STATE OF THE ENVIRONMENT REPORT OF THE MANAWATU-WANGANUI REGION | **2005**

horizons
REGIONAL COUNCIL

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FOREWORD

This is Horizons Regional Council's second state of the environment report. The first report, "Measures of a Changing Landscape", was produced in 1999. It concluded that our environment, in the short term appeared to be in reasonably good condition, particularly for air and water quality, but the questions remained about the sustainable management of the resources in the medium to long term.

Six years on Horizons is in a better position to comment on the extent and nature of the pressures facing the natural and physical resources of this region.

LEFT: Michael McCartney, Chief Executive and Garrick Murfitt, Chairman

If we were to give an overall grading we would have to say the environment is in a fair state but slowly declining as some resources experience increasing pressures.

The region has also had to cope with the aftermath of one of the nation's most significant natural hazards, the February 2004 storm. The resulting flood and landslide damage was on an unprecedented region-wide scale. While the region moves on and the affected communities begin to rebuild, the effects on the environment will be long-lasting and continue to impact on the region economically, socially and ecologically.

However this event, as well as other "national scale" issues such as water quality in Lake Taupo, "Project Aqua" and irrigation in the South Island, has served to trigger a re-examination of the same question that was being asked in 1999: "Are existing land uses sustainable?". On balance we would say no!

Under current practices much of the erodible hill country will continue to slip and release sediment into our waterways. Increased livestock numbers, irrigation and fertiliser application, unless managed properly will also contribute to surface water and groundwater quality problems. Our native biodiversity continues to face threats from fragmentation and pests, particularly in the more developed lowland areas, and this will increase as possum control funding for bovine Tb management is reduced over time. Waste disposal across the region will become an issue as landfill sites close but volumes of waste increase.

WHAT ARE WE DOING WELL AS A REGION?

Our coastal resource remains relatively underdeveloped and so has not been subject to pressures experienced elsewhere in the country. Point source discharges of waste to water have either remained stable (for treated sewage) or decreased (for livestock effluent) and while water quality tends to worsen moving downstream, our headwaters remain in a healthy state with excellent native fish populations. Generally the groundwater resource is stable although localised areas are experiencing increasing use of this resource. Our air similarly remains of good quality, but specific towns do have problems over winter with high levels of health-threatening fine particulate matter, typically from domestic fires. Leaving aside the impacts of the February 2004 storm and land intensification, high quality soils in the region are not under threat from subdivision and remain mostly available for primary production. Soil of the Manawatu plains mostly ranges from only slightly degraded to very good quality.

HOW WILL HORIZONS USE THIS INFORMATION?

In the 1999 report we acknowledged that information gaps were restricting resource management, and promised to increase our monitoring and research efforts to remedy these gaps. While there is still much more to improve upon, significant progress has been made in areas such as water quality monitoring, surface water resource assessment and conceptualising our groundwater aquifer systems.

The challenge for maintaining native biodiversity is huge, but a start has been made by targeting wetland restoration as a key activity for the council. Similarly hill country erosion is now a very significant issue that Horizons will focus efforts on over the long-term, likely climate change scenarios suggest that this issue cannot be ignored.

Land use intensification is a reality, but already research and technology is becoming available that will help mitigate potential adverse effects on the environment. Industries and sector groups too are initiating self-regulating codes of practices that serve to minimise risk to the environment and ensure market access. Where possible Horizons will look to work alongside these developments and initiatives.

Finally, it must be emphasised that while Horizons has a role in sustainable management of the region's natural and physical resource, there is an equally important role that all residents need to play in achieving a healthy and economically vibrant region. We hope that this report will help the community to understand the state of our environment and assist in the continued development of the region.

Garrick Murfitt
CHAIRMAN

Michael McCartney
CHIEF EXECUTIVE

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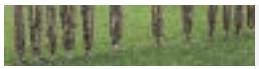

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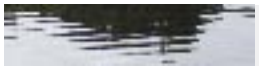

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ONE | THE MANAWATU - WANGANUI REGION

The Manawatu - Wanganui region covers a vast land area totalling 22,215 km^2 stretching from Pureora in the north to Manakau in the south, and Wanganui in the west to Cape Turnagain in the east (Map 1-1).

This represents eight percent of New Zealand's land area and is the second-largest region in the North Island.

1. THE MANAWATU - WANGANUI REGION

The region has 10 local authorities, of which six District Councils (Ruapehu, Wanganui, Rangitikei, Manawatu, Tararua and Horowhenua) and Palmerston North City Council are completely or almost completely contained within its boundaries.

About 226,000 people live in the region as at the last census carried out in 2001 (including 6,000 people in parts of Stratford, Taupo and Waitomo districts located within the region). Just over half of the population live in the cities of Palmerston North and Wanganui.

Agriculture, manufacturing and retail are the major sectors contributing to the regional economy in terms of GST sales. These, together with the government sector (administration, defence, education, health), comprise over 60% of the workforce.

The region is characterised by five land-types, each with it's own set of environmental issues and priorities (Table 1-1).

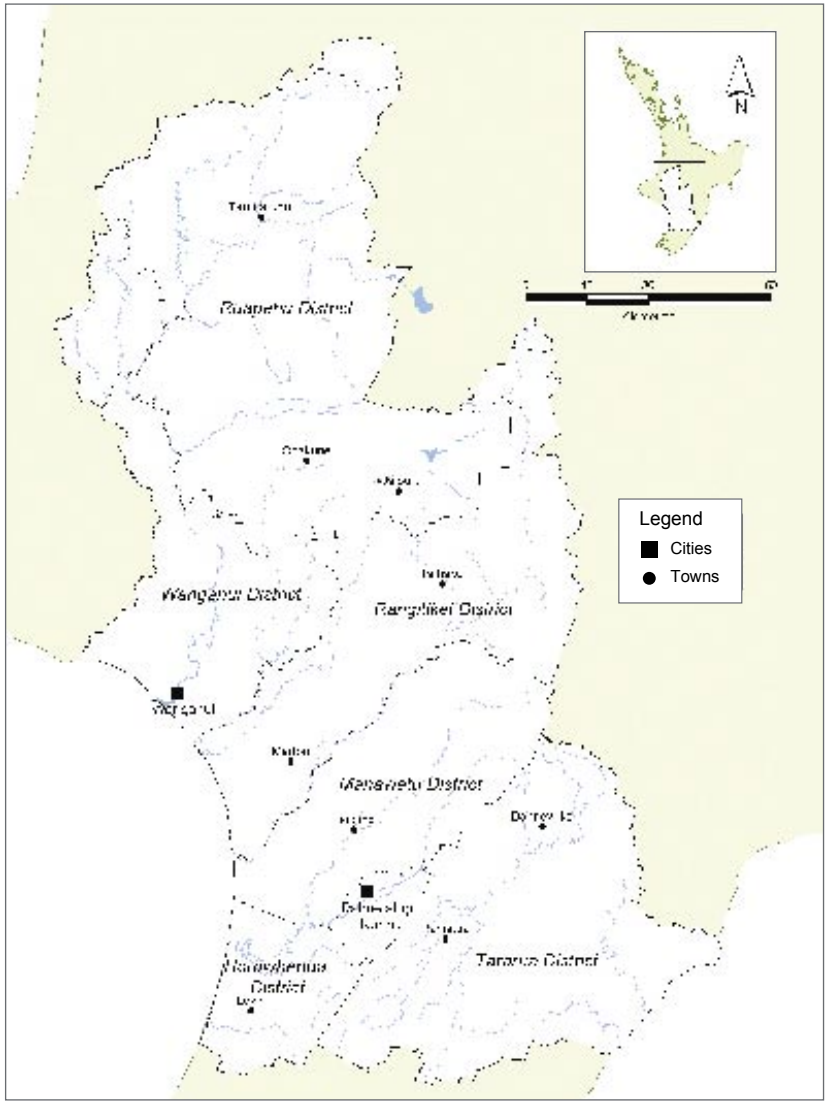
The region's boundaries are determined by river catchments. It contains three major catchments (Whanganui, Manawatu, Rangitikei), five smaller catchments (Turakina, Whangaehu, Ohau, Akitio and Owahanga) and a large number of smaller coastal catchments. Lake Horowhenua is the only large natural lake, and is a regional feature. A number of small to medium-sized lakes also dot the region, mainly on the west coast.

LAND-TYPE	AREA ('000 ha)	MAIN ISSUES
Sand country	79.3	Water allocation and quality; coastal subdivision; saltwater intrusion; loss of native biodiversity; soil erosion, pest control
Plains and terraces	386.2	Water allocation and quality, soil quality degradation through intensified land use; loss of native biodiversity
Downlands	191.9	Soil erosion and degradation; loss of native biodiversity
Hill country	1,358.2	Soil erosion; loss of native biodiversity; pest control
Mountain land	183.3	Pest control

TABLE 1-1: Area and issues of land-types within the region.

Not surprisingly with an extensive and increasingly intensive agriculture sector and the vast network of waterways in the region, management of the water resource (both surface water and groundwater) remains a core focus for Horizons, as do land use practices which also can impact on water quality and availability.

The February 2004 storm event has also highlighted issues of sustainable land use and natural hazard management, and the fragmented and threatened nature of the region's native biodiversity continues to cause concern.



MAP 1-1: The Manawatu-Wanganui region.

2. HOW DOES HORIZONS REPORT ON THE STATE OF ENVIRONMENT?

A core function of regional councils under the Resource Management Act 1991 is the sustainable management of natural and physical resources. Councils monitor their regions in order to gauge the success or otherwise of this management. The results serve to provide regional communities with a summary of the state of natural and physical resources, and assist Councils in taking actions to protect or improve these resources.

Horizons' monitoring programme uses a Pressure-State-Response framework: Human activities exert pressure on the environment, changing the quality and quantity of natural resources. These changes alter the state or condition of the environment. In turn, communities respond to these changes to reduce, prevent, or mitigate any undesirable changes.

This report presents selected pressure/state/response indicators for each of the resources or environments that Horizons monitors. Readers should note that this report summarises the main findings from our monitoring programme and data sources. More detailed analyses can be found in the detailed technical report, which can be downloaded from the Horizons Regional Council website at: www.horizons.govt.nz.

3. FURTHER INFORMATION

McNeill, J. 2004. Taking the pulse - Manawatu-Wanganui regional profile. Horizons Regional Council Report No: 2004/EXT/574.

Young, D.; McNeill, J. (eds); Janseen, H.; Phillips, J.; Todd, M.; Watson, M.; Barnett, H.; Bekesi, G.; Beveridge, A.; Cowie, B. 1999. Measures of a changing landscape. State of the environment report Manawatu-Wanganui region 1999. Horizons Regional Council Report No: 99/EXT/371. 80p

TWO | LAND

The regional economy is heavily reliant on the agricultural sector. Poor land management can therefore impact on the long-term economic viability of the region as well as on environmental and social values.

1. ISSUES

The main land management issues facing the region are:

- The effects of land use on water quality (both surface water and groundwater) and on aquatic biodiversity, through erosion, bacterial input and nutrient leaching.
- The effects of upstream erosion on river levels causing flood hazards downstream.
- Soil degradation, resulting in reduced ability of the soil to grow grass and other crops, due to soil erosion, pugging, cultivation or urban spread.

2. WHAT'S HAPPENING?

Key Points:

- Exotic forestry area has increased, although new planting rates have decreased.
- Farmland is being used more intensively with increases in dairy cattle, lambs and fertiliser use.
- High quality soils are not under immediate threat from lifestyle subdivision.
- Severe erosion has affected 29,000 ha of hill country following the February 2004 storm. A further 87,000 ha have suffered moderate erosion.
- Tree cover significantly reduced erosion compared with pasture.
- Average soil structure in Manawatu is slightly degraded, but there are more soils of good to excellent quality than moderately to severely impacted.

