnerable to contamination.
- Carrying out a combined surface water and groundwater investigation of water quality in the Mangatarere catchment.
- Monitoring groundwater levels at 147 sites across the region, of which 15 were new sites added to the network during 2008/09.
- Finalising a groundwater model of the Wairarapa valley to improve our understanding and management of this large groundwater resource.

What can you do?

- Manage animal effluent disposal systems and fertiliser use to ensure that application rates are appropriate for the soil type and soil moisture conditions, to avoid contamination of nearby waterways and aquifers.
- Apply for a resource consent before drilling any bore. If you propose to take more than 20,000 litres of water per day from a bore you will also need a water permit.
- If you have your own bore for domestic water supply, it's essential to have good well head protection, and to get the water tested regularly – we suggest annually. Greater Wellington staff can advise on how to get the water tested.
- If you have a water permit to take groundwater, read your meter regularly – this will aid any future consent renewal and assist with modelling and management of the groundwater resource.

More information

Some of the information on this card is a summary of the 2008/09 annual groundwater monitoring report which is available on our website at **www.gw.govt.nz/envreports**

If you would like to know more about groundwater, visit our website or contact:
The Environmental Scientist (Groundwater)
Phone: 04 384 5708 (Wellington office) or 06 378 2484 (Masterton office)
Email: environmentalscience@gw.govt.nz

Quality for Life

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Harbours, estuaries and beaches 2008/09

Key points:

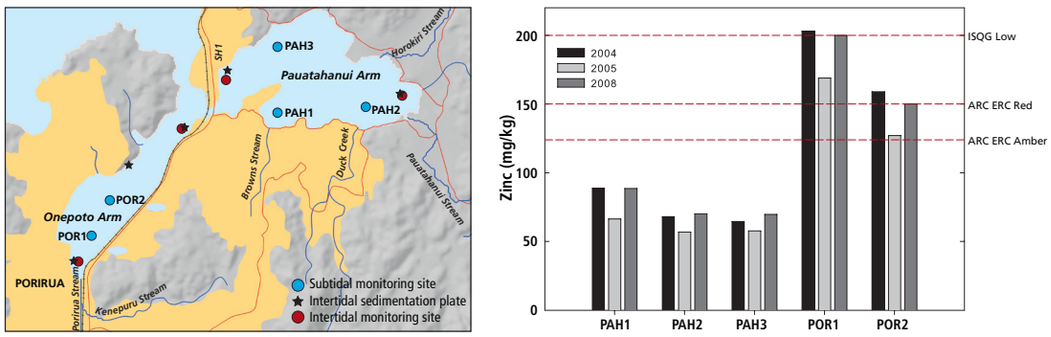
- Concentrations of heavy metals, particularly zinc, remain elevated in sediments from the subtidal basin of the Onepoto Arm of Porirua Harbour.
- Porirua Harbour is moderately eutrophic (nutrient rich), with the January 2009 survey showing nuisance algae covering more than 50 per cent of some of the 'mudflat' areas exposed at low tide.
- There is clear evidence of stormwater-derived contamination in the sediments of Porirua Harbour, and in the sediments in the beds of streams that discharge into the harbour.
- The ecological condition of the Whareama Estuary is "fair" to "good" – the very muddy and poorly oxygenated sediments are not ideal for plants and animals.
- Castlepoint Beach is in good ecological condition.

What happened in 2008/09?

Porirua Harbour sediment quality and ecological health monitoring

In late 2008 we carried out our third survey of sediment quality in Porirua Harbour. Samples of harbour floor sediment and benthic fauna (animals that live on or in the sediment) were collected from five subtidal sites (always covered by water) – three in the Pauatahanui Arm and two in the Onepoto Arm.

Results of heavy metal tests on the sediment samples mirrored those from earlier surveys in 2004 and 2005 – concentrations of copper, lead and zinc in subtidal sediments of the Onepoto Arm remain above some "alert" or "early warning" guidelines. Concentrations of other metals are currently below guideline levels in this arm, as are the concentrations of all metals in the subtidal sediments of the Pauatahanui Arm. As well as higher sediment metal concentrations, the Onepoto Arm monitoring sites are muddier and more enriched, contributing to a lower diversity of benthic fauna than that found at Pauatahanui Arm sites.



Monitoring sites in Porirua Harbour (left) and concentrations of total zinc in the surface sediments at five sites sampled in Porirua Harbour in 2004, 2005 and 2008. These sites are located in or on the edge of the subtidal basins in each arm of the harbour which are dominated by fine muds and so form a "sink" in which contaminants like heavy metals accumulate. Auckland Regional Council environmental response criteria (ARC ERC) and national interim sediment quality guidelines (ISQG) indicating possible adverse biological effects are shown in orange and red.

In January, ecological surveys were undertaken at two intertidal sites (areas exposed at low tide) in each arm of Porirua Harbour. This was the second of a proposed series of three to four annual assessments to establish an ecological "baseline". The intertidal monitoring programme is broader in scope than the subtidal monitoring – as well as sediment toxicity, it investigates sedimentation and nutrient enrichment (eutrophication), key issues in estuarine environments.

