Fresh water

Objectives

1. The quantity of fresh water meets the range of uses and values for which it is required, safeguards its life supporting capacity, and has the potential to meet the reasonably foreseeable needs of future generations.

2. The quality of fresh water meets the range of uses and values for which it is required, safeguards its life supporting capacity, and has the potential to meet the reasonably foreseeable needs of future generations.

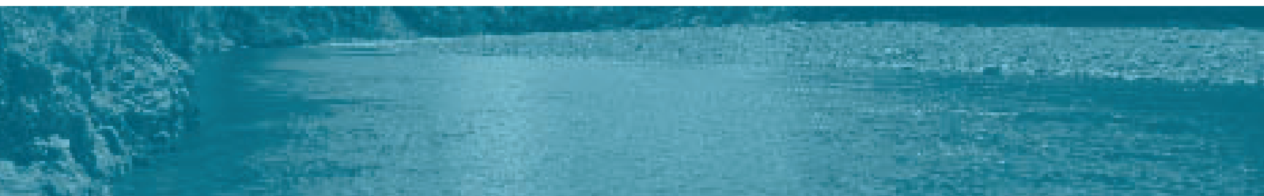
3. Freshwater resources of significant or of high value for cultural, spiritual, scenic, ecosystem, natural, or other amenity reasons are protected or enhanced.

Doing well

- Despite occasional shortages, we have enough freshwater water for now, but only just.
- We now have better ways of estimating safe yields for groundwater.
- The number of major discharges to fresh water has dropped.
- Water quality has improved in the Ngarara Stream, near Waikanae, and the Wainuiomata River after the removal of sewage discharges.
- Work has begun with city and district councils on a stormwater action plan for the region.
- Greater Wellington's programmes that benefit fresh water, such as *Be the Difference, Take Care, Take Action, Wetland incentives*, and *Streams Alive*.

Must improve

- Demand for fresh water in the region is increasing and there is a limited amount available. New ways need to be explored to ensure water is allocated efficiently in the future.
- The lower reaches of the Mazengarb Drain and the Waitohu, Mangaone, Ngauranga, Waiwhetu, Mangaroa, Mangatarere and Whangaehu streams have poor water quality.
- Impacts of stormwater discharges on urban streams and the effects of land use on rural streams need to be reduced.



Getting things clear

Fresh water is integral to our health, wellbeing, livelihood and culture. It helps drive our economy, defines our landscape and sustains ecosystems. We use and enjoy it in countless ways, yet we often take fresh water for granted – assuming it will always remain clean and plentiful.

But demands on fresh water are growing, and like any other natural resource, there are limits to how much use – or abuse – fresh water can sustain. So what is the state of our fresh water? Is it still clean? Is it still plentiful?

Where we are now

Uses and values of fresh water

There are two types of freshwater values and uses. The first is "instream" uses – such as swimming or the value of healthy aquatic ecosystems that don't remove water from its natural source. The second is taking – or "abstracting" – water for public supply, irrigation or other needs. In the Wellington region, public water supply, stock, irrigation, industry and vineyard frost protection are the biggest water consumers.

People value clean fresh water for many reasons – recreational, aesthetic, ecological and cultural. Greater Wellington doesn't monitor for aesthetic or cultural values, but it does audit the ecological health of water and its suitability for recreation. Generally, results are satisfactory, but there is still room for improvement in some places.

Normally, water use is restricted only during dry spells, though some rivers and groundwater zones are fully allocated, and takes from these are curbed any time demand exceeds supply.

Water for public use is taken from a variety of surface and groundwater sources in the region. Large drinking water suppliers typically draw good quality "raw" water from forest catchments, then treat it to meet the New Zealand Drinking Water Standard.

Some drinking water for farm stock comes from rivers and streams. Water quality monitoring, described later in this chapter, shows that 61 per cent of streams draining rural catchments failed Australia New Zealand Environment and Conservation Council (ANZECC) guidelines for stock drinking water quality.

Minimum flows in rivers

Minimum flows, set by Greater Wellington, help safeguard the life supporting capacity of aquatic ecosystems in 14 of our rivers. These are based on water quality, historical flow records and instream habitat surveys. Sometimes, though, levels fall below these limits because flows fluctuate naturally and we still have to keep drawing water from rivers, even during dry spells. Flows below minimum may not necessarily harm a river's life-supporting capacity – as long as they are temporary.

Since the Regional Freshwater Plan set minimum flows, levels for instream habitats have been reviewed on the Waikanae, Hutt and Wainuiomata Rivers.

These reviews found that the minimum flow for the Waikanae River is appropriate, setting flows at different locations on the Hutt River is an option, and a higher level might need to be considered for the Wainuiomata River to provide adequate trout habitat.

Many rivers in the region have no official minimum flows, but limits – based on historical flows rather than instream needs – may be imposed as conditions of resource consents. Priority rivers for establishing minimum flows and allocation amounts are shaded green in Table 2.2.

Safe yields for groundwater

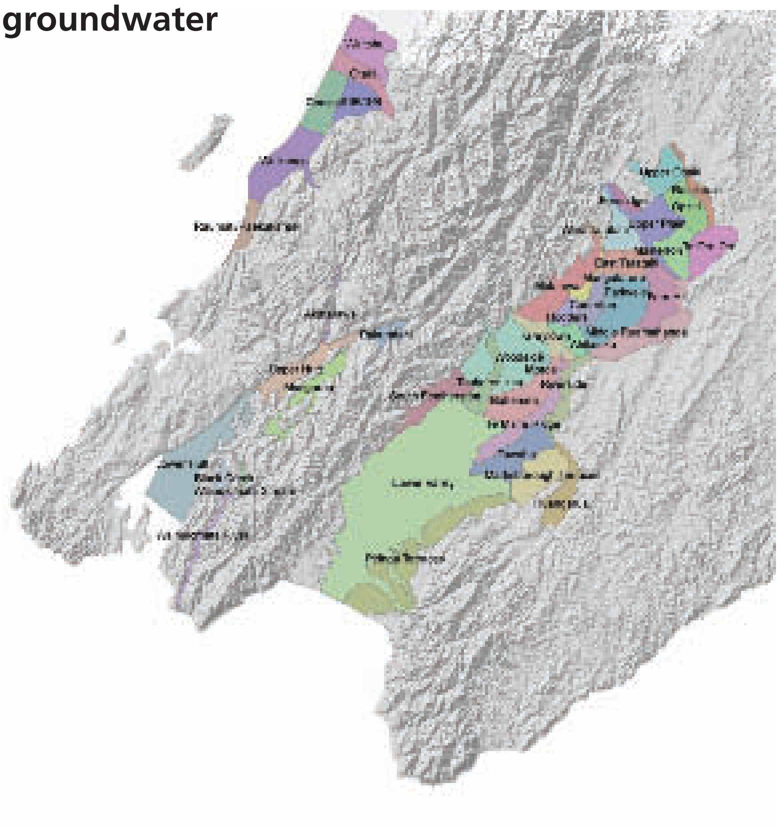


Figure 2.1: Groundwater management zones in the region. Elsewhere in the region, groundwater is not present in sufficient quantities to be used.