2.1 LAND USE INTENSIFICATION

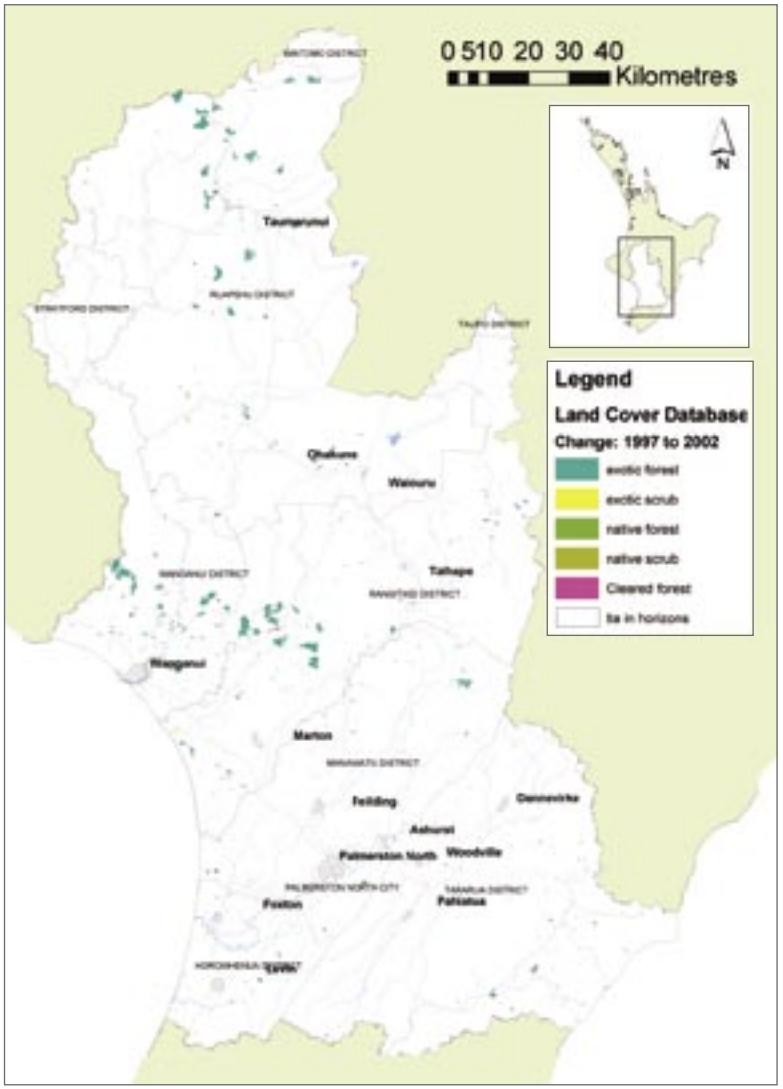
Land use intensification puts pressure on soil and water quality and biodiversity by the following mechanisms:

- Cattle providing excess nutrients and bacteria to streams and shallow groundwater, and pugging soils.
- Lack of trees on erodible land causing erosion and silt deposition in stream beds. Siltation of river beds is the main threat to aquatic biodiversity and freshwater fisheries, as well as making water unattractive for swimming. River silt also leaks nutrients, contributing to algal blooms.
- Leaching of applied fertiliser
- Over-cultivation causing loss of soil structure and organic matter, leaching of nutrients, and erosion.
- Urban areas have disproportionately large effects on water quality due to septic tanks, stormwater or sewage disposal.

Two main land-use trends are apparent:

1. The area of exotic forest blocks is increasing at the expense of hill country farmland. This is expected to improve water and soil quality. The total area of exotic forest is up by 20,000 hectares or 16% between 1997 and 2002 (Map 2-1). However new planting rates have fallen steadily over the last ten years and are now at a very low level.
2. The remaining farmland is being used more intensively. This is expected to improve the economy but also may degrade water and soil quality due to:
   a. Increased dairy farming: In the last ten years the number of dairy cattle has increased by 50%.
   b. More intensive drystock farming: Although the number of sheep wintered has decreased from 7.5 million to 6.6 million in the last five years. Horizons is the only region in New Zealand to have increased the number of lambs tailed. Lamb weights are also expected to have increased.
   c. National fertiliser use has more than doubled over the last 15 years. Use in the region is expected to follow this trend.

A future concern is the expected invasion of clover root weevil into Manawatu pastures. Clover root weevil prevents nitrogen fixation in clover roots thereby eliminating a valuable source of slow release nitrogen into the pasture system. More fertiliser is therefore required to maintain production levels.



MAP 2-1: Locations of afforestation and forest clearing from 1997 to 2002 from LCDB2.

Outside urban areas, high quality soils do not appear to be under immediate threat from lifestyle subdivision. Lifestyle blocks and non-production land account for between 4% and 10% of Land Use Capability Class 1 and 2 land (land that has the highest quality soils for primary production) in the region (Map 2-2).

2.2 EROSION

The Manawatu-Wanganui region has the largest area of hill country of any region in New Zealand. As a result the rivers are frequently dirty. Erosion in the hill country loads the river water, channels and banks with mud, silt, sand and gravel.

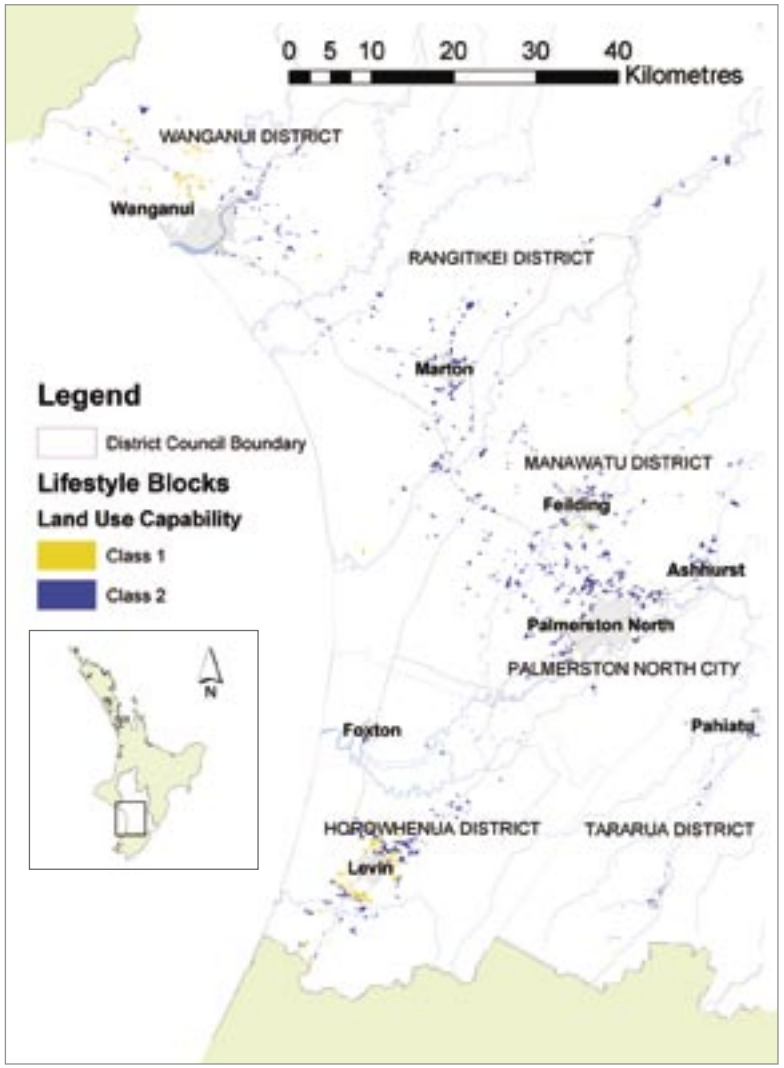
Mud and silt is arguably the major threat to aquatic biodiversity as these can cause habitat degradation, reduce visibility, clog gills and affect periphyton and invertebrate growth (the life supporting capacity of the river). Gravel can raise river bed levels (aggradation), thus increasing flood hazard. However, gravel provides habitat for invertebrates, thus benefiting aquatic biodiversity.

In February 2004 much of the region suffered major storms and erosion. About 300,000 hectares of hill country experienced a storm with a return period of greater than 150 years (Map 2-3), 20,000 hectares of land was flooded, and the total estimated economic impact on the region was over $300 million.

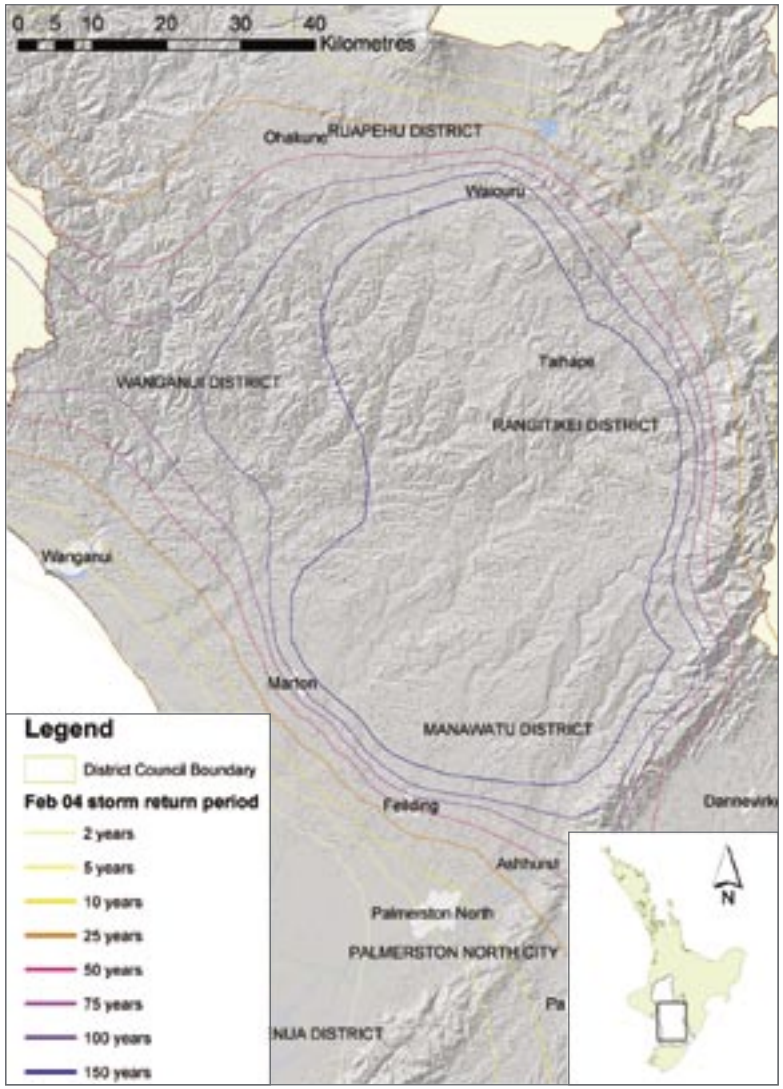
Although only around a fifth of the landslide debris ended up in our waterways (Dymond et al., unpubl.), approximately 30 million tonnes of sediment entered the rivers. This is almost three times the average annual discharge for the region and river clarity will be worse than usual for the next few years.

As an example; Manawatu River has run clear (having 1 metre visibility or better) between 35% and 45% of the time for all of the last 6 years. In 2004 it was clear only 13% of the time, and that was nearly all before the February storm.

Figure 2-1 shows what severe erosion (>15% bare ground) looks like: This hillslope had 25% bare ground. There are 29,000 ha of hillsides that looked like this (shown in purple and blue in Map 2-4). The main areas of severe erosion were in the upper Whangaehu and Turakina valleys, large areas on eastern tributaries of the Rangitikei River, and smaller areas up Pohangina valley and along upper Kiwitea Stream. There are another 87,000 ha of moderate erosion (5 - 15% bare ground, shown in orange and red in Map 2-4).



MAP 2-2: Lifestyle blocks on Class 1 and 2 land.