This year's results indicate heavy metal toxicity is not an issue at any of the intertidal monitoring sites and, after one year, sedimentation rates at most sites are low. However, similar to last year, sediment nutrient concentrations and the depth of the oxygenated surface sediment layer indicate that both arms of the harbour are moderately enriched. One sign of this is the presence of nuisance growths of sea lettuce and other algae. Around one third of the intertidal habitat in the Onepoto Arm and one tenth of the intertidal habitat in the Pautahanui Arm had greater than 50 per cent coverage of algae, resulting in localised nuisance conditions (rotting algae and poorly oxygenated and sulphide-rich sediments).

Porirua Harbour sediment "hotspot" assessment

In February, together with Porirua City Council, we carried out some additional testing of contaminants in Porirua Harbour sediments, targeting intertidal areas close to contaminant sources such as stormwater outfalls and stream mouths. The sampling focused mainly on the surface sediments from the southernmost end of the Onepoto Arm, in the area between the Porirua Stream channel and several large stormwater outfalls draining parts of Porirua City. Sediment samples were also taken near the mouths of Onepoto Stream, Browns Stream and Duck Creek and from the beds of the lower reaches of Porirua, Kenepuru and Onepoto streams.

The sampling results show clear evidence of stormwater-derived contamination in parts of Porirua Harbour and in the sediments from the beds of streams that discharge into the harbour. We found:

- Most samples exceeded sediment quality guidelines for one or more persistent contaminants, especially zinc (all samples from sites in the Onepoto Arm) and the pesticide DDT (all intertidal sediment and streambed samples).
- Concentrations of lead and polycyclic aromatic hydrocarbons were above guideline values in some sediment samples taken from near the Semple Street stormwater outfall and the Onepoto Stream, and intertidal sediments beside the Porirua Rowing Club and the mouth of Browns Stream.

In most cases, sediment contaminant concentrations only exceeded "early warning" guidelines. This indicates that there is an opportunity to implement actions to limit the extent of degradation and prevent adverse environmental effects from occurring.

Whareama Estuary and Castlepoint Beach monitoring

Ecological assessments of Whareama Estuary and Castlepoint Beach on Wairarapa's east coast were carried out for a second time in January. Based on the National Estuary Monitoring Protocol, they included an assessment of sediment grain size and chemistry, and sediment dwelling plants and animals. The key findings were similar to those from last year's initial surveys:

- Whareama Estuary: overall the intertidal habitat is generally in "fair" to "good" condition despite measurements from sediment plates buried in the estuary during the 2008 survey revealing a high sedimentation rate (average 14.5 mm over a year). Excessive inputs of sediment are largely a natural phenomenon given the erosion-prone mudstone soils in the catchment. While the very muddy and poorly oxygenated sediments are a concern (they create poor conditions for plants and animals), there was a slight improvement in the diversity of the estuary's biological community over the year.
- Castlepoint Beach: the intertidal habitat is generally in "good" condition. The beach sediments consist of well-oxygenated sands and support animals commonly found in exposed low-nutrient beach environments, such as crustaceans and beetles.

Photos: Wriggle Coastal Management

Collecting sediment from one of the monitoring sites at Whareama Estuary (left) and Castlepoint Beach (right), on the eastern Wairarapa coast. At each site, sediment samples are collected for laboratory testing and the algae and animals living in and on the sediment are identified and counted.

Discharge from the Semple Street stormwater outfall at the southern end of the Onepoto Arm of Porirua Harbour. A thick cover of algae can also be seen. Discharges from stormwater outfalls contain contaminants that run off hard surfaces such as roofs, roads and footpaths when it rains. Sometimes the discharges include paint, oil or other chemicals that people have tipped into roadside gutters or down storm drains without realising that these flow to streams and the coast.

What is Greater Wellington doing?

- Regularly monitoring microbiological water quality at 77 coastal sites (see the *Recreational water quality* report card) and designing a water quality monitoring programme for Lake Onoke, a shallow brackish lagoon on Wairarapa's south coast.
- Monitoring sediment quality and ecological health in sensitive estuarine and harbour environments, particularly those likely to be affected by urban stormwater.
- Assisting with funding Victoria University postgraduate research comparing the biodiversity values associated with restored and non-restored coastal dune systems in the Wellington region.
- Working closely with the Porirua City Council and other stakeholders to put in place an action plan by June 2011 to address various environmental issues in Porirua Harbour and its catchment.

What can you do?

- **Save the drain for rain:** Rubbish, paint, oil or any other waste that enters the stormwater drain in the gutter outside your house go directly to streams or the coast. Paints (oil and water-based) and thinners are toxic to aquatic life, and discolour streams and coastal water.
- **Secure your recycling and put your rubbish in the bin:** On windy days, if not properly secured, recycling and rubbish left for local council collection can be blown into the coastal environment. This spoils the use of our beaches for recreation and may harm bird and marine life.