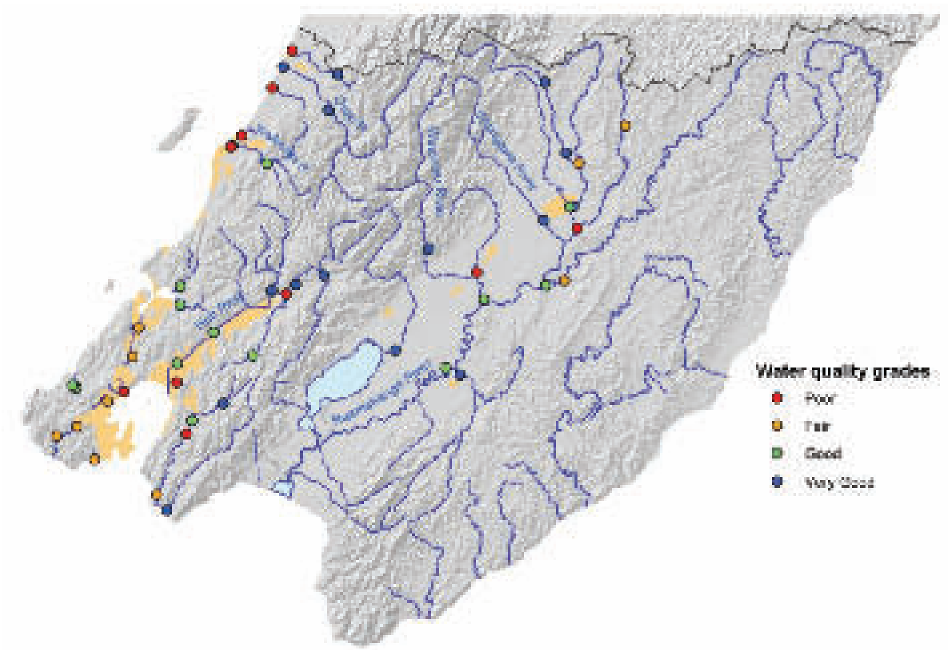
Figure 2.1 shows the region's groundwater. The Regional Freshwater Plan sets extraction limits, called safe yields, for all aquifers in these zones. These safe yields identify the amount of water that can be taken from an aquifer while still preserving flow and quality.

Greater Wellington has indicated there should be no additional water takes from the Parkvale, Martinborough Terraces and Kahutara (a sub-zone of the Lower Valley zone) groundwater zones, because levels are falling in these zones and we now believe our safe yields are too high (see *Pressures from water abstraction, page 33*).

Healthy aquatic ecosystems

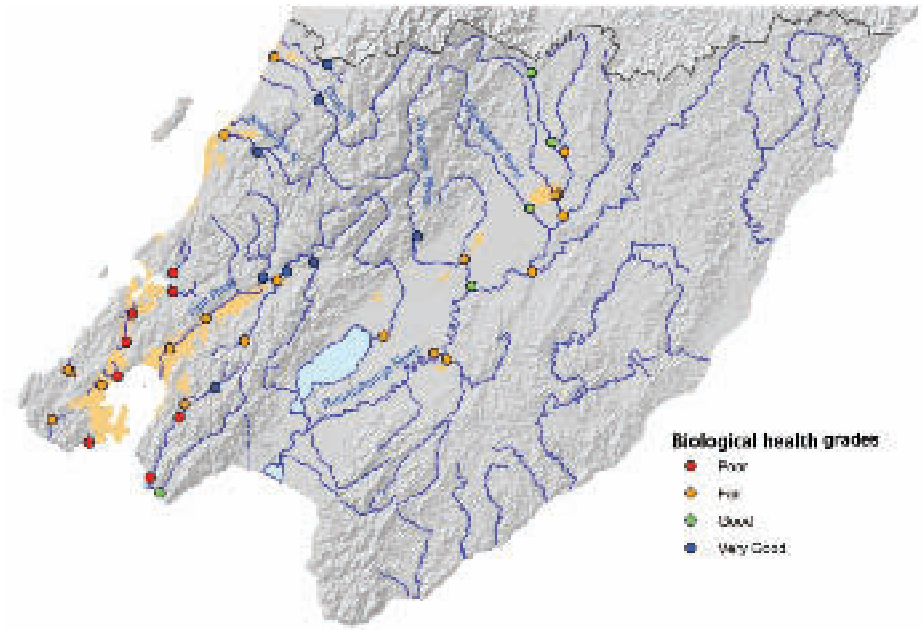
Water quality grades of 51 sites sampled monthly from 1997 to 2003 are shown in Figure 2.2. Grades are based on clarity, dissolved oxygen, nitrate-nitrogen, dissolved reactive phosphorus, ammoniacal-nitrogen, and faecal coliforms. Some monitoring sites were changed in 2003 and results since then are not reported here because the period of record is too short.

Figure 2.2:
How water quality rated at 51 sites monitored between 1997 and 2003 using six key water quality indicators.



We also monitored aquatic life in rivers annually at 42 sites between 1999 and 2003, using macroinvertebrate communities (small creatures without backbones like snails and insect larvae) as an indicator of their biological health (See Figure 2.3).

Figure 2.3:
Biological health as measured using macroinvertebrates at 42 sites monitored between 1999 and 2003.



We found a correlation between water quality and biological health – seven of the nine sites in very good biological health also had very good water quality. Of the other eight sites which had very good water quality, five enjoyed good biological health and four were rated fair. Two of the fair sites were in lowland streams, and the other two were downstream from dairy, sheep and beef farms.

Only a few sites showed any significant change in water quality over time. In most cases, changes were small and only showed up in one or two of the quality indicators. Two sites that showed a clear improvement in water quality were the Ngarara Stream on the Kapiti coast and the Wainuiomata River. In both cases the improvement was because treated sewage discharges upstream had been stopped.

Figure 2.4 shows the decrease in nutrients (dissolved reactive phosphorus concentrations) in the lower Wainuiomata River since late 2001 when the discharge of treated sewage from Wainuiomata to the river stopped.

The water in the Mangaone Stream on the Kapiti Coast has also improved - in this case the improvement was because ammoniacal nitrogen concentrations fell after five dairy sheds along the stream stopped discharging to water.

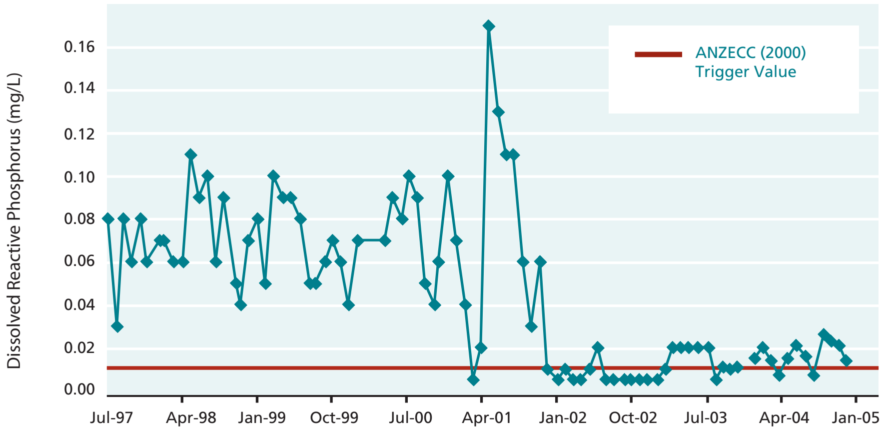


Figure 2.4: Levels of dissolved reactive phosphorus (DRP) in the Wainuiomata River dropped dramatically after the discharge of treated sewage was stopped in late 2001. The red line shows the guideline/trigger value for aquatic life – DRP levels should be under this line.