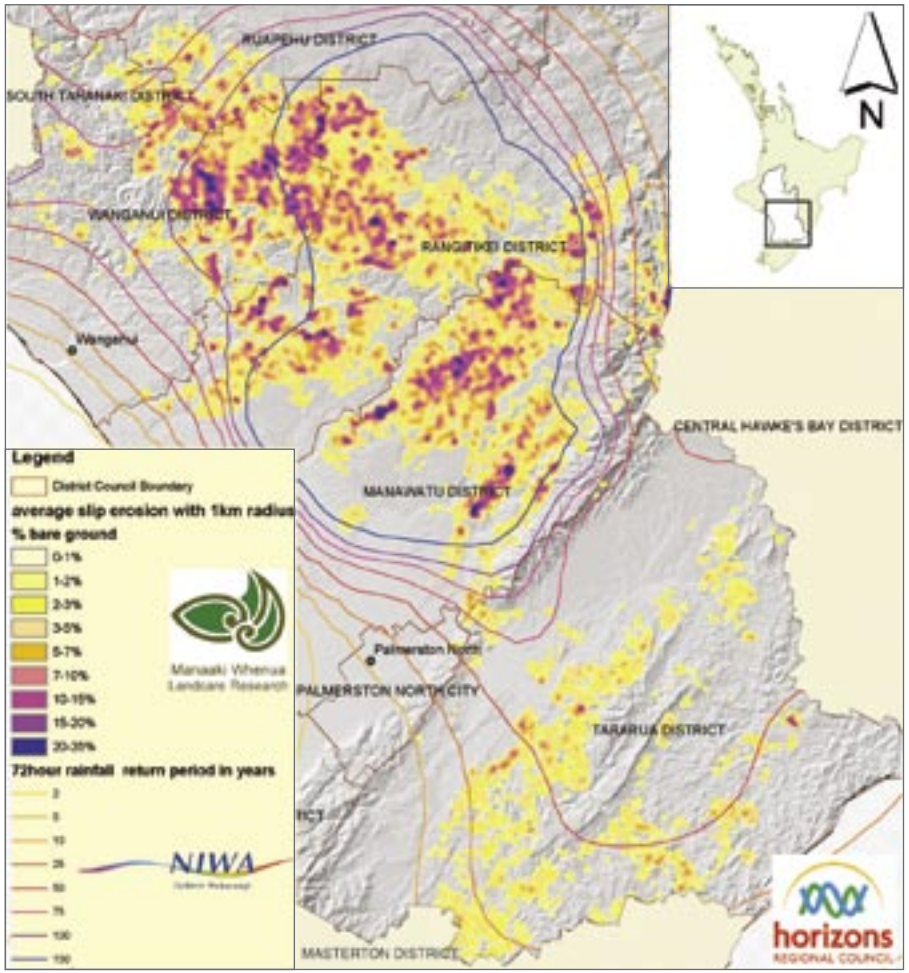
MAP 2-3: Distribution of rainfall from the February storm (from NIWA).

Some important conclusions on hill country land use have emerged from this storm. Analysis of aerial photography, satellite imagery and fieldwork has shown that on steep land, forest cover reduces erosion by about 75% (Figures 2-2, 2-3 and 2-4).

Figure 2-3 shows the results of satellite analysis of erosion. There was a 90% reduction in the amount of landslide scars on steep land under trees compared with pasture.

Figure 2-4 shows results of aerial photo analysis. Scattered trees made very little difference to erosion rates, while forest cover reduced the erosion to one third of what it was under pasture. This study is likely to underestimate the effectiveness of trees, as forests are often specifically planted on eroded ground.

FIGURE 2-1: Very severe slip erosion, Pohangina Valley.



MAP 2-4: Location of erosion after the February 2004 storm (Landcare Research).

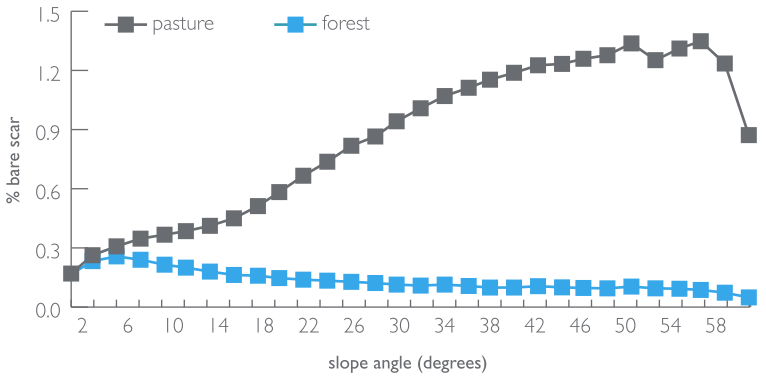


FIGURE 2-3: The effectiveness of intact forest cover in controlling erosion (from Landcare Research).

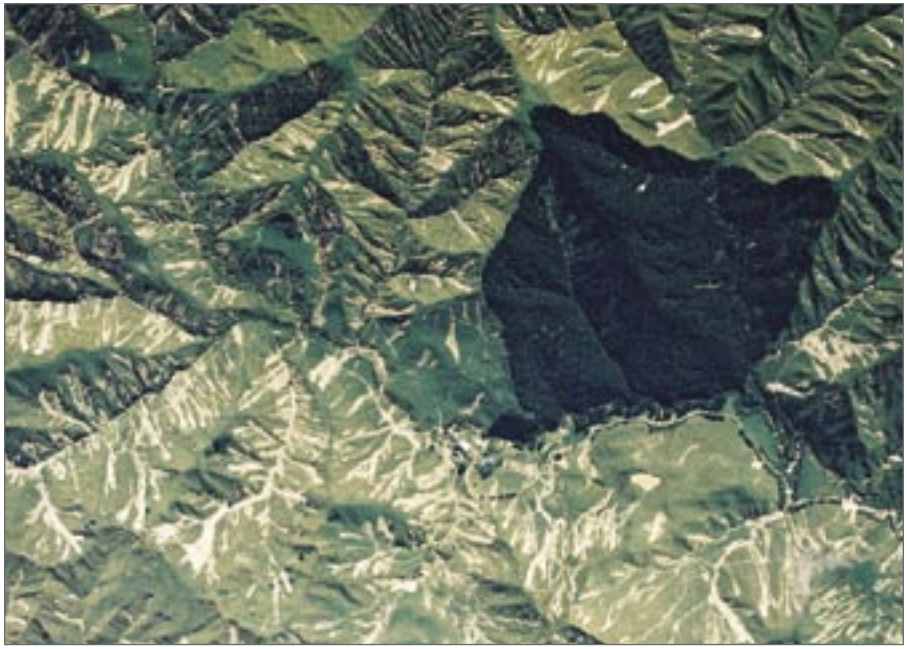


FIGURE 2-2: Hill country inland of Wanganui, showing the effectiveness of Pinus radiata in slowing erosion.

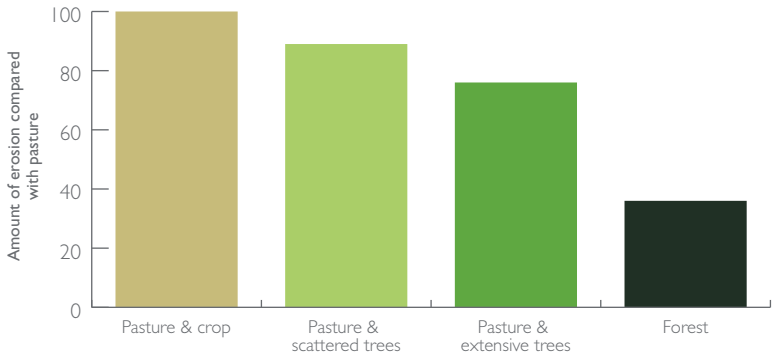


FIGURE 2-4: Effectiveness of scattered versus dense tree cover in controlling erosion (from aerial photo analysis by Ecological Research Associates).

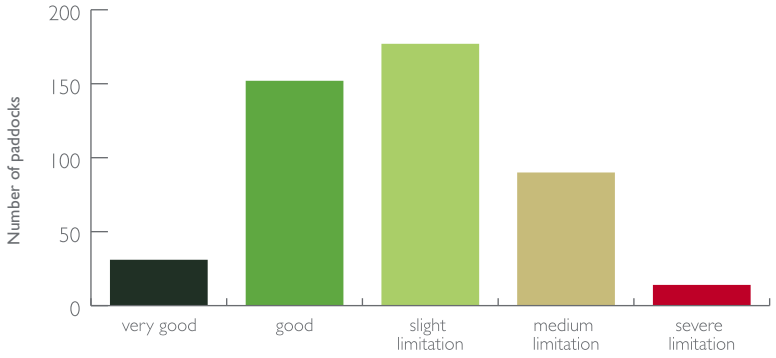


FIGURE 2-5: Visual Soil Quality survey results, 2003.

2.3 SOIL DEGRADATION

There are three broad issues around soil quality and soil degradation:

- Soil structure degradation reduces the ability of the soil to support plant growth and also increases runoff. Under farming systems it can take decades to restore. In saturated conditions, cattle or machinery cause pugging, while in very moist conditions, compaction results. Cultivation also degrades soil structure and organic matter.
- Chemical residues in soil. These include excesses of copper (a common horticultural and organic pesticide), cadmium (a contaminant in superphosphate and has been detected in sheep livers above threshold values), arsenic (once used in sheep dips and for timber treatment, and may now be building up in orchard and vineyard soils) or DDE (a breakdown product of DDT widely used for grass grub control in the 1960's and 70's).
- Over fertilisation of phosphate and nitrate. This causes water quality problems for shallow groundwater and surface water (particularly in lake catchments and during summer low flows in rivers). There are now instances where phosphate levels in soil are so high, due to excessive fertiliser applications, as to cause animal health problems (Shepherd, T.G., pers.comm.).

A survey of soil quality was carried out in January to March 2003 using the Visual Soil Assessment technique. The survey was carried out following a wet winter and spring, but by the conclusion of the survey, Manawatu was in a 100-year drought. The results are shown in Figure 2-5, the main findings were that:

- Soil quality at the paddock scale was heavily influenced by how heavy machinery or stock were managed when soils were wet, and what practices were adopted to alleviate potential impacts (e.g. on-off grazing, using a feed pad, delaying harvest)
- Overall soil structure was moderate to good. However 22% of paddocks had moderate to severe structure problems, relating to a production loss of 20 to 40%. Tokomaru, Kairanga and Marton soils had the most compaction and pugging, while Kiwitea, Levin and Manawatu soils had the least.
- Cropping and sheep/beef had significantly better soil quality than dairy farms.
- One third of farmers said they would do something different as a result of the findings.
- 97% of farmers thought the visit was useful.

3. WHAT IS HORIZONS DOING?

3.1 LAND USE INTENSIFICATION

While land use is intensifying, people are becoming more aware of the adverse effects of certain land use activities on the environment, and are taking action to reduce these effects. Horizons has recently signed the Dairying and Clean Streams Regional Action Plan with Fonterra Co-operative Group Ltd, in which dairy farmers will retire streams from grazing.

Uptake of Horizons Regional Council's Environmental Grant is higher than it has ever been (funds spent on riparian and native retirement have increased 10-fold), resulting in around 1000 ha per year of wetlands, streams or forest remnants retired or land protected from erosion.

However the encouraging trend of mainly lowland communities restoring low-quality but rare wetlands and native forest remnants (often at significant expense), contrasts with that of remote hill country land users converting high quality but fairly common native forest to pasture or exotic forestry (about 1000 ha between 1997 and 2002).

3.2 EROSION

Following the February 2004 storm, attention has turned once again to hill country land use and what can be done to reduce erosion. It is now possible to map hillslopes that suffer severe erosion on a recurring basis, perhaps every few decades.

Some sectors of the community are calling for land use change in catchment headwaters and Horizons is coordinating efforts with land users and territorial authorities to look at appropriate land use. The use of forest cover will be an important element although while afforestation does reduce the amount of silt carried in the floodwater; minimising the amount deposited on paddocks and in houses once floodwaters recede, it will not prevent very large (e.g. 1:100 year) floods and their damaging impacts. Substantial increases in forest cover will also have an impact on river low flows.

Similarly, trees next to rivers reduce streambank erosion in small to medium sized floods, but in very large ones these trees can make the problem worse, both by restricting the size of the channel and by contributing logs to the rivers, which then pile up against bridges. In the February storm, 26 bridge approaches were damaged and one entire bridge was destroyed because of logjams.

More work is needed to determine the extent to which afforestation can reduce future flooding problems. We do not yet know the extent to which the aggradation problems came from mountain land (where erosion is hard to control), hill country (where afforestation can be effective in controlling erosion), or riverbank erosion on the plains.

3.3 SOIL DEGRADATION

Soil quality monitoring will be carried out in early 2005 in order to determine the extent to which 2003 results were affected by the drought. Soil quality this time is expected to be worse, due to the saturated conditions over most of 2004, and resulting pugging and compaction.