More information

The information on this card is a summary of the more detailed 2008/09 annual coastal monitoring report, which is available on our website at **www.gw.govt.nz/envreports**

If you would like to know more about the coast, visit our website or contact:

The Team Leader, Environmental Science
Phone: 04 384 5708 (Wellington office)
E-mail: environmentalscience@gw.govt.nz

Rainfall and river flows 2008/09

Key points:

- Although 2008/09 was a year with alternating periods of settled and stormy weather, there were no significant floods or droughts during the year.
- The summer was 'interrupted' by a particularly stormy February, which meant Wellington was spared from region-wide drought conditions like those that occurred the previous year. However, eastern Wairarapa was affected by a particularly dry autumn.
- Greater Wellington is continuing to investigate minimum flow requirements to sustain river values, and this information will contribute to the upcoming review of our Regional Freshwater Plan.

What happened in 2008/09?

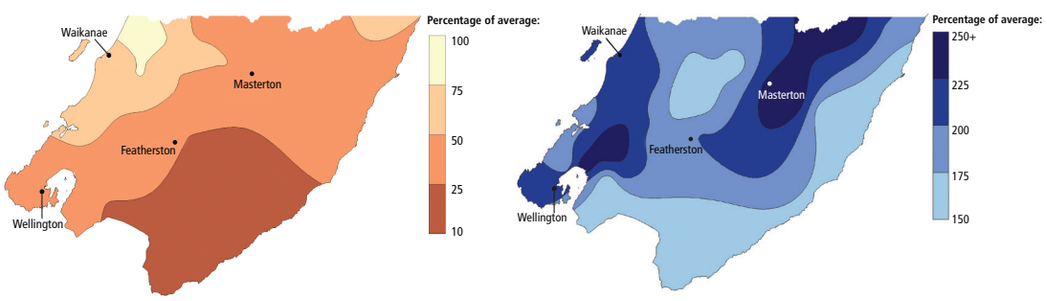
A variable year

In contrast to the previous two years, there were no significant floods or droughts in the Wellington region in 2008/09. However, the year was very variable with alternating periods of settled and stormy weather. Although rainfall was generally about average for the year as a whole, there were some months of very high rainfall and other months of very low rainfall. For example, Masterton had two months during 2008/09 with rainfall more than double the average (August and February), and two months with less than half the average rainfall (November and January).

The Ruamahanga River near Masterton, during autumn 2009. Two phases of low river flows occurred during 2008/09; the first was during early summer and the second was in autumn. High rainfall and river flows during February meant that the restrictions on water takes imposed during January could be lifted.

Very low rainfall during late spring and early summer meant that by late January 2009 restrictions on water takes from some rivers were in force. However, the summer was 'interrupted' by a very wet February. The particularly high rainfall during February was due to unusually stormy weather for the time of the year. The resulting high river flows and recharge to groundwater systems meant that Wellington avoided region-wide drought conditions like those that occurred in summer 2007/08. After issuing water use restrictions in January, Greater Wellington was issuing flood warnings in February, although fortunately there were no severe floods.

Following the wet February, eastern Wairarapa experienced low rainfall and soil moisture during March and April, prompting concerns about drought. However, the rains returned shortly after a medium-level drought was declared by the Minister of Agriculture in May, eliminating the soil moisture deficit that had persisted through most of autumn.



Rainfall as a percentage of average for the month during January (left) and February 2009 (right). Summer 2008/09 was a season of contrasts, with a very dry January, a wet February, and a return to low rainfall and river flows in March.

Minimum flows review

Minimum flows for rivers and streams are set in the Regional Freshwater Plan to protect ecological, cultural and recreational values. Greater Wellington seeks to maintain river and stream flows above the minimum flow by restricting or prohibiting consented water takes during times of low flow.

Greater Wellington has been carrying out scientific investigations to ensure that the minimum flows are set appropriately. This year, we initiated a study of the Waiohine River that looked at the effects of low flows on fish habitat. We also continued our monitoring of dissolved oxygen in several Wairarapa rivers and streams, to see how low flows affect the amount of oxygen in the water. The results of these studies will be considered in the upcoming review of our Regional Freshwater Plan.

Learning about Te Hapua wetland hydrology

The Te Hapua wetland complex, near Te Horo, is an important remnant of "the Great Swamp" that spanned over 2,000 hectares of the Kapiti Coast from Paekakariki to Foxton. Te Hapua is home to a number of rare or threatened species of birds and plants, but the wetlands are under threat from surrounding land development and human activities. To improve our understanding of the wetlands, Greater Wellington, in conjunction with Kapiti Coast District Council and the local community, has installed equipment to monitor water levels in the wetlands and nearby groundwater bores, as well as rainfall. This will help us understand the hydrology of the area so that we can better manage activities that might affect these significant wetlands, such as roading, diversion of water through culverts, and taking water from bores.

A new monitoring site in the Te Hapua wetland complex. Automatic monitoring equipment records the water level every 15 minutes. The readings are sent to the Greater Wellington office via telemetry, and can be viewed on our website.

Installing dissolved oxygen monitoring equipment in a river in the Wairarapa. Low river flows may result in low dissolved oxygen concentrations, particularly in small streams with a lot of aquatic plant growth. The dissolved oxygen monitoring results will be taken into account when we recommend minimum flows for small streams.