The region is home to a healthy diversity of native freshwater fish: 22 species including the inanga – one of the five "whitebait" fish – eels, mudfish and several species of kokopu. Many of these fish migrate between freshwater and the sea, but often find their way blocked by culverts, weirs and other obstructions in river beds. In partnership with community groups, iwi and government agencies, Greater Wellington has been promoting "fish passes" to allow fish back to ancestral spawning grounds.

The Taupo Stream fish pass, installed in 2005, helps native fish like inanga and giant kokopu get upstream into Taupo Swamp once again.

The Waiohine River at the gorge is one of our monitoring sites that has grades of "very good" for its water quality and biological health.

Brown trout, a prized sports fish, is an exotic species that inhabits the region's lowland rivers and lakes. Trout fishing is a popular activity in the region, and the Regional Freshwater Plan identifies which rivers to manage for trout habitat. We monitor 19 sites in these rivers as part of our water quality, biological and flow monitoring programmes. Fifteen of the 19 sites have water quality that is "good" or "very good". The remaining four sites have either "fair" (Kopuaranga and Taueru rivers) or "poor" (Mangaroa River and Mangatarere Stream) water quality.

Urban streams

Since 2001, Greater Wellington has been investigating impacts on urban streams and coastal environments from stormwater discharges. We found bacteria counts well above recommended microbiological water quality guidelines in many of our urban streams (see Figure 2.5). Although these streams are not generally used for swimming, high levels of *E. coli* bacteria still pose a health risk to children playing in the water, people biking through, or people collecting watercress.

Polluted urban streams also empty into the sea where they can affect swimming beaches.

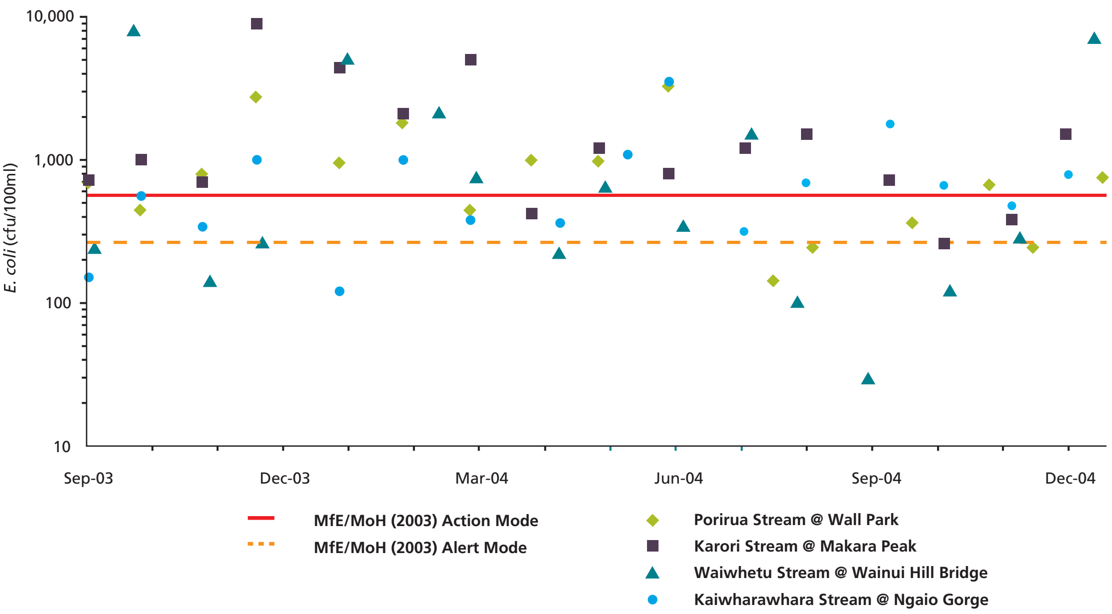


Figure 2.5:
E. coli counts recorded in some urban streams between August 2003 and December 2004 were often above guideline levels for "action", which means there is a high risk of illness from contact with the water.

We also measured concentrations of metals, hydrocarbons and pesticide residues in urban stream water and sediments. The following contaminants were found to be above ANZECC guidelines:

- Heavy metals, notably copper and zinc, in stormwater at most sample sites, and in stream bed sediment at some sites.
- Poly-aromatic hydrocarbons in stormwater and in stream bed sediment at some sites.
- Organo-chlorine pesticides such as DDT, lindane and dieldrin in stormwater at one site and in stream bed sediment at others.

These pollutants were most abundant in catchments flowing to Wellington and Porirua harbours. Rain washes pollutants from roofs, roads and the land into the stormwater pipes. They are carried quickly to streams and then to the coast where they build up in the marine sediments (see **Coastal Environment**).

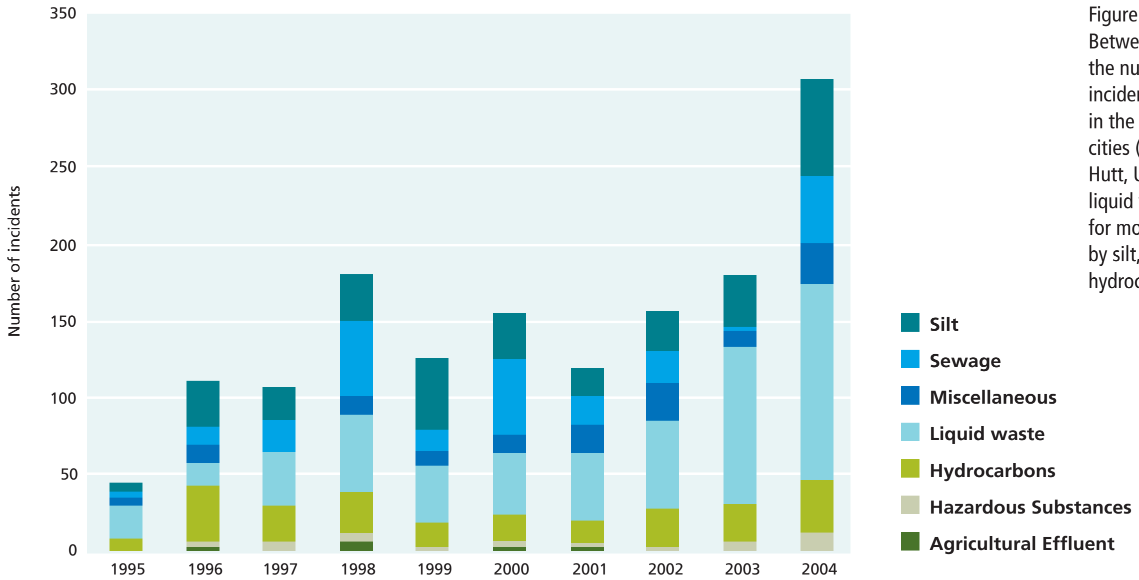


Figure 2.6: Between 1995 and 2004, the numbers of pollution incidents affecting streams in the region's four largest cities (Porirua, Wellington, Hutt, Upper Hutt) show that liquid waste is responsible for most incidents, followed by silt, sewage and hydrocarbons.