4. FURTHER INFORMATION

New Zealand Land Cover Database (LCDB2)
www.terralink.co.nz/tech/data/lcdb/lcdb2-metadata.htm

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Ministry of Agriculture and Forestry; 2003 *Agriculture Statistics 2002.* ISSN 0110-4624. www.stats.govt.nz/domino/external/pasfull/pasfull.nsf/0/4c2567ef00247c6acc256ecf0077ce23/$FILE/alltabs.xls

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Shepherd T. G., Soil Scientist, personal communication. Todd, M. D. 2002, unpublished; Draft Manawatu-Wanganui Soil Quality monitoring report 2002.

THREE | SURFACE WATER QUANTITY AND FLOWS

THREE | SURFACE WATER QUANTITY AND FLOWS

Surface water is generally an abundant resource in the region and is therefore used extensively by the regional communities for economic development and recreational activities. However river flows are variable and the challenge is to manage scarce water over summer when it is needed most.

1. ISSUES/PRESSURES

The overarching objective of this Council is balancing the water demand for current and future water needs of communities, the economy and the environment. The main issues and pressure for surface water quantity resources in the region are:

- Balancing the demands for water for out-of-stream use e.g. town water supply, agricultural and industrial uses with in-stream requirements e.g. aquatic ecosystems, recreation and natural character.
- The occurrence of floods (Reported in the natural hazards chapter).

2. WHAT'S HAPPENING?

Key Points:

- Total consented abstraction volumes have increased by 108% from 1997 to 2004
- Agriculture is the largest user of water and use has increased by 313% from 1997 to 2004
- The Ohau catchment, upper Manawatu River and its tributaries show high levels of stress on the river from increased abstraction.

2.1 CONSENTED ABSTRACTION VOLUMES

Demands for water range from community drinking supplies, irrigation and electricity generation, to uses for other industrial processes such as meat works and milk factories. The consented volumes discussed below are for surface water and riparian abstractions. Riparian abstractions are water takes from shallow aquifers that are hydraulically linked to rivers and streams.

The maximum daily quantities consented for generating electricity are many times greater than for any other types of use. They are based on abstraction rates during high flow events so are misrepresentative of the average electricity abstraction totals. Use of water for electricity generation throughout the region is around 55 m^3/s on average.

Consented daily abstraction volumes (excluding electricity supply) for the region have increased by 108% from 1997 to 2004 (Table 3-1).

In 2004, the majority of the consented water abstraction was for agricultural use (51%). This represents a large shift from 1997 when agricultural use accounted for 26% of the consented volumes. Consented volumes for agricultural use have increased by 313% from 1997 to 2004, with significant increases occurring in the last three years (Figure 3-1). The increases are largely due to an increase in the amount of irrigation on dairy farms.

Volumes consented for water supply takes have increased by 34% from 1997 to 2004, but have in fact dropped as a percentage of the total consented volume (60% in 1997 and 39% in 2004). Volumes increased steadily from 1997 to 2001 however in the last three years there has been little change in the total consented volumes for water supplies. Consented abstraction volumes for industry have increased by 44% from 1997 to 2004.

YEAR	AGRICULTURE	INDUSTRY	WATER SUPPLY	TOTAL
	m^3/day			
1997	70668	38835	162024	217527
2004	291949	56003	219088	567040

TABLE 3-1: Consented water use (m^3/day) by category in 1997 and 2004.

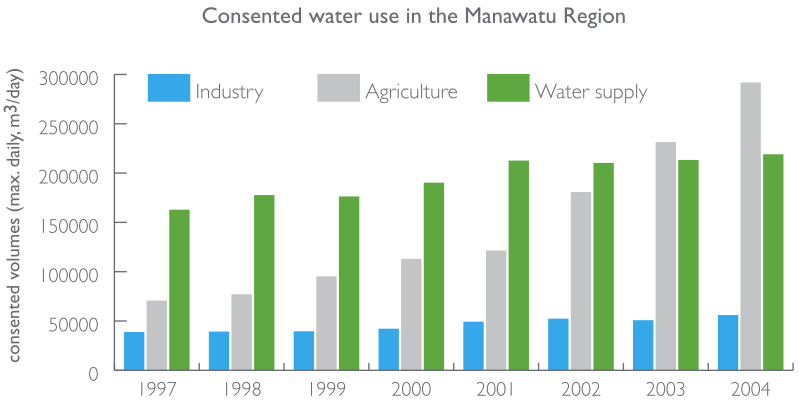
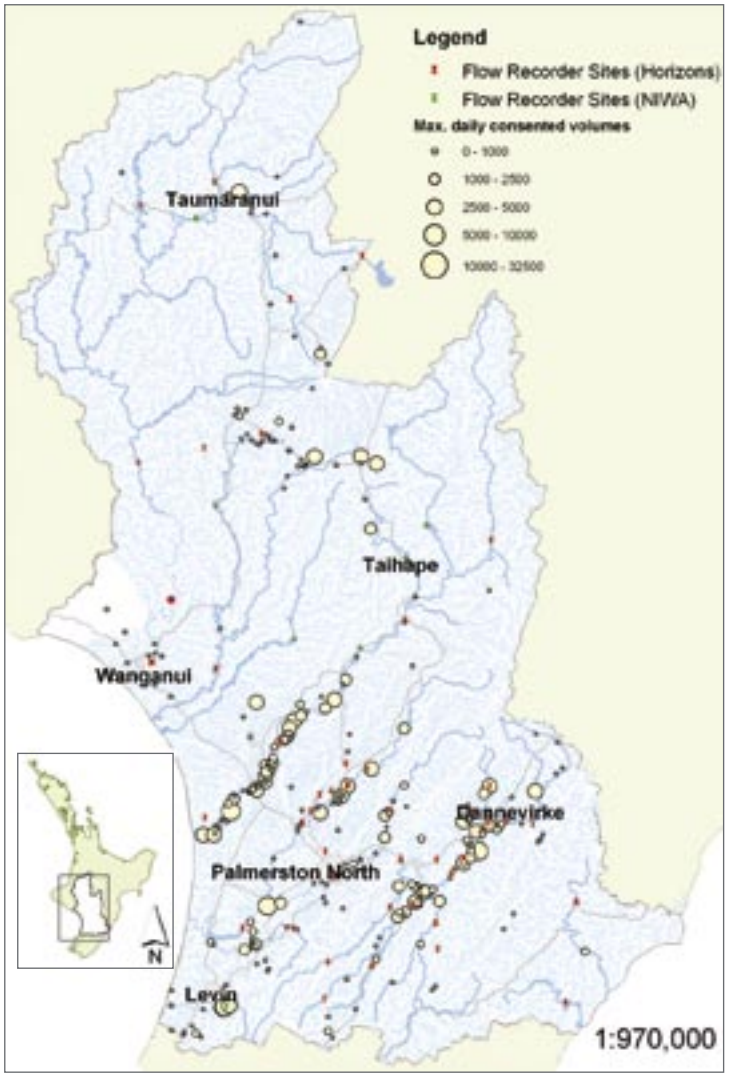


FIGURE 3-1: Consented water use (m^3/day) by category in 1997 and 2004.



MAP 3-1: consented surface and riparian water takes in the region and location of river flow monitoring sites, 1 September 2004.

2.2 ALLOCATION VOLUMES COMPARED WITH FLOWS

Consented surface and riparian water takes in the region (excluding water supplies) are mapped with the location of the region's river flow monitoring sites (Map 3-1). Water demand is concentrated in specific areas of the region including the lower Rangitikei River, the Manawatu River and several of the Manawatu River Tributaries e.g. the Tamaki, Raparapawai, Oruakeretaki, Mangatainoka, Pohangina and Oroua Rivers.

Mean annual low flow (MALF) of a river provides an estimate of the low flow that may be expected to occur in any one year. Comparing the allocated volume from a river with the MALF provides an indicator of potential stress on the river.

Of the major rivers in the region, the Manawatu River has the highest proportion of allocated volume to MALF (Table 3-2). The upper Manawatu River above Hopelands has over 27% of the MALF allocated. This is significant for the main stem of the river, however much of this allocation occurs from the smaller tributaries and some of these are under greater stress. For example, upstream of the Tamaki at water supply weir site, 8640 m^3/day over 50% of the MALF is allocated. Downstream of this site to the confluence a further 7933 m^3/day is allocated from the Tamaki River and its tributaries.

In the Ohau catchment, allocation of surface water is greater than 50% of the MALF at Rongomatane. Not all of this allocation is used. For example the water permit for Levin water supply allows for abstraction of up to 280 l/s, however water use records show peak abstraction rates of around 155 l/s.

The relationship between maximum consented and actual water use varies greatly. Knowing the volumes of water use are key to calculating the natural flow record i.e.. the flow that would have occurred had there not been any abstraction. For example, recorded flows at monitoring sites measure volume after any upstream abstraction from the river has taken place. Therefore, the natural MALF of the river is expected to be higher than the recorded MALF.

Naturalised flows are a key component of water allocation methodologies. To determine the natural flow record requires understanding of the amount of water abstracted from the river and the timing of the abstractions. Water use records have traditionally either not been recorded/required or have been in the form of daily abstraction volume. Water use records are now a standard requirement for all new consents, with large consents being required to install water meters fitted with telemetry units that provide water abstraction data to Horizons in near real time i.e. every hour. The communication links take away the burden of the user having to record and send in water use records. The hourly provision of this data enables the naturalised flows of the rivers to be accurately calculated.

River (-tributary)	Site	Recording Authority	Catchment area above Recorder (km^2)	Flow Statistics (l/s)			Consented maximum daily volumes[1] (l/s)	Consented volume as a percentage of MALF	Percentage of total consented use		
				Minimum Flow	Mean Annual Low Flow (MALF)	Median Flow			Agriculture	Industry	Water Supply
Akitio	Weber	Horizons	123	2	45	616	12.78	28.4	0	0	100
Akitio	Coast[2]	--	--				30.72	--	58	0	42
Manawatu	Weber Road	Horizons	713	1051	1850	7744	120.75	6.5	97	3	0
- Tamaki	Water Supply Weir	Horizons	31.6	23	183	1001	100.00	54.6	0	0	100
- Kumeti	Te Rehunga	Horizons	12.1	12	59	274	11.00	18.6	100	0	0
Manawatu	Hopelands	Horizons	1247	2000	3400	15000	928.47	27.3	73	9	18
- Tiraumea	Ngaturi	Horizons	734	1567	2385	7112	34.61	1.5	77	0	23
- Makakahi	Hamua	Horizons	158	91	346	3081	31.27	9.0	0	0	100
- Mangatainoka	Suspension Bridge	Horizons	404	231	1570	8750	135.53	8.6	13	48	39
Manawatu	Upper Gorge	Horizons	3231	7318	11764	50561	1648.26	14.0	69	15	16
- Pohangina	Mais Reach	Horizons	471	1350	2266	9849	54.38	2.4	99	0	1
Manawatu	Teachers College	Horizons	3900	8395	15228	72880	1838.20	12.1	70	13	17
- Kiwitea	Spur Rd[3]	Horizons	246	38	153	997	14.38	9.4	38	0	62
- Oroua	Almadale	Horizons	293	413	1197	7132	257.34	21.5	3	0	97
- Makino	Boness Road	Horizons	139	28	81	232	13.43	16.6	100	0	0
Manawatu	Foxton[4]	Horizons	5946	--	--	--	2332.99	--	63	11	26
Ohau	Rongomatane	NIWA	105	584	1057	3843	115.74	10.9	0	0	100
Ohau	Coast[2]	--	--	--	--	--	561.83	--	3	0	97
- Hautapu	Alabasters	NIWA	268	272	736	2808	116.79	15.9	0	0	100
Rangitikei	Mangaweka	NIWA	2787	9038	13700	43024	148.60	1.1	0	3	97
Rangitikei	Onepuhi[3]	Horizons	3420	10086	15200	55291	514.59	3.4	42	1	57
Rangitikei	Hamptons[3]	--	--	--	--	--	1959.77	--	70	8	22
- Mangawhero	Ore Ore	NIWA	506	1137	2783	8479	83.26	3.0	24	24	52
Whangaehu	Kauangaroa	Horizons	1917	10184	13652	27186	269.73	2.0	22	39	39
- Ongarue	Taringamotu	NIWA	1075	4416	8251	24701	10.65	0.1	0	98	2
Whanganui	Piriaka	NIWA	834	3872	9240	18534	93.96	1.0	1	27	72
Whanganui	Te Maire	NIWA	2212	19814	24938	48796	251.97	1.0	0	11	89
Whanganui	Paetawa	NIWA	6643	33401	41286	131090	256.13	0.6	0	10	90
Whanganui	Coast[2]	--	--	--	--	--	284.33	--	5	14	81

TABLE 3-2: Flow statistics for flow monitoring s

[1]excluding consents for electricity generation. [2]Consents downstream of the flow recorder [3]Simulated flow series. [4]Simulated flow series (excludes tidal influence).