Greater Wellington staff measuring the flow in a stream in the Wairarapa. Small streams can support important values, such as providing habitat for threatened fish species. In some parts of the region, small streams are also used as a source of water for irrigation. In order to set appropriate minimum flow policies, it is important that we collect accurate information about stream flows.

What is Greater Wellington doing?

- Monitoring rainfall, river flows and lake levels at more than 90 automatic recording stations across the region.
- Operating a flood warning system that involves monitoring river levels, forecasting flood peaks, and issuing warnings to people who may be affected.
- Assessing compliance with resource consents to take water from rivers and streams, and issuing water take restrictions during times of low flows.

What can you do?

Conserve water by watering your garden deeply once or twice a week during dry spells, rather than watering lightly every day. This encourages deeper-growing roots, making the plants more resistant to drought. Other tips on saving water in your garden can be found on our website.

More information

Some of the information in this card is a summary of a more detailed 2008/09 annual hydrology monitoring report that is on our website at **www.gw.govt.nz/envreports**

River flow, lake level, soil moisture, and rainfall data, along with other environmental monitoring data, can be viewed on our website: **www.gw.govt.nz/monitoring**. The information is updated frequently throughout the day.

If you would like to know more about rainfall or river flows, visit our website or contact:

The Environmental Scientist (Hydrology)
Phone: 04 384 5708 (Wellington office) or 06 378 2484 (Masterton office)
Email: environmentalscience@gw.govt.nz

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River and stream health 2008/09

Key points:

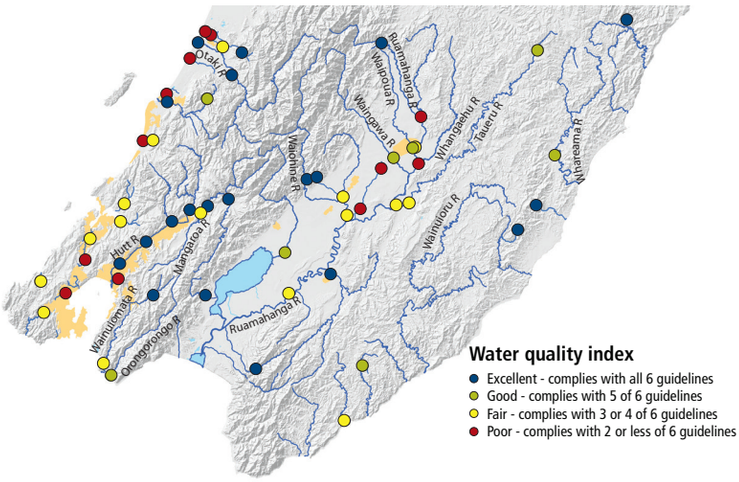
- Half of the 56 river and stream sites monitored over 2008/09 had good or excellent water quality and the other half had fair or poor water quality. The poorest water quality was recorded in urban streams and in the lower reaches of small rivers and streams draining intensive agricultural catchments.
- Elevated concentrations of heavy metals in some urban streams may be impacting on aquatic life.
- Urban streams can provide valuable habitat for native freshwater fish, but numerous instream barriers are stopping many species from migrating into these streams.

What happened in 2008/09?

Water quality

Monthly sampling during 2008/09 showed that 20 of the 56 river and stream sites we monitor had excellent water quality and complied with all six guidelines we use to measure overall stream health. A further eight sites failed just one of the guidelines and are classed as having good water quality. River and stream sites with excellent or good water quality are located in catchment areas where the land cover is predominantly indigenous forest and human influences are minimal. These sites are typically on rivers and streams flowing out of the Aorangi, Tararua and Rimutaka ranges and include the Hutt, Otaki, Waikanae, Waiohine, Waingawa and Tauherenikau rivers and the upper reaches of the Waitohu Stream and Wainuiomata and Ruamahanga rivers.

Half of the river and stream sites monitored exceeded two or more guidelines and were classed as having fair or poor water quality, reflecting the large proportion of their catchments in agricultural or urban land use. The water quality variable that exceeded guidelines at the most sites was water clarity (31 sites), followed by dissolved reactive phosphorus (24 sites), *E. coli* bacteria (19 sites) and nitrate nitrogen (17 sites). Guidelines for ammoniacal nitrogen and dissolved oxygen were exceeded far less frequently. Rivers and streams with poor water quality include the Whangaehu and Kopuranga rivers and the Mangaone, Mangapouri, Porirua and Waiwhetu streams. These waterways have catchments heavily influenced by either intensive agricultural or urban land use, or a combination of the two.



The level of compliance with guidelines for six key water quality variables (water clarity, dissolved oxygen, dissolved reactive phosphorus, nitrite-nitrate nitrogen, ammoniacal nitrogen and *E. coli*) gives us an overall picture of water quality in the region's rivers and streams. The water quality index ratings shown here are based on a comparison of median values from monthly data collected between July 2008 and June 2009 against national guideline values.

Heavy metals in our urban streams

During 2008 water samples from 14 river and stream sites located within urban areas were tested for heavy metals as an indicator of potential stormwater contamination. Dissolved copper, lead and zinc were regularly detected at the majority of these sites with samples from the Porirua, Karori Kaiwharawhara and Waiwhetu streams exceeding toxicity guidelines for at least one metal. Elevated metal concentrations may contribute to the poor aquatic ecosystem health frequently observed in these streams. The contaminant impacts can also extend further into receiving coastal waters such as Porirua Harbour (see the *Harbours, estuaries and beaches* report card).