In 2003 and 2004 we surveyed the ecology of urban streams at 61 sites in 40 streams in Kapiti, and the cities of Porirua, Wellington, Hutt and Upper Hutt. This has given us valuable information against which we will be able to measure future trends. This investigation was later extended to urban streams in the Wairarapa but those results were not available for this report. Our work confirms that urban streams need special management.

Recreational and ecological values

Greater Wellington keeps watch on water quality and its suitability for recreation at 23 river sites around the region (see Figure 2.7). These swimming holes are popular with swimmers and kayakers. The water at these sites is tested every week during summer for the presence of *E. coli* bacteria.

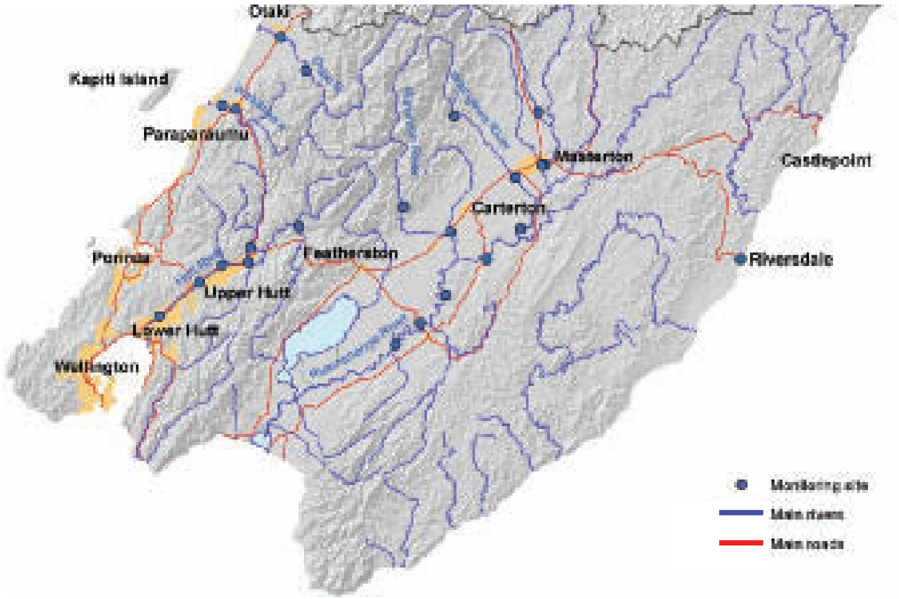


Figure 2.7:
These sites are sampled throughout the summer and tested for compliance with the recreational water quality monitoring guidelines. Weekly results are posted on our web site.

The green, orange and red colours in Figure 2.8 work in a similar way to traffic lights. When water quality is within the green "surveillance" level, there is little risk of illness from bathing. The orange "alert" indicates an increased risk, but still within an acceptable range, while the red "action" means a high health risk from bathing.
At this point, people are advised not to swim.

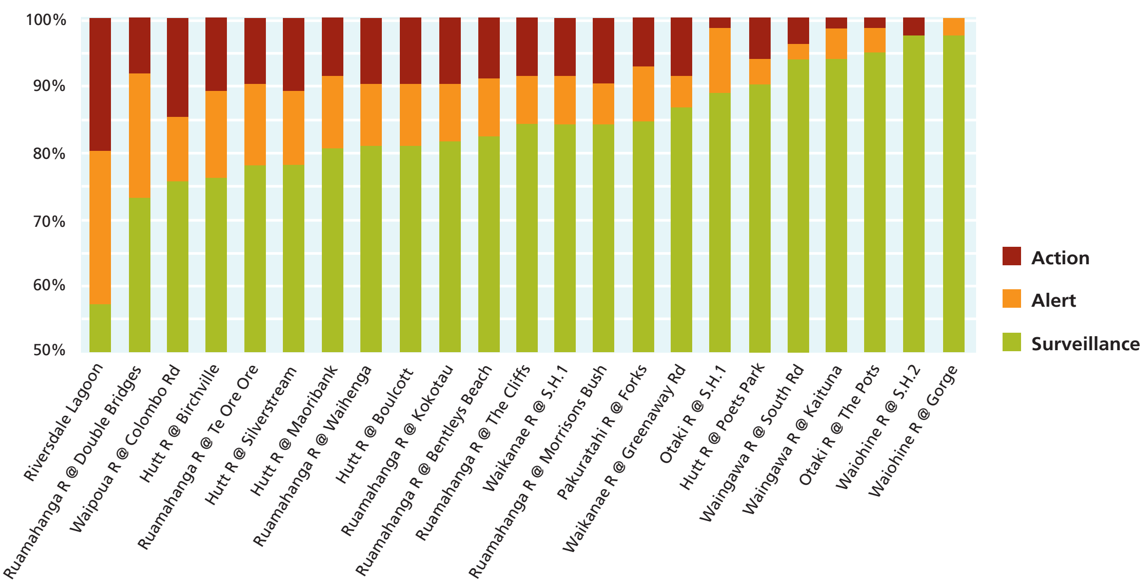


Figure 2.8:
Compliance with the surveillance, alert and action levels of the Ministry for the Environment – Ministry of Health recreational water quality guidelines, expressed as a percentage of total samples over the last four summer seasons.

Only six of the 23 sites met the guidelines for more than 90 per cent of summer samples. Compliance was highest where there was no influence from people, notably the Waiohine River at the Gorge, the Waingawa River at Kaituna and the Otaki River at The Pots. All these sites are surrounded by bush.

Rivers flowing through agricultural catchments were in a poorer state. Riversdale Lagoon, the Waipoua River at Colombo Road, and the Hutt River at Silverstream and Birchville all fell to “action” status several times.

Compliance was best during the dry summer of 2002-2003 and lowest over the much wetter 2003-2004 summer. Weather records show that all action level (red) occurrences in Kapiti coincided with rain, while rainfall appears to account for 90 per cent of action level occurrences in the Hutt Valley and Wairarapa. Because of this link between rainfall and high bacteria counts, people are warned to avoid swimming and other activities during heavy rain, and for two days afterwards.

Lake Wairarapa – a special case

Lake Wairarapa and its environs make up the largest wetland complex in the southern North Island and are a vital habitat for native plant, bird and fish communities. They are also very important for recreation, culture and heritage. Flood protection works, which are part of the Lower Wairarapa Valley Development Scheme, are a major influence on the lake and its wetlands.

Minimum water levels for Lake Wairarapa have been set in the Regional Freshwater Plan and are consistent with the National Water Conservation (Lake Wairarapa) Order. Over the last five years, the lake was well above target levels for most of the autumn, winter and spring, but sometimes fell short during summer.