3. WHAT IS HORIZONS DOING?

Horizons has responded to the increased demands for surface water abstraction by:

- Improving the monitoring network.
- Completing instream habitat assessment studies.
- Completing water resource assessment studies for catchments under pressure.
- Undertaking a project to estimate the value of the water resource.
- Developing new water allocation policy.

3.1 IMPROVED MONITORING NETWORK

The Horizons river flow monitoring network has been increased in the pressured catchments. Five new sites have been installed in locations downstream of areas of increasing demand e.g. new sites in tributaries of the upper Manawatu River, including the Raparapawai, Tamaki, Oruakeretaki and Manga-atua. These sites provide the necessary data for developing water allocation management options and monitoring the effect of abstractions on flows in the river.

3.2 INSTREAM HABITAT ASSESSMENTS

Horizons has completed several instream habitat requirement studies throughout the region including sites in the Rangitikei, Oroua, Kiwitea, Makino, Upper Manawatu river and Upper Manawatu Tributaries. Further instream habitat requirement studies are planned for the Pohangina River, Mangatainoka River and several volcanic plateau streams.

3.3 ESTIMATING THE VALUE OF THE WATER RESOURCE

A report on the economic value of the region's water (White and Sharp, 2002) states that water is worth $2.4 billion for productive or consumptive uses (e.g. hydropower, agriculture and drinking water supply), with a further $283 million for non-consumptive uses (e.g. fishing and recreation).

3.4 WATER ALLOCATION PLANS AND POLICIES

The Oroua Water Allocation Plan was implemented in 1997. Further water resource assessments have been completed for the Ohau and Rangitikei rivers. These projects assess the water resource and develop options for managing water allocation in the catchment. Recommendations from these reports have been incorporated into recently developed water allocation policy to address the increasing demand for surface water resources in the region.

4. FURTHER INFORMATION

Horizons Regional Council. 2003. Water allocation project Ohau river. Water resource assessment allocation limits and minimum flows. Technical report to support policy development. Report No. 2003/EXT/575. 89p.

Roygard, J. and Carlyon, G. 2004. Water allocation project Rangitikei river. Water resource assessment - allocation limits and minimum flows. Technical report to support policy development. Horizons Regional Council Report No. 2004/EXT/

White, P.A. and Sharp B.M.H. 2002. Economic value of water in the Manawatu-Wanganui region. Institute of Geological and Nuclear Sciences Client report 2002/82. 114p.

FOUR | FRESHWATER QUALITY

FOUR | FRESHWATER QUALITY

Good water quality is a community priority: water is valued for the wildlife it supports, as a drinking and food source, for its spiritual and cultural values, for many recreational activities, and simply for its aesthetic values.

1. ISSUES

Water quality is influenced by a number of natural factors such as climate, topography, soils and land cover. Some human activities such as: waste disposal, urban and road network development, and unsustainable agricultural practices may also have marked detrimental effects on the water quality and compromise the values of a water body.

The main issues affecting water quality in the region are:

- Faecal contamination compromising the water's recreational quality and affecting its mauri.
- Nutrient enrichment causing accelerated eutrophication.
- Modified physicochemical characteristics of the water and/or presence of toxic substances compromising the life supporting capacity of the water.
- High turbidity, affecting aesthetic values, life supporting capacity (also an indicator of soil erosion).

2. WHAT'S HAPPENING?

During the past five years, water quality has been monitored at 470 sites across the region. A set of integrated indicators and indices relating to specific issues has been developed, summarising how often water quality is satisfactory, resulting in a score from 1 to 10.

A score of 10 means that the water quality is satisfactory 90 to 100% of the time, a score of 6 means the results are satisfactory 50 to 60% of the time.

Water quality at a monitoring point on a river is the result of what is happening upstream; therefore the score for each monitoring point is attributed to the catchment above this point.

2.1 SUITABILITY FOR CONTACT RECREATION

Pathogens from human and animal faecal material can enter the freshwater environment. Elevated concentrations of these pathogens may pose a health risk to people in direct contact with the water. Sources of faecal contamination of the water include:

- Overland runoff of urban and farmed land.
- Discharge of untreated or poorly treated sewage, agricultural or industrial waste.
- Dysfunctioning septic tanks.

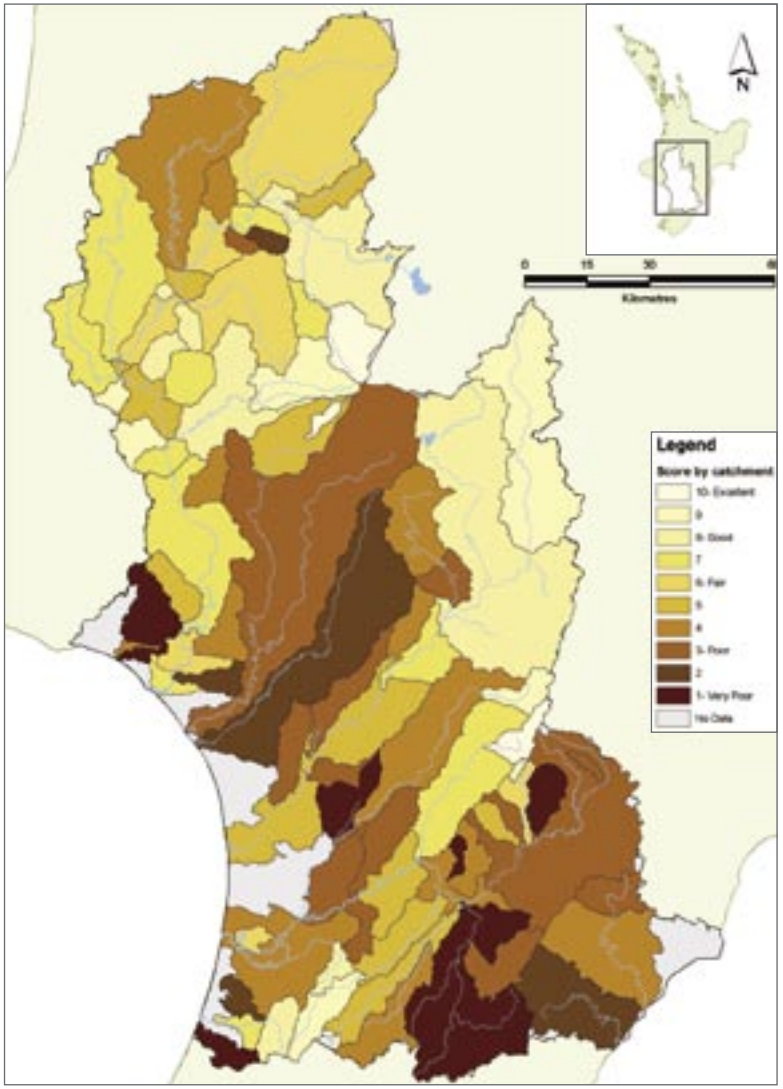
The Contact Recreation Index summarises the prevalence of unacceptable bacterial levels for the past five years (Map 4-1).

EXCELLENT / GOOD (WATER IS ALMOST ALWAYS SAFE FOR SWIMMING):
Upper catchments of Whanganui, Mangawhero, Rangitikei (down to Mangaweka), Pohangina, Oroua, Ohau, Tokomaru and Mangahao Rivers.
Some tributaries of the middle Whanganui River.

FAIR:
Middle and Lower Whanganui River and most of its tributaries,
Middle Rangitikei (down to Vinegar Hill), Pohangina.

POOR:
Most of the Manawatu catchment, some tributaries of Whanganui (Ohura, Upokongaro) and Rangitikei (Porewa, Tutaenui, Hautapu, Rangitawa) Rivers, Turakina and Akitio Rivers.

VERY POOR (WATER IS ALMOST ALWAYS UNSAFE FOR SWIMMING):
Some coastal streams (Mowhanau, Kai Iwi, Waikawa). Some tributaries of Manawatu (Tiraumea, Makino, Mangapapa, Mangatera), Whanganui (Hikumutu, Matarawa), and Whangaehu Rivers.



MAP 4-1: Contact Recreation Index score by catchment.

2.2 NUTRIENT ENRICHMENT

Nutrients such as nitrogen and phosphorus encourage the growth of aquatic plants and algae. These are a normal and necessary part of an aquatic ecosystem, as they form the base food web. However, excessive amounts of nutrients in rivers cause nuisance periphyton[1] growth particularly during periods of extended stable / low flows in summer. In lakes, excess nitrogen and phosphorus is responsible for summer nuisance algae blooms. The main sources of nutrients entering the freshwater environment are:

- Discharge of treated wastewater (sewage, industrial effluent, livestock operation effluent).
- Runoff and seepage from agricultural land (excessive or poorly timed application of fertilisers, poorly managed discharges to land).
- Seepage from dysfunctioning septic tanks.

The Nutrient Enrichment Index uses the concentration of nitrates, ammonia and phosphates in the water to summarise how often the nutrients concentration in the water will encourage weed and algae proliferation.

EXCELLENT / GOOD (WATER IS ALMOST NEVER TOO NUTRIENT-RICH):

Most of Whanganui catchment, Rangitikei down to Vinegar Hill, Mangahao and upper catchments of Pohangina, Oroua, Ohau Mangatainoka and Tokomaru Rivers.

FAIR:

Lower Whanganui, Mangawhero Whangaehu, Rangitikei Mangahao and Pohangina, Akitio and Owahanga, Upper Hautapu.

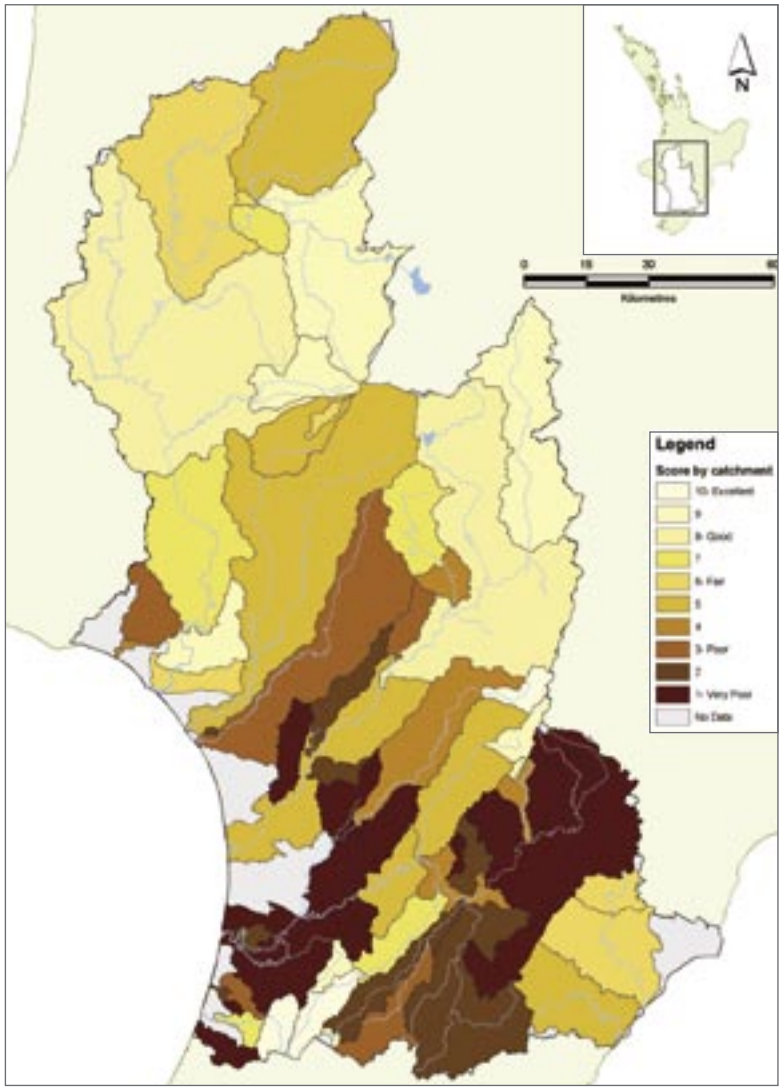
POOR:

Turakina and Lower Hautapu Rivers, Kai Iwi and Makohine Streams

VERY POOR (WATER IS ALMOST ALWAYS TOO NUTRIENT-RICH):

Most of Manawatu catchment, some tributaries of lower Rangitikei River (Tutaenui, Porewa, Rangitawa), Hokio Stream (Lake Horowhenua), Waikawa Stream.