Native fish in our urban streams

In early 2009 Greater Wellington staff undertook electric fishing and spotlighting surveys to improve our understanding of native freshwater fish communities in the region's urban streams. Many of the surveyed streams were found to contain large populations of banded kokopu, koaro, redfin bullies and eels. Threatened species, such as giant kokopu, were also recorded but far less frequently.

However, in nearly all streams fished the communities only consisted of species that are renowned climbers; some streams contained only a few large (and hence old) fish meaning populations in these streams are not sustainable because there are no young fish to replace the old fish. While habitat destruction and pollution affect all our native fish, it is clear that instream barriers such as extensive piping, large dams, weirs, grade control structures and perched culverts are significantly impacting on fish communities in urban streams. These instream barriers are relatively common in the lower reaches of urban streams and are a big problem for New Zealand's native fish as the majority need to migrate between freshwater and the sea to complete their lifecycle. Those species that are not good climbers can't negotiate these barriers and therefore aren't able to repopulate our urban streams.

Greater Wellington is committed to ensuring no new instream barriers are created and is working to improve fish passage in streams with known barriers. The recently built fish pass in Hulls Creek, Silverstream (Upper Hutt) has proven to be successful, with inanga, not a notable climber, found above a weir that was once a formidable barrier to upstream fish passage.

Electric fishing in a tributary of the Ngauranga Stream in Wellington City (left). Koaro (middle) and banded kokopu (right) are excellent climbers (this koaro is climbing out of a bucket) and are still present in reasonable numbers in many urban streams. Sadly many native fish species that are not good climbers are rarely found in urban streams due to the high occurrence of instream barriers that prevent them from migrating from the sea.

Aquatic invertebrate monitoring

As well as monitoring water quality at 56 river and stream sites, Greater Wellington also measures ecosystem health through annual sampling of the aquatic invertebrate community. Aquatic invertebrates (small stream animals without backbones) can tell us a lot about the overall health of a river or stream because different species have different sensitivities to water quality and habitat degradation. Rivers and streams with good water and habitat quality, such as many headwater streams, support high numbers of pollution sensitive caddisflies, stoneflies and mayflies. In contrast, degraded streams such as the Mangapouri Stream (Kapiti Coast) contain high numbers of pollution tolerant midge larvae and snails.

Nesameletus is a sensitive type of mayfly restricted to high quality rivers and streams. Our monitoring in 2009 showed *Nesameletus* was present in relatively high numbers in the Akatarawa and Whakatikei rivers (tributaries of the Hutt River).

What is Greater Wellington doing?

- Monitoring stream and river health at 56 sites around the region.
- Investigating poor water quality in the Mangatarere Stream catchment in Carterton and monitoring the ecological benefits of stream riparian planting projects.
- Investigating the effects of flood protection works on the aquatic fauna and habitat in the Waingawa River, south of Masterton.
- Helping Biosecurity NZ monitor selected river sites for the presence of the invasive freshwater alga, didymo (*Didymosphenia geminata*).
- Providing advice to landowners about streamside management. In 12 high quality catchments we provide plants to landowners who have fenced off streams. Email riparian@gw.govt.nz or visit **www.gw.govt.nz/streams** to learn more.
- Supporting 25 care groups to improve streamside and wetland environments across the region.

What can you do?

- Keep stock, especially cattle and deer, out of rivers and streams.
- Don't pour paint, chemicals or any other waste into stormwater drains, rivers or streams.
- Join Greater Wellington's "Be the Difference" programme and learn some easy steps to help the environment for generations to come, with cleaner streams and less waste. Sign up on-line at **www.bethedifference.gw.govt.nz**

More information

Some of the information on this card is a summary of the 2008/09 annual freshwater quality monitoring report which is available on our website at **www.gw.govt.nz/envreports**

If you would like to know more about river or stream health, visit our website or contact:
The Environmental Scientist (Surface Water Quality)
Phone: 04 384 5708 (Wellington office) or 06 378 2484 (Masterton office)
Email: environmentalscience@gw.govt.nz

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Recreational water quality 2008/09

Key points:

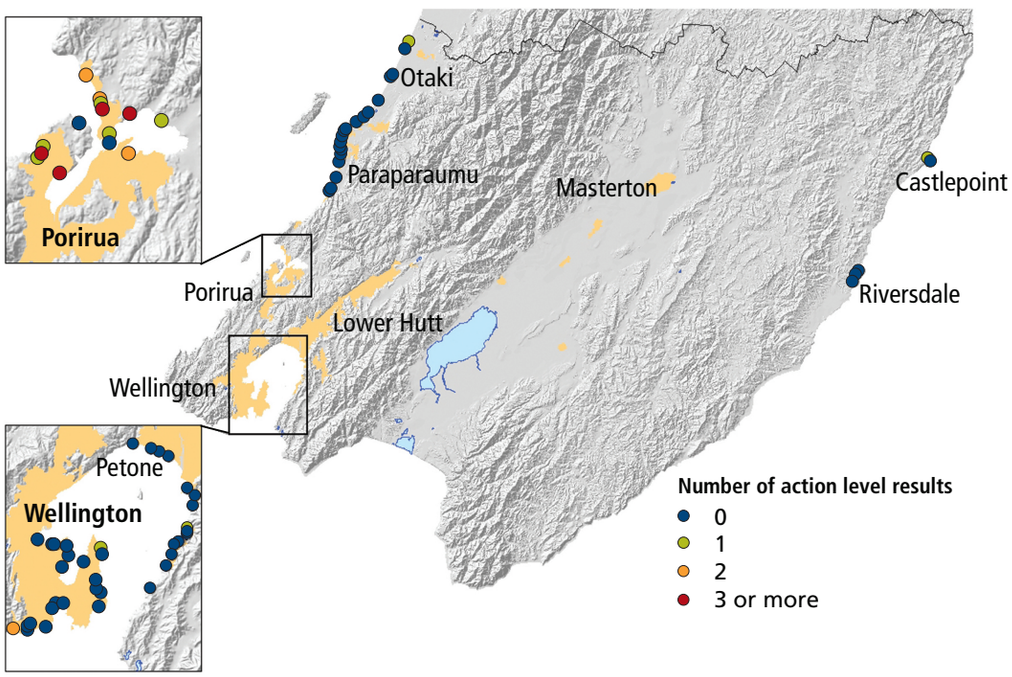
- Coastal water quality was suitable for swimming on all sampling occasions at 59 of the 77 beaches monitored during the 2008/09 bathing season.
- River water quality was suitable for swimming on all sampling occasions at 10 of the 21 swimming spots monitored weekly during the 2008/09 bathing season.
- Extensive toxic blue-green algal growth occurred in some rivers, especially parts of the Hutt and Waipoua rivers.
- Most of the occasions when water quality was unsuitable for swimming were during and shortly after rain, especially in rivers.

What happened in 2008/09?

Coastal waters

Recreational water quality was good at most beaches throughout the region last summer. Only 18 of the 77 sites monitored exceeded the "action" level of the national recreational water quality guidelines for indicator bacteria (280 enterococci/100 mL). Of these, 10 sites exceeded the guideline only once, four sites exceeded twice and three sites exceeded three times. One site, Porirua Harbour at Rowing Club, exceeded the guideline five times. Signs were erected advising people not to swim in this part of the harbour. Investigations undertaken by Greater Wellington and Porirua City Council suggest that a small stream entering the harbour next to the rowing club may be the source of contamination. Further sampling is being undertaken to identify the source within the stream catchment.

Seventy-five per cent of the 32 occasions where sites exceeded the "action" level coincided with at least 10mm of rainfall in the three days prior to sampling and 53 percent coincided with more than 10mm of rainfall in the 24 hours before the day of sampling. The strong correlation between rainfall and elevated bacteria counts in coastal waters relate to runoff from the land entering stormwater systems, rivers and streams discharging to the coast. Pollution in rivers and streams can also affect water quality at some beaches during dry weather, as can re-suspension of sediments from wind and tidal action.

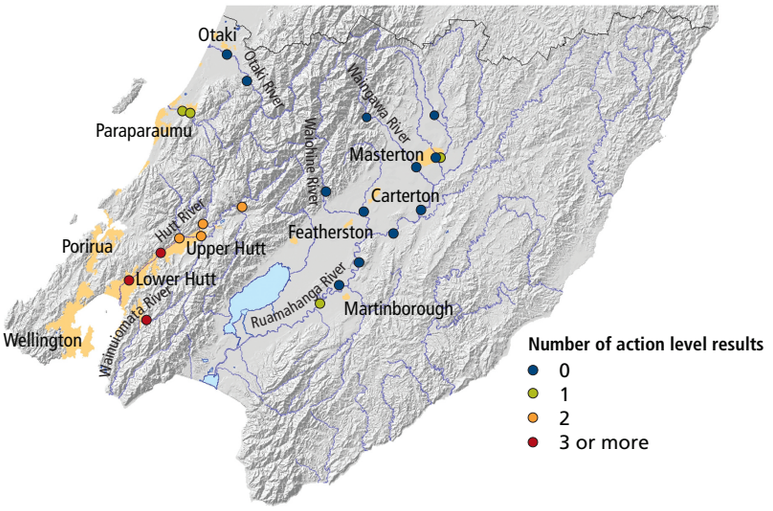


The number of times over the 2008/09 summer that our beach bathing sites exceeded the "action" level of the national microbiological water quality guidelines for coastal recreational areas. For up-to-date results about bathing water quality, check our website during summer.

Fresh water

Eleven of the 21 river sites monitored weekly last summer exceeded the "action" level of the national recreational water quality guidelines for indicator bacteria (550 *E. coli*/100 mL). Of these, four sites exceeded the guideline once, four sites exceeded twice, one site exceeded three times and two sites exceeded four times.