The lake’s water quality has been consistently poor throughout the last decade. High nutrient levels and algal biomass combined with low water clarity all point to a highly modified system. This is likely to be a consequence of Featherston’s sewage discharge and runoff from pastoral land.

Monitoring shows the biological health of the lake is holding up. However, we know nothing about the state of its margins and the effects of controlled lake level fluctuations on them. We suspect their ecology is probably altering, but we can’t measure this change without vital data on things like wading bird numbers and wetland turf communities.

Table 2.1: Regionally significant water resources and their state according to our monitoring of their water quality, biological condition and flow. All except Lake Wairarapa are meeting their management goals. We don't have information about the state of the margins and wetlands of Lake Wairarapa and so its overall state is unknown.

Management purpose	Water body	State
Natural features/natural state, indigenous vegetation or habitats of indigenous fauna	Waiohine River (gorge and above)	✓
	Otaki River (gorge and above)	✓
	Hutt River (Kaitoke Gorge and above)	✓
	Upper Wainuiomata River	✓
	Upper Orongorongo River	✓
	Lake Wairarapa	?
Landscape and scenic qualities	Ruamahanga River (gorge and above)	✓
	Waiohine River (gorge and above)	✓
	Otaki River (gorge and above)	✓
	Hutt River (Kaitoke Gorge and above)	✓
	Orongorongo River (upper reaches)	✓
Landforms and geological characteristics	Otaki River, upstream of Pukehinau Stream	✓
	Ruakokopatuna Gorge	✓

Leaving enough behind

We can't predict whether there will be enough water for all uses in the future, or whether freshwater ecosystems will be healthy. But we can comment on where special care is needed now to protect people's future needs.

We know that water abstraction is on the increase, and that many of our water resources are already at, or close to, full stretch. Yet demand is predicted to keep growing. We know enough about population growth and consumption to plan for future water supply needs, but the same information is lacking for other uses. We don't know, for instance, how much irrigation will draw in the years ahead. To protect future needs, we need to know a lot more about future demand.

Figures 2.2 and 2.3 show that water quality and biological health in some of our rivers is poor, although since the last *Measuring up* in 1999, the halting of sewage and dairy discharges has brought some improvements. Meeting the needs of future generations means protecting rivers from pollution, protecting urban streams from stormwater discharges and limiting the impacts of rural land use.

Pressures on fresh water

A variety of pressures affect the quality and quantity of fresh water. Some, like the weather, can't be controlled, but we can manage land use, water consumption and discharges. All bodies of water – lakes, rivers, aquifers, wetlands – experience natural fluctuations. But rainfall doesn't just determine water levels; it affects quality too, when it washes contaminants off the land.

Groundwater is recharged by rain that filters through the soil, but even during dry spells groundwater levels can rise when water leaks from rivers, lakes and wetlands. Geology also influences groundwater quality. The taste of groundwater is affected by where it comes from because it picks up the flavour of the aquifer. Water from shallow zones of active flushing (recharge areas) is very different to old, sluggish water.

These days, we know more about the way climate cycles affect our freshwater resources. The Southern Oscillation – with its two phases El Niño and La Niña – brings distinct weather patterns. We use the Southern Oscillation Index (which charts fluctuations in air pressure between Tahiti and Darwin) to develop models to predict drought. These models need ongoing testing, but they are proving to be a valuable tool for easing pressure on water resources.

Human activity, such as burning of fossil fuels, releases greenhouse gases into the atmosphere, causing it to heat up. This is predicted to alter the region's climate in a number of ways. Between 2070 and 2099, it's been forecast that:

- average summer rainfall will rise by five to 10 per cent in Kapiti and in Wellington, Porirua, Hutt and Upper Hutt Cities, but will decrease by up to five per cent in eastern Wairarapa
- summer droughts are more likely in the Wairarapa
- average winter rainfall will climb by 10 to 15 per cent in Kapiti and in Wellington, Porirua, Hutt and Upper Hutt Cities, but will drop by up to 10 per cent in the Wairarapa
- the risk of heavy rain is expected to increase across the region. Specific changes are likely to depend on catchment characteristics and the amount of temperature increase
- temperatures will rise by between 0.8° C and 2.7° C throughout the region.

Water shortages will likely hit hardest in the east of the region, where less rain will lower river flows and slow recharge to groundwater systems. We don't yet know enough about climate variability to estimate drought risk in Kapiti, but higher summer temperatures will almost certainly drive up water demand.

Pressures from land use

Runoff from agricultural land (which covers 55 per cent of the region) can carry bacterial contamination, nutrients and sediment into rivers and lakes. A high proportion of our rivers fail guidelines for stock drinking water because bacteria in animal effluent get into the water. Livestock access to rivers and stock crossing streams can aggravate these impacts.

Dairy farms and piggeries produce large volumes of effluent and contaminated wash water. Prior to 1994, this effluent was routinely discharged into rivers and lakes. Nowadays, however, this waste is applied to land.

Stock trampling stream banks releases soil into the stream, and their effluent pollutes the water with bacteria and nutrients.

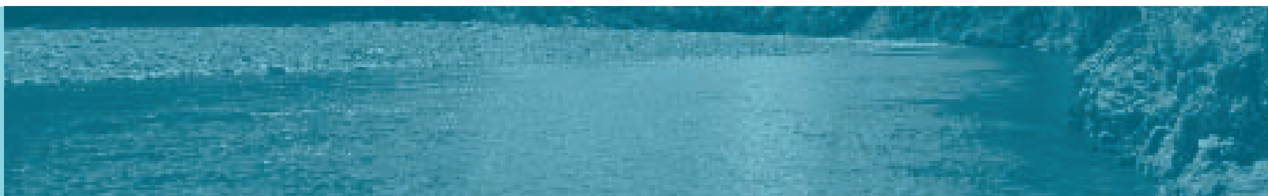
Land cover is a good indicator of land use, which can have a direct bearing on water quality. Of the 15 sites with very good water quality in Figure 2.2, all but one were covered in indigenous vegetation, whereas pasture or urban development cover all but one of the ten poor sites.

In urban areas, runoff from earthworks and hard surfaces like roads, tar seal, and concrete contaminates urban streams. The amount of impervious cover in a catchment is a useful and accurate indicator of urban pressure on water quality – research shows that stream health declines when impervious cover exceeds 10 to 15 per cent. No regional estimates have been done, but impervious cover in our urban areas is likely to be higher than that.

Greater Wellington monitors groundwater at 80 sites in the region, and we've found water quality to be highly variable. Water quality is determined mostly by natural processes, but at 17 monitoring sites there is some evidence of farming or horticulture influences.

Animal effluent, fertilisers and soil cultivation can push up levels of nitrate, ammonium, phosphorus and potassium in groundwater. Pesticides and herbicides also find their way into aquifers. The use of nitrogen-based fertilisers has increased markedly over the past 12 years as the agriculture sector strengthens – there has been an increase of urea-based fertiliser in the region of roughly 900 per cent between 1992 and 2004. Contamination from septic tanks is suspected at a number of locations, including Riversdale Beach and Te Horo.