[1] Periphyton is the algae living on the surface of the river substrate.



MAP 4-2: Nutrient Enrichment Index score by catchment.

2.3 LIFE SUPPORTING CAPACITY

In a healthy water body, the main physicochemical characteristics, such as water temperature, pH, and dissolved oxygen, are kept within limits compatible with a healthy development of the aquatic life. The water and sediment should also not contain any toxicants, such as ammonia or cadmium.

Sources of degraded water quality include:

- Discharge of poorly treated industrial, agricultural or domestic effluent.
- Stormwater from urban / industrial areas.
- Absence of riparian vegetation.
- Abstraction of water.
- Runoff and seepage from agricultural land

The Stressors Index incorporates all these variables and summarises how often any one of these parameters is outside the acceptable range.

EXCELLENT / GOOD:
The large majority of the region's rivers.

FAIR:
Lower Whanganui, Mangaone Stream, Tutaenui Stream

POOR:
Rangitawa Stream

VERY POOR:
Hokio Stream (Lake Horowhenua) catchment, Whangaehu River[2]

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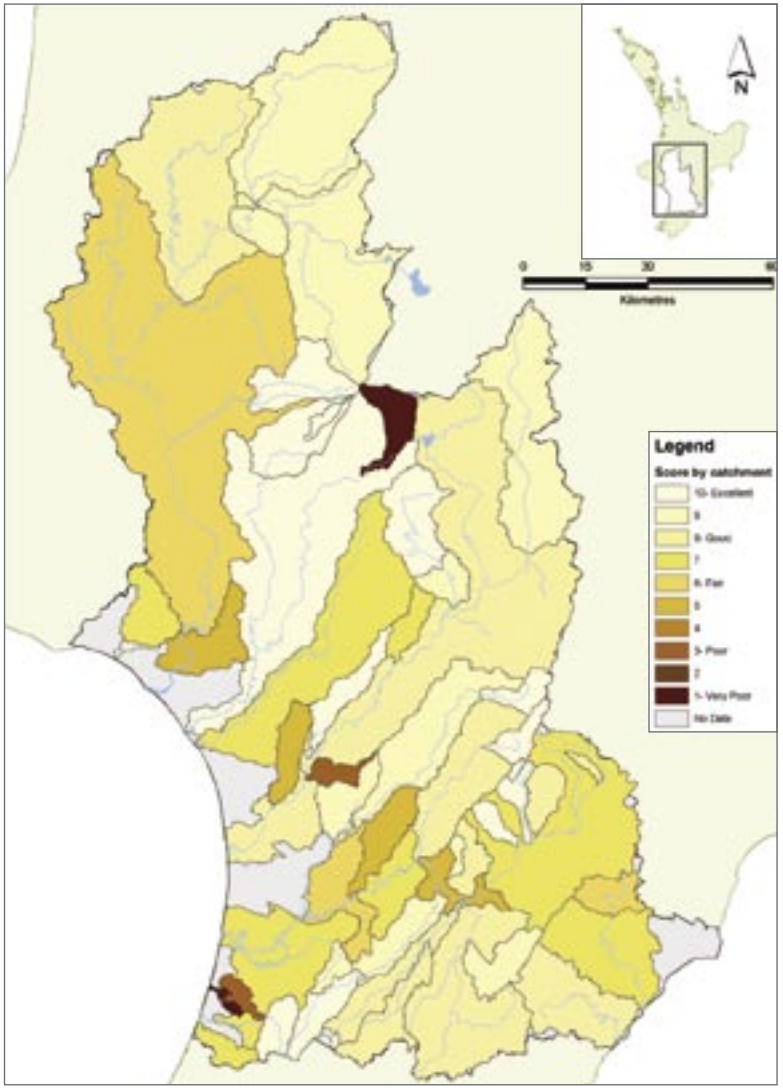
[2] Whangaehu River is a special case as it drains from the Mt. Ruapehu Crater Lake and has naturally very acidic water. This naturally compromises its life supporting capacity.



MAP 4-3: Stressors Index score by catchment.

2.4 TURBIDITY

High turbidity is associated with low water clarity and large amounts of sediment suspended in the water. This is the "visible" part of water quality. Fairly high turbidity during floods and "freshes" is a natural phenomenon, and some rivers will naturally be more turbid than others.

However, "muddy" water compromises the aesthetic values of the water. Further, large amounts of sediments in the water can also impact on aquatic life by clogging the gills and smothering stony habitat. Finally, high frequency of high turbidity is the sign of accelerated land erosion.

Sources of sediments in the water can be:

- Land erosion (landslides, slips and gullies reaching the waterways).
- River channel erosion.
- Discharge of stormwater, industrial wastewater (e.g. vegetable washing operations).
- Runoff from agricultural land (ploughed land, farm tracks).

EXCELLENT / GOOD

Upper Rangitikei (down to River Valley Lodge), Mangawhero, Manganui O Te Ao, Whakapapa, Mangahao, Mangatainoka. Tamaki and Makino and upper Tokomaru

FAIR

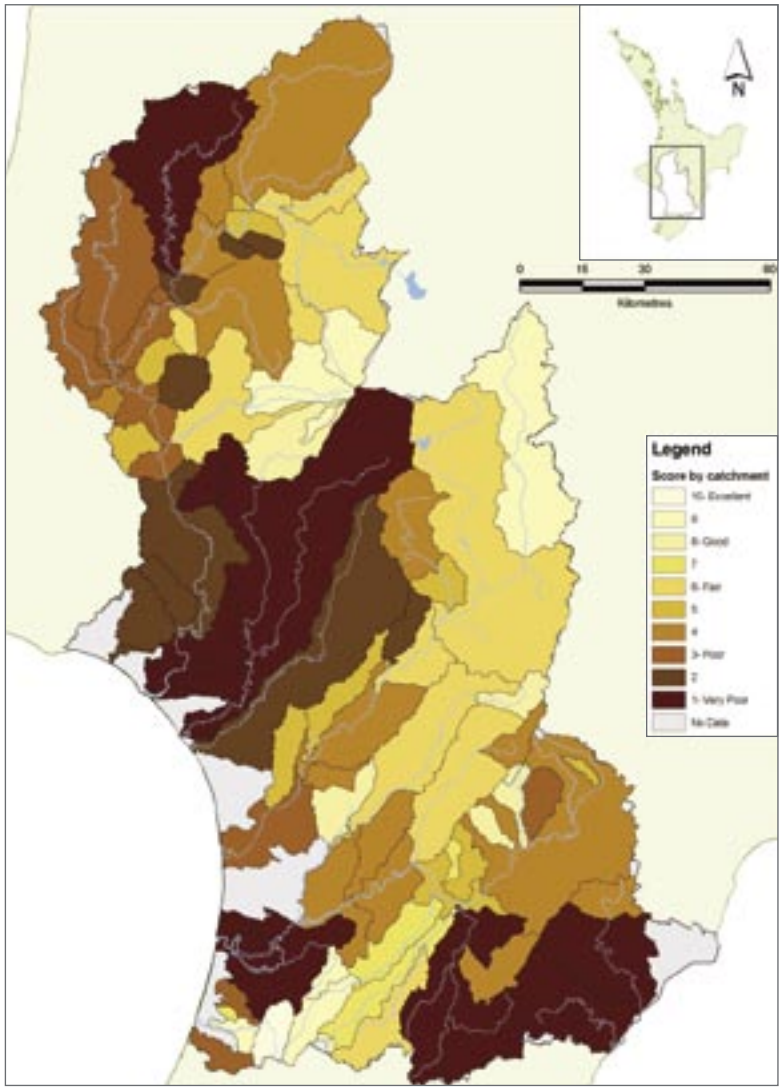
Upper Whanganui, Rangitikei down to Mangaweka, Oroua above Feilding

POOR

Lower Rangitikei, middle Whanganui and some tributaries (Tangarakau, Whangamomona)

VERY POOR

Whanganui catchment downstream of Pipiriki (including tributaries), Ohura. Lower Manawatu, Tiraumea, East coast catchments (Owahanga, Akitio)



MAP 4-4: Turbidity Indicator score by catchment

2.5 EFFLUENT DISCHARGES

Effluent discharges to water have been identified as a major source of degraded water quality across the region. Over the last eight years, Horizons has promoted discharge of effluent to land rather than to water.

As shown in Figure 4-1, the total number of discharges of livestock operation effluent (including dairy, poultry and piggery effluents) has remained fairly stable (about 1200) over the last eight years. The proportion of discharges to water has decreased from 35% to 10%.

Over the past few years the number of discharges of treated sewage effluent to water has remained relatively stable, although the total number of discharges has steadily increased (Figure 4-2).

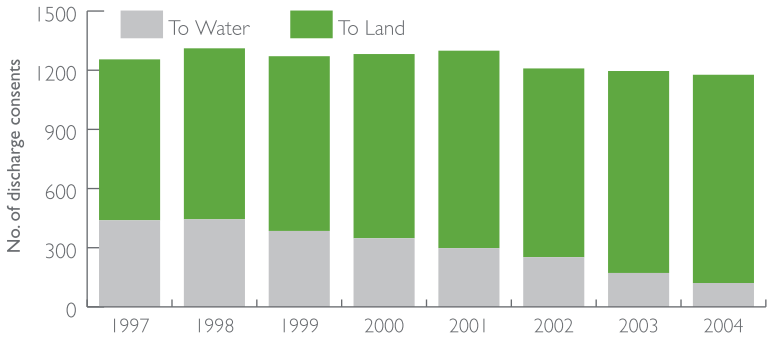


FIGURE 4-1: Number of consented discharges of livestock operations effluent from 1997 to 2004.

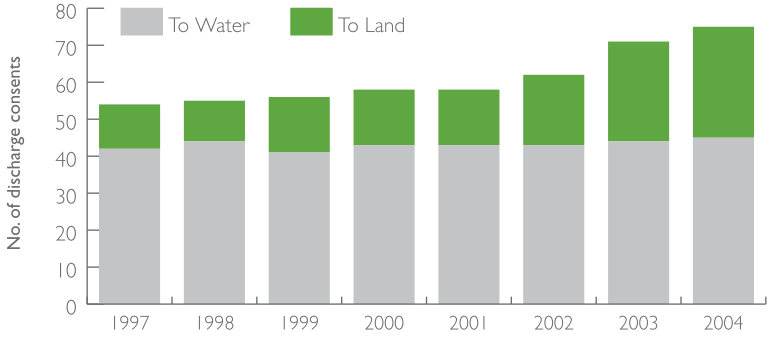


FIGURE 4-2: Number of consented discharges of treated sewage effluent from 1997 to 2004.

3. WHAT IS HORIZONS DOING?

3.1 THE OVERALL PICTURE

Parts of the region have excellent water quality, particularly in headwaters with extensive native vegetation or exotic forest cover. However, water quality typically declines moving downstream of a river.

Indicators show clearly that water quality in many river systems is being affected and catchments face different water quality issues, as summarised in Table 4-1.

CATCHMENT	CONTACT RECREATION	NUTRIENT ENRICHMENT	STRESSORS	TURBIDITY (SEDIMENTS)
Whanganui	++	-	+	**+++**
Rangitikei	++	++	+	++
Manawatu	++	**+++**	-	++
Whangaehu	+	-	+++	+++
Turakina	++	+	-	+++
Akitio	+	-	-	+++
Owahanga	++	-	-	+++
Ohau	-	-	-	-
Hokio (Lake Horowhenua)	+++	+++	+++	-
Kai Iwi, Mowhanau	+++	+	-	+
Waikawa	++	+++	-	+

TABLE 4-1: Main water quality issues by catchment. Significance of issues is indicated as: (+++) major, (++) moderate, (+) minor, and (-) not significant issue for each catchment.