More than 70 per cent of the 23 "action" level results coincided with at least 10 mm of rainfall in the three days prior to sampling. Rainfall causes bacteria to be washed into rivers and streams via urban and agricultural runoff, and also stirs up bacteria attached to streambed sediment.



The number of times last summer that river bathing sites exceeded the "action" level of the national microbiological water quality guidelines for freshwater recreational areas. Two sites – the Hutt River at Silverstream and the Wainuiomata River at Richard Prouse Park – exceeded the guidelines four times.

Toxic algae

Although river swimming spots were mostly safe from pathogens, during warm dry periods some reaches of the Hutt and Waipoua rivers were affected by widespread growth of toxic blue-green algae (cyanobacteria). Health warning signs were put up beside the Hutt River at Silverstream for two days in mid-December and along the Hutt River downstream from the Melling Bridge from late January until mid-February. Health warning signs were also put up along parts of the Waipoua River in Masterton in early January and remained in place until the end of the bathing season. No dog deaths associated with toxic algal mats were reported. For more information on toxic blue-green algae go to **www.gw.govt.nz/toxic-algae**.

Blue-green algal mats along the left bank of the Hutt River at Silverstream late last summer. These types of mats can produce toxins that may harm animals and people, especially dogs.

How do you tell if it is safe to swim?

Greater Wellington uses the national microbiological water quality guidelines "traffic light" system on our website to let people know whether water is suitable for swimming, surfing and other recreational activities.

Green (surveillance) for go – sampling indicates a low health risk.

Amber (alert) for caution – sampling indicates the health risk has increased, but is still within an acceptable range.

Red (action) for stop – sampling indicates the water poses an unacceptable health risk.

The Otaki River Gorge – this monitoring site was suitable for swimming on all sampling occasions last summer.

What is Greater Wellington doing?

Together with the city and district councils and public health agencies, Greater Wellington monitors and reports on:

- The suitability of water quality for recreation at 23 freshwater sites and 77 coastal sites around the region. At most sites the water is sampled weekly during the "bathing season" (from 1 November to 31 March) and the results are assessed against the national recreational water quality guidelines so that we can advise people whether or not, from a public health perspective, the water is suitable for swimming and other forms of contact recreation.
- The suitability of water quality for shellfish gathering at nine coastal locations.
- The presence and potential risk to river users of toxic algal blooms.

What can you do?

- Avoid swimming during and shortly after rain and in rivers where toxic algal mats are present.
- Keep stock, especially cattle and deer, out of rivers and streams to prevent them fouling the water.

More information

Some of the information on this card is a summary of the 2008/09 annual recreational water quality monitoring report which is available on our website at **www.gw.govt.nz/envreports**

If you would like to know more about recreational water quality, visit our website at **www.gw.govt.nz/on-the-beaches** or contact:

The Environmental Scientist (Surface Water Quality)
Phone: 04 384 5708 (Wellington office) or
06 378 2484 (Masterton office)
Email: environmentalscience@gw.govt.nz

Soil health and contaminated land 2008/09

Key points:

- Most soil quality monitoring sites tested last year had at least one soil quality indicator (generally compaction) outside the target range for their land use and soil type, although in most instances this can be remedied with appropriate management.
- Over 19,500 poplars and willows were planted on 280 hectares of erosion-prone land, assisting with soil conservation in the region.
- The clean-up of contaminated sediments in the Waiwhetu Stream is underway following a successful trial in early 2008.

What happened in 2008/09?

Soil quality monitoring

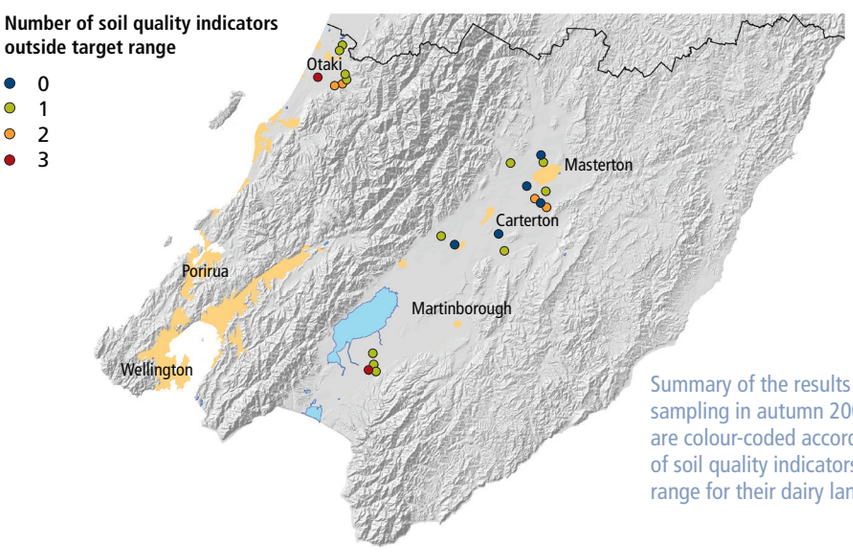
Greater Wellington's soil quality monitoring programme covers 118 sites on a range of land uses across the region's high quality soils. In autumn 2009 we re-sampled 23 dairy farm sites that had previously been sampled twice between 2001 and 2007. Soil health was assessed using a set of seven physical, chemical and biological indicators – including soil structure, nutrients, organic matter and trace elements.