While we haven't detected any significant deterioration in the region's groundwater quality, care is still needed, because groundwater is very slow to respond to contamination – anything from two to more than twenty years. The current monitoring network is being reviewed because it may not detect changes early enough to stop deterioration.



Pressures from water abstraction

At December 2004 there were 659 resource consents to take water in the region – 200 for surface water and 459 for groundwater. Most of these are in the Wairarapa (just over 150 surface water consents and 318 groundwater consents). Irrigation is the single largest use of water there. In the western part of the region, abstraction is mostly for public water supply, with some irrigation in Kapiti.

The amount of surface water allowed to be taken in the region has risen since 1999. Prior to 2003, much of the increase arose from irrigation demand. More recently we've seen a notable jump in surface water allocated to vineyard frost protection around Martinborough – a relatively new water use in the region.

Currently, 539,101 cubic metres per day of groundwater is allocated regionally, nearly double the 1996 volume. Figure 2.9 gives allocation trends in different parts of region over the last nine years. The Wairarapa accounted for almost all groundwater allocation growth. The only notable exception is an increase in Kapiti in 2004, with the granting of the District Council's water permit for a new public supply wellfield. Greater Wellington has recommended that no additional water be taken from seven surface water management zones in the Wairarapa.

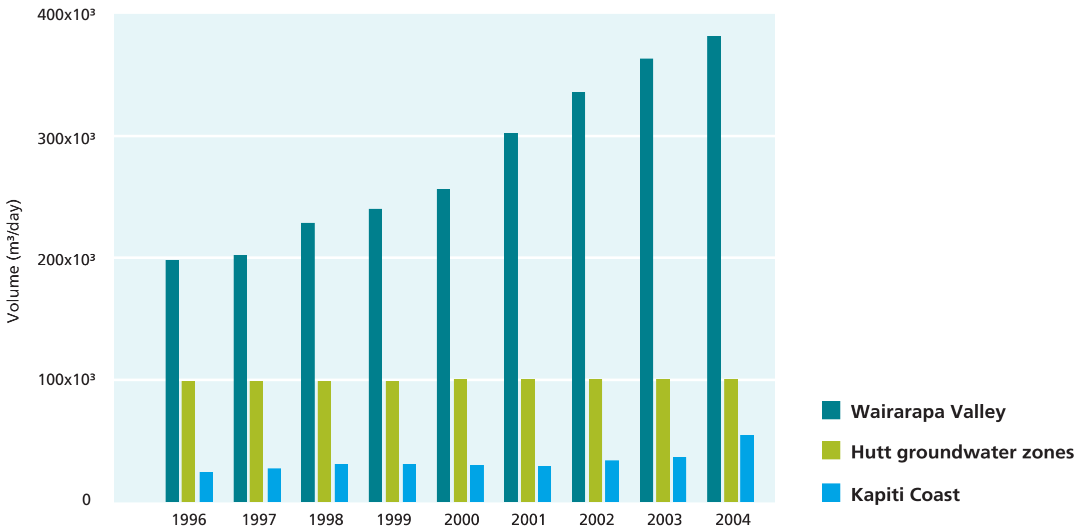


Figure 2.9:
Volumes of groundwater allocated for use in the Wairarapa, Hutt Valley and Kapiti from 1996 to 2004.

We expect more water will be needed for public supply as our population increases. For example, in Wellington, Porirua, Hutt and Upper Hutt cities, the population is predicted to grow from 367,600 to 377,000 by 2008. We also expect demands on water for irrigation and vineyard frost protection to increase, particularly in the Wairarapa.

Table 2.2 shows rivers shaded blue that are allocated through minimum flows and/or allocation limits in the Regional Freshwater Plan. Of the 13 sections of rivers with allocation limits, 10 are more than 80 per cent allocated. All four sections of rivers managed solely by minimum flows are also fully allocated.

Rivers shaded green in Table 2.2 do not have minimum flows or allocation limits set in the Regional Fresh Water Plan, but are considered to be under pressure from abstraction and are the highest priority for setting minimum flows and allocation limits.

Table 2.2:
Allocation of water from rivers in the region. Some consents specify that abstraction can only occur at high flows. Their abstractions do not affect the allocation limit, which applies at low flows. The rivers in bold may also be affected by streamflow depletion from nearby groundwater abstractions.

Rivers	Allocation limit (litres/sec)	Total amount allocated (litres/sec)	Percentage of allocation limit used
Dock Creek and tributaries		207	
Huangarua River, Ruakokoputuna Stream		244	
Kopuaranga River	125	125	100 per cent
Makahakaha, Mangahuia, Maringiawai Streams		46	
Mangatarere River	320	276	89 per cent
Otakura Stream, Battersea Drain		74	
Papawai Stream, Tilsons Creek		226	
Parkvale Stream and tributaries, Booths Creek		279	
Ruamahanga River from its headwaters to the confluence with the Waiohine River	800	1171	97 per cent
Ruamahanga River from Waiohine River confluence to CMA boundary	1500	1223	81 per cent
Tauherenikau River, Murphys Line Drain, Taits Creek	405	472	84 per cent
Tauweru River and Kourarau Stream		215	
Waingawa River, Hyslops Drain, Kells Stream	1040	1089	100 per cent
Waiohine River	740	734	99 per cent
Waipoua River	90	209	88 per cent
Whangaehu River (northern)		28	
Hutt River to the confluence with the Pakuratahi River	Not specified	1850	
Hutt River from Pakuratahi River confluence to CMA boundary	300	131	44 per cent
Orongorongo River and its tributaries	Not specified	1132	
Wainuiomata River, Gollans Stream	Not specified	999	
Mangaone Stream	25	28	100 per cent
Otaki River	2120	24	1 per cent
Waikanae River and tributaries	Not specified	478	
Waitohu Stream	57	32	56 per cent

Aquifers in several of our groundwater zones are fully allocated or close to it. The volume of water set aside for public water supply from the Waikanae and Lower Hutt groundwater zones is more than 80 per cent of their safe yields.

In the Wairarapa, shallow aquifers in the Tawaha, Riverside, and Ruamahanga groundwater zones are also more than 80 per cent allocated, as are the deep groundwater aquifers of the Kahutara (a sub-zone of the Lower Valley groundwater zone), Martinborough Terraces, and Parkvale.

Investigation of the Parkvale, Kahutara and Martinborough Terraces groundwater zones prompted us to review the way we estimate safe yields in the region. The abstraction of groundwater is depleting these aquifers. Figure 2.10 is an example of declining groundwater levels from a well in the Kahutara zone due to taking water over the last 12 years. The red and blue dots respectively denote the annual minimum and maximum groundwater levels in the well.

Underestimating the recharge to deep groundwater systems means the depletion of aquifer storage and lower well yields. We now believe a better way to estimate safe yields is to look at how much water is discharging from an aquifer, rather than how much is going in.