Monitoring allows the identification of nature and location of significant water quality issues. The next step is to determine the likely source of these issues. Pollution that enters the aquatic environment at a clearly identified point, like a treated effluent discharge into a river is called point source pollution. However, even in the absence of direct discharges to water, poor water quality in some rivers can be observed. In these cases the pollution is coming from a multitude of unidentified sources. This diffuse pollution is called non point source pollution. High levels of non point source pollution are generally associated with:

- Intense / intensifying farming: dairying, market gardening, cropping.
- Poor land management: absence of riparian protection, no erosion control.
- Large urban areas in the catchment.

3.2 CURRENT PRACTICE

Better management of point source pollution has been a major focus for Horizons over the past years, and important improvements have been achieved. The implementation of the Land and Water Regional Plan has led to a significant reduction in the number of consented discharges to water. The remaining discharges are managed through the Resource Consents process. However, point source pollution is still an issue, particularly where:

- Wastewater treatment processing is not satisfactory.
- The receiving environment (stream or lake) is too small for the discharge.
- The receiving environment is naturally or artificially subjected to extended periods of low flows.
- There are cumulative effects of several discharges along a stretch of river.

By nature, the effects of non point source pollution are difficult to identify and mitigate, and are the main water quality management challenges for the region. Horizons is implementing solutions aimed at reducing the impact of non point source pollution on the rivers and lakes. For several years now, Horizons has been encouraging, promoting and funding:

- Riparian management (such as fencing and planting of streams banks) that prevents stock access to the waterways, capture sediment, and strips nutrients off farmland runoff.
- Erosion control.
- Wetland restoration work that improves water quality in many lakes and in wetland-fed streams.
- Sustainable land management practices.

The recent signing of the Dairying and Clean Streams Regional Action Plan with Fonterra Co-operative Group Ltd encompasses these same principles in relation to the dairy farming sector and is a positive move by this industry.

3.3 FUTURE FOCUS

Priorities for Horizons and the community to focus on in the short to medium term are:

- Carry on promoting discharges to land rather than to water, particularly for sewage effluent.
- Promote upgrading of effluent treatment systems.
- Better manage discharges to land and fertiliser use (establishment of codes of practice).
- Carry on erosion control programmes.
- Promote better management of riparian zones, tracks and stream crossings on farms.
- Nutrient management of coastal lake catchments.
- Determine priority catchments and promote an integrated catchment management approach.
- Better managed discharges of stormwater to water from urban areas.
- Examine cumulative effects of discharges.

FIVE | GROUNDWATER

Groundwater is used extensively in the region for stock and domestic water supply, especially in Manawatu, Horowhenua, alluvial flats in Tararua, and lower Rangitikei and Wanganui catchments (Map 5-1). There are an estimated 12,000 bores in the region. Most of the bores tap confined aquifers[1].

1. ISSUES

Many bores in the region are free-flowing artesian bores (where pressure in the aquifer is enough to make water flow at ground level). However some of these have been found flowing to waste. This not only wastes water it also decreases the pressure in the aquifer for other users.

Rapid development in the coastal areas of Manawatu, Horowhenua and Rangitikei for irrigation of dairy pasture is placing pressure on the groundwater resource and intensive farming in the region also impacts on groundwater quality.

The two main issues facing groundwater management in the region are:

1. Declining groundwater levels (indicating over extraction).
2. Degraded water quality (indicating inappropriate land use and intensive farming).

An area of concern, but not yet an issue, is saltwater intrusion into coastal aquifers.

2. WHAT'S HAPPENING?

Key Points:

- Groundwater levels in the region are stable, but some areas within Manawatu are showing abstraction stress.
- Total consented abstractions have increased rapidly since 2001.
- Naturally high levels of iron and manganese occur in groundwater of Manawatu and Rangitikei Districts.
- Many bores in Horowhenua area have high levels of nitrate that exceed the New Zealand drinking water standard.

[1]Groundwater is stored in spaces between grains of sand and gravel, these layers of water-bearing sediment are known as aquifers and confined aquifers are capped by finer sediment layers that restrict water movement.

2.1 GROUNDWATER QUANTITY

Groundwater levels provide an indicator of the state of groundwater quantity in the region. Generally groundwater levels are stable, however, there are limited areas within Manawatu that are showing abstraction stress. These areas are usually limited by aquifer.

2.1.1 Groundwater Use

Pressure on groundwater resources in the region is increasing. Total volume of consented groundwater abstractions (more than 50 m^3/day) has increased by over 45% since 1997 and rapidly since 2001 (Figure 5-1). Although the number of consents has slightly reduced from 1997, the amount of water abstracted in individual groundwater consents has increased.

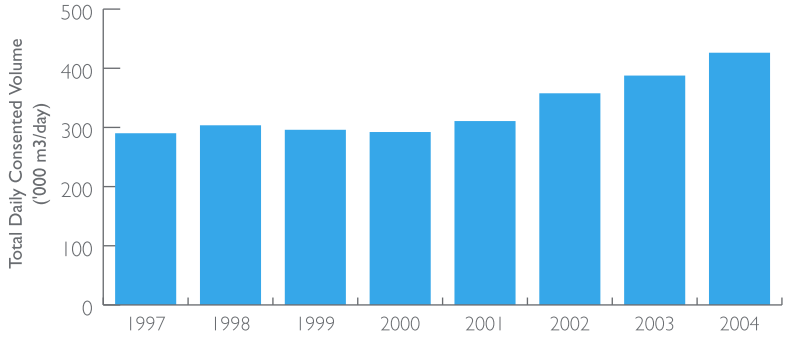
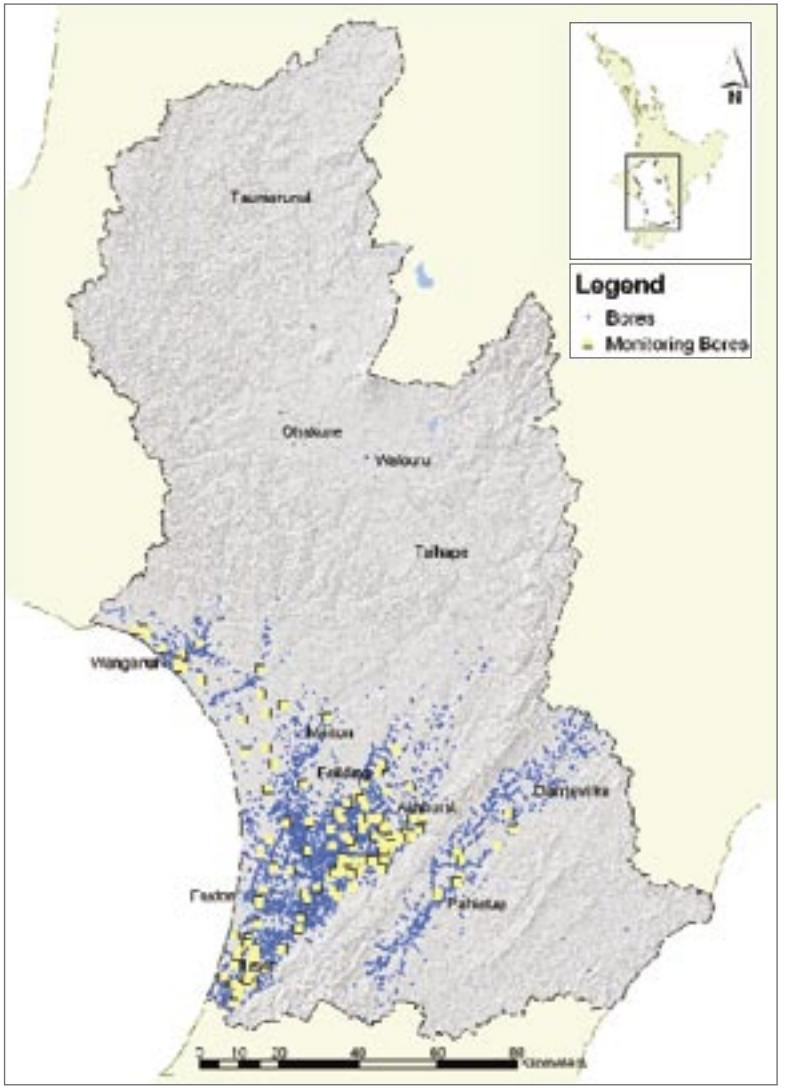


FIGURE 5-1: Consented groundwater abstraction has increased rapidly since 2001.

The distribution of consented groundwater abstractions is very similar to the distribution of bores in the region. Recent development of the groundwater resource for irrigation has concentrated on the Manawatu Plains.



MAP 5-1: Distribution of bores and static water level (SWL) monitoring bores in the region.

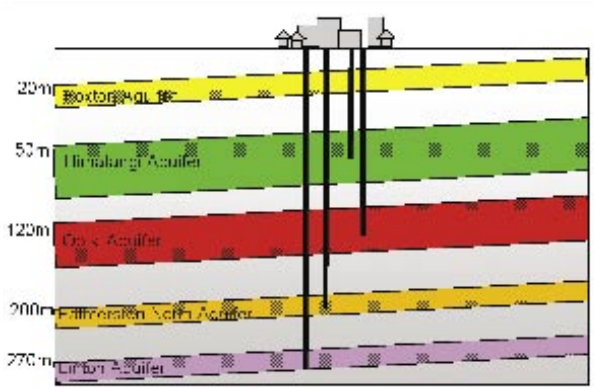


FIGURE 5-2: Schematic cross-section of Manawatu aquifers as identified in Palmerston North.

2.1.2 The Manawatu Plains in Detail

There are three major aquifer systems that have been identified across the Manawatu plains, and two deeper aquifers that are recognised in the Palmerston North area (Figure 5-2).

Three areas of rapid groundwater development for irrigation within the last three to four years are highlighted in Map 5-2. Generally irrigation development for dairy pasture has been concentrated on sandy soils near the west coast. These soils can dry out significantly over summer. Within the areas of recent development, large groundwater abstractions are generally concentrated within the same aquifer system. Rapid development of the Opiki Aquifer, north of Foxton (red circles, Map 5-2), has raised concern about potential saltwater intrusion, which may occur when the groundwater pressure falls significantly to allow the inland migration of seawater into the aquifer. This area has public water supply bores, which may be threatened by saltwater intrusion.

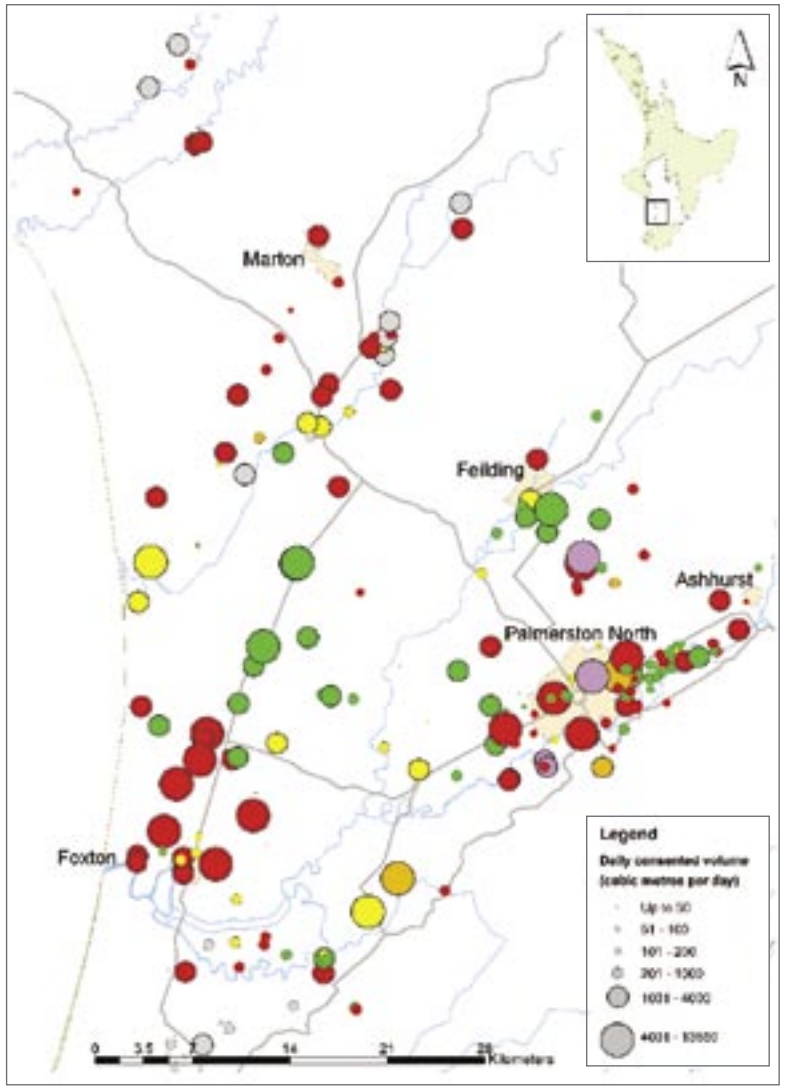
New water supply bores have also been drilled for Palmerston North, Feilding, Foxton, Levin and Wanganui in the last four years.