This dairy farm in Otaki is one of our soil quality monitoring sites. At each monitoring site, samples are taken from a depth of 0-10cm using a soil corer (pictured above), tested for various indicators, and the results compared with the optimum range for the soil type and land use. The soil at this site was slightly compacted but nutrient levels were satisfactory.

The main findings from the 2008/09 sampling were:

- Eighteen out of the 23 sites sampled had at least one indicator outside the target range for dairy/pastoral farming and soil type, with two sites outside the target range for three soil quality indicators.
- Low macroporosity (an indication of soil compaction) was the soil quality indicator most often outside of target ranges. Other indicators outside target ranges were Olsen P (an indication of soil fertility), total nitrogen and mineralisable nitrogen. In all cases, Olsen P and nitrogen concentrations were too high.

Low macroporosity values mirror findings from other regions around New Zealand, and generally result from more intensive land use. Compacted soils combined with high nutrient levels increases the risk of nutrient and sediment-rich runoff contaminating nearby streams. There are land management practices that can be used to reduce soil compaction and high nutrient levels in soils.



Summary of the results of soil quality sampling in autumn 2009. The sites sampled are colour-coded according to the number of soil quality indicators outside the target range for their dairy land use and soil type.

Soil conservation

Greater Wellington has a long history of working with landowners to help control soil erosion, particularly in the Wairarapa hill country. This includes preparing individual farm plans and soil conservation programmes. Last year we helped 133 landowners plant over 19,500 poplars and willows on 280 hectares of erosion-prone pastoral land. Just over 100 hectares were established as conservation woodlots, of which 82 hectares were funded under the Government's Afforestation Grant Scheme. Three kilometres of shelterbelts were also established to decrease the effects of wind erosion on alluvial soils within the Wairarapa Valley.

Planting poplar poles on erosion prone soils in the Wairarapa. Over 19,500 poplars were planted during 2008/09.

Greater Wellington also assists landowners fence and plant streamsides to improve water quality and increase biodiversity. Last year 3.9 kilometres of new fencing and planting, and 6.5 kilometres of maintenance planting were completed.

Waiwhetu Stream clean-up

The sediments in the bed of the lower reaches of the Waiwhetu Stream contain high levels of heavy metals and pesticides. This is a legacy of past practices when the stream was used to dispose of trade waste from the industries in Gracefield and Seaview. After a successful trial clean-up of a section of the stream was completed in March 2008, the full stream clean-up and flood protection works have now commenced. Earthworks and infrastructure works are underway, with the construction of permanent flood protection features and the removal of contaminated sediment on track to begin in late 2009. When stream flow reaches its average seasonal low, sheet pile cells will be constructed and the clean-up works will begin near the Bell Road Bridge, continuing downstream. This work is being jointly funded by Greater Wellington, Hutt City Council and the Ministry for the Environment's Contaminated Sites Remediation Fund.

In early 2009 baseline sediment quality and ecological monitoring was undertaken in the tidal reaches of the Waiwhetu Stream. The stream rated poorly in terms of enrichment (eutrophication), sedimentation, toxicity and habitat loss. Further monitoring will be undertaken after the stream remediation works are complete so that we can assess any improvements in the health of the stream's biological community.

Collecting a sediment sample from the lower reaches of the Waiwhetu Stream for laboratory testing (left) and a pile rig at work installing the first sheet piles near the Bell Road Bridge (right).

What is Greater Wellington doing?

- Sampling and testing soils under various land uses to monitor the quality of soils across the region.
- Promoting land management practices that reduce soil compaction and over-application of nutrients to safeguard soil quality.
- Implementing the Wellington Regional Erosion Control Initiative in five selected catchments to increase the protection of erosion-prone soils.
- Maintaining, on behalf of the city and district councils, a database known as the Selected Land Use Register, which contains a list of sites in the region that have (currently or historically) used, stored or disposed of hazardous substances (e.g. landfills, petrol stations, timber treatment sites).
- Leading the Waiwhetu Stream sediment clean-up project.

What can you do?

- Ensure that animal effluent disposal systems and fertiliser application rates are appropriate for your soil type.
- Compost your kitchen scraps and garden waste and add it to your soil.
- Plant trees on erosion-prone land to promote soil conservation, enhance biodiversity and provide shelter and shade for stock.
- Ensure hazardous waste – such as old paints and used oil – is taken to the hazardous waste collection facility at the landfill or to the household hazardous waste collection run by your city or district council.
- Contact Agrecovery at **info@agrecovery.co.nz** to register for one of their agrichemical collections and dispose of banned or unwanted agrichemicals.

More information

The soil quality information on this card is a summary of the more detailed 2008/09 annual soil quality monitoring report, which is available on our website at **www.gw.govt.nz/envreports**

If you would like to know more about soils or contaminated land, visit our website or contact:

The Environmental Scientist
(Land and Water Contamination)

Manager, Land Management

Phone: 04 384 5708 (Wellington office)
06 378 2484 (Masterton office)

Email: environmentalscience@gw.govt.nz