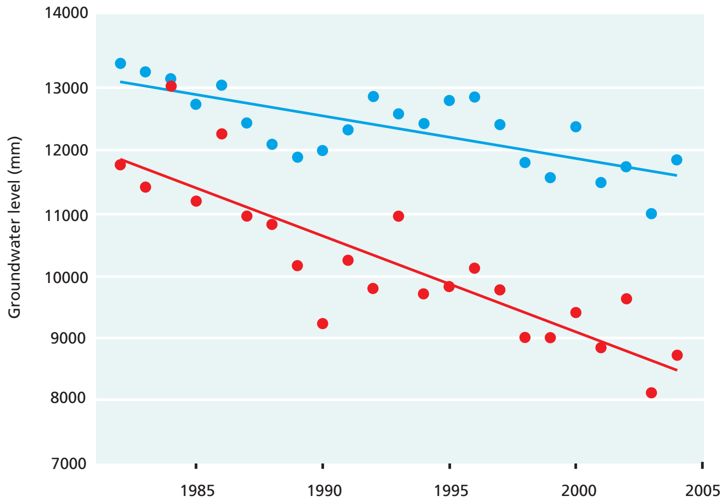


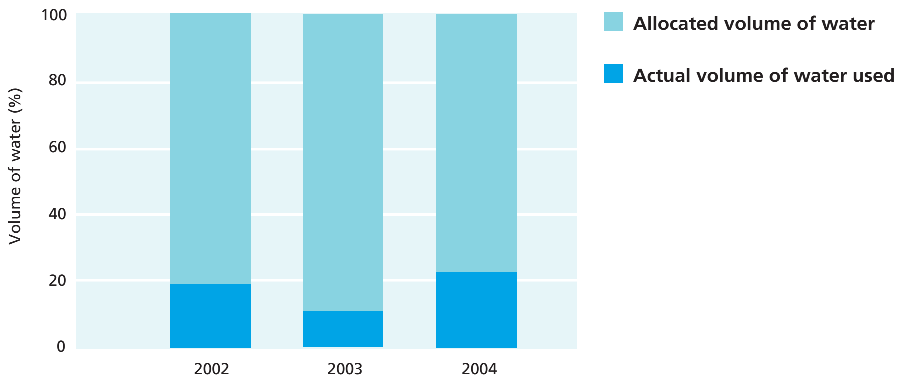
Figure 2.10:
A well in the Kahutara groundwater zone in the Wairarapa shows changes in the annual maximum (blue) and minimum (red) groundwater levels. The reduction of groundwater levels over the 12 year period indicates that current yields are not sustainable.

We already use discharge models for the Lower Hutt aquifer and the shallow groundwater resource in the Paraparaumu-Waikanae area. The Lower Hutt safe yield is mainly designed to prevent sea water intrusion, but it does illustrate the discharge from an aquifer usually limits the amount of water that can be taken.

The relationship between groundwater takes and safe yields is based on the volumes allowed by resource consents. Because very few takes are metered, actual groundwater use is poorly known. Those takes that are metered are typically read before and after an irrigation season to give a bulk value.

Actual and consented takes for metered wells are shown in Figure 2.11, which shows the actual use compared with allocated use as a percentage. The limited data we have indicate that around 20 per cent of the allocated volume is actually being used – a finding consistent with other regional councils. This discrepancy arises partly because irrigators typically apply for the amount of water they estimate they might need to get them through dry spells, which only occur infrequently. Consequently, unused but allocated water is effectively locked up for the rest of the time. Although this lends a margin of safety, it does prevent any new groundwater users.

Figure 2.11:
Actual use compared with the amount of water allocated by resource consents for Wairarapa groundwater users. Only about 20% of water allocated in resource consents is actually used.



It may be that there is room for more efficient allocation and use. One way would be to meter all consented water takes, which would enable us to better correlate actual and allocated use. Another possibility is to promote water trading, so that another irrigator can make use of a consent holder's unused water. The paradox of trading however, is that everyone wants the water when it is most scarce.

Irrigation studies in the Wairarapa suggest some water is wasted. Movement of irrigation water through the soil profile was monitored in different substrates. At the vast majority of sites, more water was being applied than could be held in the soil, which meant that a proportion of irrigated water recharged the shallow groundwater. To stop such waste, we need to better understand water requirements under differing crop, soil and climatic conditions.

Discharges to surface water

At December 2004, there were 175 resource consents to discharge to surface water. Around 30 applications have been granted each year over the last decade. Most are for small or infrequent discharges of minor impact, such as temporary construction.

These oxidation ponds, which treat Featherston's sewage, discharge to fresh water.

Larger, more disruptive discharges in the region come from municipal wastewater (sewage), wet weather sewer overflows, urban and industrial stormwater, dairy effluent, water treatment plants, landfills, major earthworks and large flood protection schemes. The number of resource consents granted for these discharges has fallen in the last ten years. Treated sewage discharges to the Wainuiomata River and Ngarara Stream have ended and the Mangatarere Stream now only receives treated sewage from Carterton during winter. Over the same period, dairy shed discharges to water have plummeted – from 63 to just three.

Water quality is at its best in the headwaters of many of our rivers, typically in unmodified mountain ranges. As the rivers flow through lowland pasture and urban areas to the sea, their quality deteriorates because of discharges from municipal wastewater (in the Wairarapa), urban stormwater, and runoff from agricultural land.

The Ruamahanga, our longest river, is a case in point. It rises on the northern boundary of the region and flows through the Wairarapa valley to the coast in the south. We sample the Ruamahanga at five sites (shown in Figures 2.2 and 2.3) and the water quality and biological health slips from very good at the top of the catchment to fair at the lowest site.

Along with treated sewage from Rathkeale College north of Masterton, four of the five main Wairarapa urban centres discharge wastewater loaded with nutrients (nitrogen and phosphorus) directly into the Ruamahanga River or its tributaries. Figure 2.12 shows the phosphorus and dissolved reactive phosphorus concentrations increasing at consecutive monitoring sites along the river. The dashed lines in the Figure represent corresponding target values for aquatic ecosystem health.

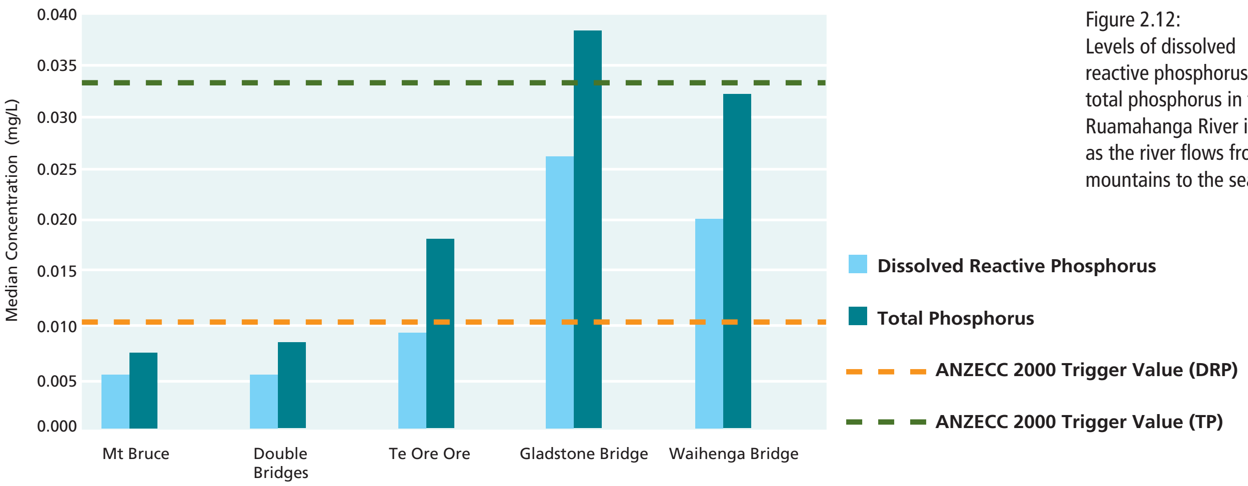


Figure 2.12: Levels of dissolved reactive phosphorus and total phosphorus in the Ruamahanga River increase as the river flows from the mountains to the sea.

What's being done

Water quantity

Our Regional Freshwater Plan includes the following provisions which aim to reduce abstraction pressures on fresh water:

- allocation limits and minimum flows for certain rivers and streams
- collection of information to set minimum flows and allocation limits in other rivers liable to water shortages
- target levels for Lake Wairarapa
- safe yields for all groundwater zones
- a priority for public water supply over other uses
- a maximum allocation of water for irrigation of 350 m^3/ha/week
- preferring groundwater use as an alternative to surface water use.

The Plan allows up to 20 cubic metres of water per day to be taken without consent (except for water taken from the Hutt groundwater zone). All other abstractions need resource consents.

River flows, lake levels, groundwater levels and water abstraction are monitored around the region as part of our regular monitoring programmes.

Since the last *Measuring up* in 1999, instream habitat assessments have been completed on the Wainuiomata, Hutt, Waikanae, Waipoua, Kopuaranga, Mangatarere and Upper Ruamahanga rivers. We have a programme in place to maintain flows for instream values and set allocation limits in those rivers under abstraction pressure. Priority rivers are shaded in green in Table 2.2.

For groundwater, reviews of safe yields for the Waikanae, Hutt, Martinborough, Parkvale and Kahutara groundwater zones are complete or in progress. Safe yields for the Waikanae and Hutt groundwater zones are satisfactory, but results from the Wairarapa groundwater zones hint at flaws in previous methodology, and have prompted a comprehensive review of Wairarapa's groundwater availability.

Water quality

The quality of water in a number of the region's lakes and rivers could be improved, and these are identified in the Regional Freshwater Plan. The Plan allows the discharge of a few minor contaminants and the discharge of stormwater subject to conditions. All others require resource consents.

We follow up all reported pollution spills, and draw on enforcement procedures in the Resource Management Act 1991 (RMA) when necessary.

The impacts of stormwater discharges in urban streams and coastal waters are being investigated to see whether they meet the minimum standards of the RMA. In addition, Greater Wellington is committed to the preparation of a stormwater action plan for the region, in partnership with city and district councils.

In 2002, the Council adopted a riparian strategy to minimise impacts of rural land use on freshwater. It includes pilot projects at the Enaki Stream near Carterton, the Kakariki Stream near Waikanae and the Karori Stream in Wellington City. The Strategy also directed us to target financial assistance to high quality catchments, which we are now doing through our *Streams Alive* programme. Ration and Glendhu creeks, the Waitohu, Karori, Owhango and Waihora streams and the Otaki, Mangaroa, Wainuiomata, Kaiwhata, Waiohine and Upper Ruamahanga rivers all qualify for funding through the *Streams Alive* programme. In other catchments, Greater Wellington provides landowners with information and advice about riparian management.

Results from the pilot projects show health improvements in two of the pilot streams (Enaki and Kakariki) within two just years of fencing and planting. The third project site on the Karori Stream, did not respond so quickly – a reflection of the dominating impact of contaminated stormwater from the large residential area upstream.

Through Greater Wellington's social marketing campaign *Be the Difference* we have raised awareness of the harmful effects of urban stormwater on streams and promoted personal action among residents to help keep streams clean.

Regional councils around the country are parties to the Dairying and Clean Streams Accord with Fonterra, the Ministry for the Environment and the Ministry of Agriculture and Forestry. In the Wellington region, Fonterra and Greater Wellington have drawn up an Action Plan to implement the Accord.

Greater Wellington established the *Take Care* programme to fund and support community environment projects. Currently, there are 25 fresh water projects such as riparian planting and wetland restoration. Fresh water is a major focus of *Take Charge*, a pollution prevention programme to improve the environmental performance of small and medium sized businesses.

Take Action is Greater Wellington’s environmental programme for schools – a five to six week programme aimed at eight- to 12-year olds. Our environmental educators work with school children, showing them how to care for water and the environment in their daily lives.

Where to from here?

Despite occasional shortages, we have enough surface and groundwater to meet our needs for now, but water use is at a critical stage. We must look at some new management approaches if we’re to meet people’s needs in future. In the short term, we can:

- Require metering of resource consents for all water takes from fully- or close to fully-allocated water resources.
- Review safe yields for fully-allocated groundwater in the Wairarapa, using a revised methodology based on aquifer discharges.
- Develop minimum flows and water allocation for the rivers shaded yellow in Table 2.2.
- Get a clearer picture of water demand in the Wairarapa to provide for the needs of future generations.

In the longer term, we can:

- Use our improved understanding of climatic cycles to manage water better.
- Develop minimum flows and water allocation limits in all rivers where water is taken.
- Ensure that irrigation water is used efficiently.
- Develop ways of estimating Wairarapa crop soil requirements based on soil and climate.
- Look at systems for transferring and/or trading of water permits.
- Develop models for stream flow depletion caused by groundwater abstractions near rivers and streams.

Surface water quality is generally staying the same but we have recorded some improvements. The number of major discharges to rivers has decreased. There are some notable improvements as a result of removing sewage discharges from the Wainuiomata River and the Ngarara Stream in Waikanae.

By June 2005 there were there were only three discharges of dairy effluent made directly to water compared with 63 discharges ten years ago.

While improvements in water quality can be identified in some rivers, in other rivers it has not improved. There is growing evidence that stormwater discharges are having significant adverse effects on urban streams, our coast, and especially our harbours (see **Coastal Environment**). We are currently working with city and district councils to work out how to reduce the effects of these discharges. Increased awareness of the effects of stormwater discharges is being highlighted by people's growing interest in urban streams, and their desire for streams to be healthy.

Streams and rivers flowing through rural land are showing bacterial numbers over guideline levels for stock drinking water, with seven of the ten sites that we have classified as having "poor" water quality being rural streams. In some rural areas, land use is intensifying and discharges of animal effluent and nitrogen fertilisers to land have increased. We need to work closely with landowners to make sure that these things happen at a rate that the land can take.

Our freshwater resources are now being helped by actions that were not in place when we prepared *Measuring up* in 1999. Greater Wellington's *Be the Difference* social marketing campaign, Care Groups, programmes aimed at schools (*Take Action*) and small to medium sized industry (*Take Charge*), the Fonterra Accord, and our *Streams Alive* programme for riparian plantings are all supported by communities. They will all lead to greater community involvement in the management of our water bodies.

More Information

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