2.1.3 Groundwater Response to Usage

Groundwater levels (static water levels) show the balance between inputs (i.e. recharge from rainfall and surface water) and outputs (discharge to surface waters and the sea, and groundwater use). Water levels fluctuate seasonally but long-term declining groundwater levels can be a result of a natural inbalance between recharge and discharge, or excessive unsustainable use or change in land drainage system.

Groundwater levels in confined aquifers respond more dramatically to abstraction than unconfined aquifers due to their lower storage capacity. However a significant fall in water levels during periods of intense use (irrigation season) can be recovered over winter when aquifers recharge.

Horizons monitors 140 bores on a monthly basis. These bores are spread throughout the region to cover areas of intense groundwater use, especially areas that are under pressure from use (Map 5-1). There are also 15 sites that continuously record water levels every 15 minutes.



MAP 5-2: Consented groundwater takes per aquifer in Manawatu. The colour of the circles represents aquifers as in Figure 5-2 and the size of the circle represents the daily consented volume.

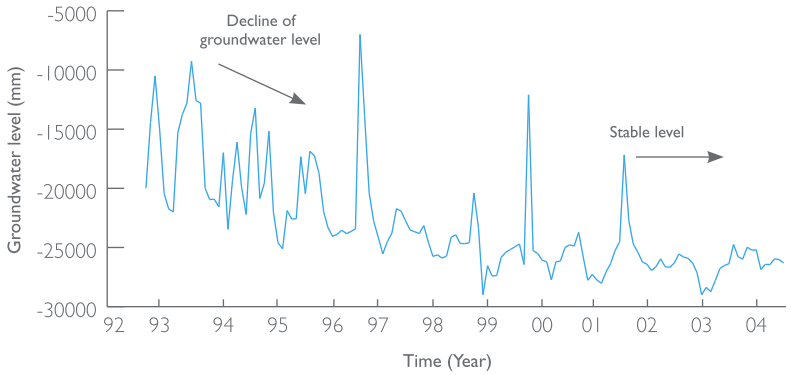


FIGURE 5-3: Groundwater level changes at bore 325019, Himatangi Aquifer, Feilding. Peaks occur when use in nearby industry stops.

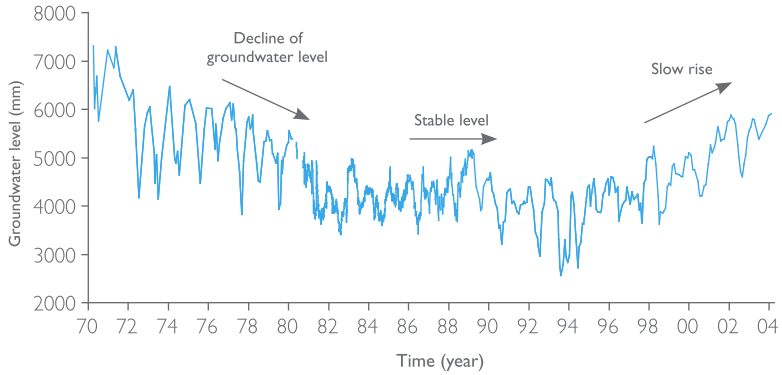


FIGURE 5-4: Groundwater level changes at bore 336001, Opiki Aquifer, Milson Airport, Palmerston North.

While long-term trends for groundwater levels across the region are stable, there are some areas with declining levels as highlighted in Map 5-2. Groundwater levels in Feilding have stabilised in most bores however one of the monitored bores is continuing to decline (Figure 5-3). The declining trend is attributed to overuse of the Himatangi Aquifer in this area.

Northern Palmerston North bores tapping the Opiki aquifer show a rising trend, recovering from a decline in water levels during the 1970's (Figure 5-4, Map 5-3).

In Opiki, the Opiki Aquifer is showing a strong declining trend in one monitoring bore, but it is not shown in the other monitoring bore in the same aquifer in the Opiki area (Figure 5-5).

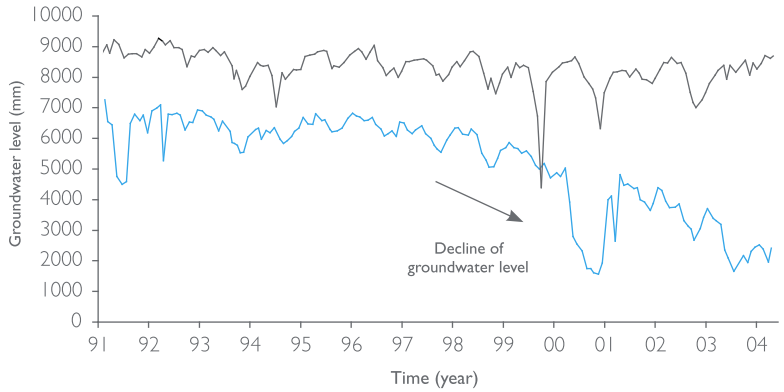
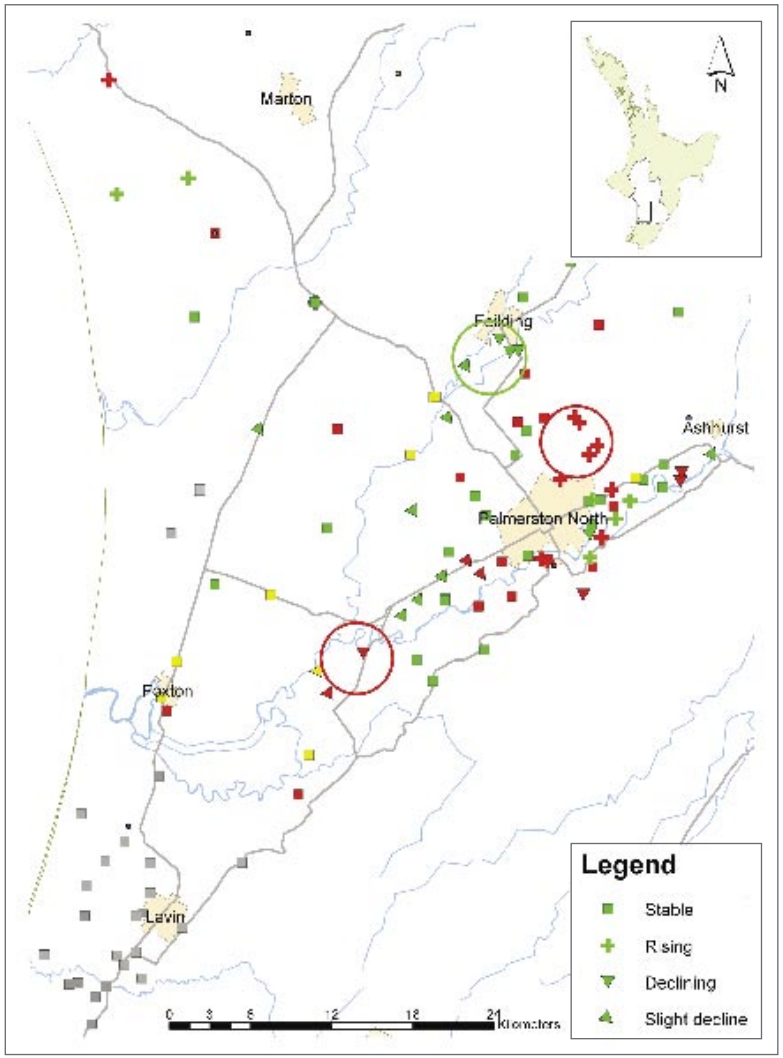


FIGURE 5-5: Groundwater level at two monitoring bores (344007 and 344001) within the Opiki Aquifer, Opiki.



MAP 5-3: Long-term water level trends of Horizons Monitoring sites. Colours represent aquifers as shown in Figure 5-2. Grey symbols represent undefined aquifers. Dots represent sites with not enough information to determine a long-term trend.

2.2 GROUNDWATER QUALITY

Water Quality in the region is generally good, however natural levels of iron and manganese can cause aesthetic problems. Key indicators for groundwater quality are: Calcium, magnesium, sodium, potassium, iron, manganese, alkalinity, chloride, sulphate, nitrate, nitrite, ammonical nitrogen, and dissolved reactive phosphorus. Other indicators include, turbidity, pH, conductivity and biocides (including pesticides, herbicides and insecticides).

Currently 28 bores throughout the region are monitored for water quality every seven months, and four bores are monitored every three months as part of the national groundwater monitoring program (run by IGNS). Several Horowhenua bores are regularly monitored for nitrates.

Naturally high levels of iron and manganese occur in groundwater of Manawatu and Rangitikei Districts (especially in deep aquifers). The levels of iron are often over New Zealand drinking water standards (Ministry of Health, 2000).

Many bores in Horowhenua have high levels of nitrate in excess of New Zealand drinking water standards. Water from some bores tapping the shallow unconfined gravels of Tararua also exceed drinking water guidelines for nitrate. Excessive nitrate in drinking water may result in a condition known as blue baby syndrome in bottle-fed infants. Nitrate-nitrogen is a broad indicator of contamination from a variety of sources including fertilizers, agricultural and human wastes. The high levels are generally associated with areas of intensive horticulture and agriculture.

3. WHAT IS HORIZONS DOING?

A new water allocation policy is being developed by Horizons to manage the development of the water resources in the region. In this context consultation over a new methodology for allocating groundwater (McCarron and Gyopari, 2004) is underway.

Wells to monitor salinity of the water are proposed for coastal areas in Manawatu and Lower Rangitikei. A well will be drilled in this coastal area to monitor trigger levels when irrigation takes will be restricted.

Consented abstractions are being more carefully monitored to look at the volumes actually being removed form the groundwater system. New monitoring sites have been added in the last few years to cover areas not previously covered. The monitoring network will be reviewed in the next year.

4. FURTHER INFORMATION

Ministry of Health. 2000. Drinking-water standards for New Zealand.

McCarron, C. and Gyopari, M. 2004. Groundwater Allocation Methodology. Horizons Regional Council Report No: 2004/EXT/597

New Zealand's first State of the Environment report concluded that loss of indigenous biodiversity is New Zealand's most pervasive environmental issue (Taylor and Smith, 1997).

1. ISSUES

The most significant issue in the region is the combined effects of the loss of nearly 80% of native forest and wetland habitat since 1840, and the introduction of exotic pests, leaving remaining fragmented areas vulnerable. Impacts on aquatic habitats through human activities and pest threats are also of concern.

The region's podocarp-broadleaf forest ecosystems contain the bulk of New Zealand's biodiversity assets. Almost all of its species are endemic to New Zealand. Fewer endemic species occur outside forest ecosystems and many indigenous species have disappeared from deforested areas.

The region's many streams, rivers, lakes and wetlands provide a wide range of habitats for abundant and diverse aquatic wildlife. Native fish are a significant ecological component. They are viewed by the community as icons of stream health and life supporting capacity and are a good indicator of the state of aquatic biodiversity.

2. WHAT'S HAPPENING?

Key Points:

- Only 23% of the original forest cover remains today, a third of which is in private ownership.
- Only 2% of the original lowland wetland-forest area remains today.
- Voluntary protection measures continue but remain small relative to the area under pressure.
- Reduced control of possum populations due to a decline in bovine Tb is expected to increase pressure on native forest ecosystems.
- Overall native fish communities in rivers and wetlands are in a poor state, however some excellent populations remain in some headwaters and coastal streams.

2.1 EXTENT OF NATIVE ECOSYSTEMS

Overall, the region has retained 23% of its original native forest cover, a third of which is privately owned lowland and hill country forest, much of it highly fragmented and under threat from animal and plant pests. The distribution of native forest cover is shown in Map 6-1.

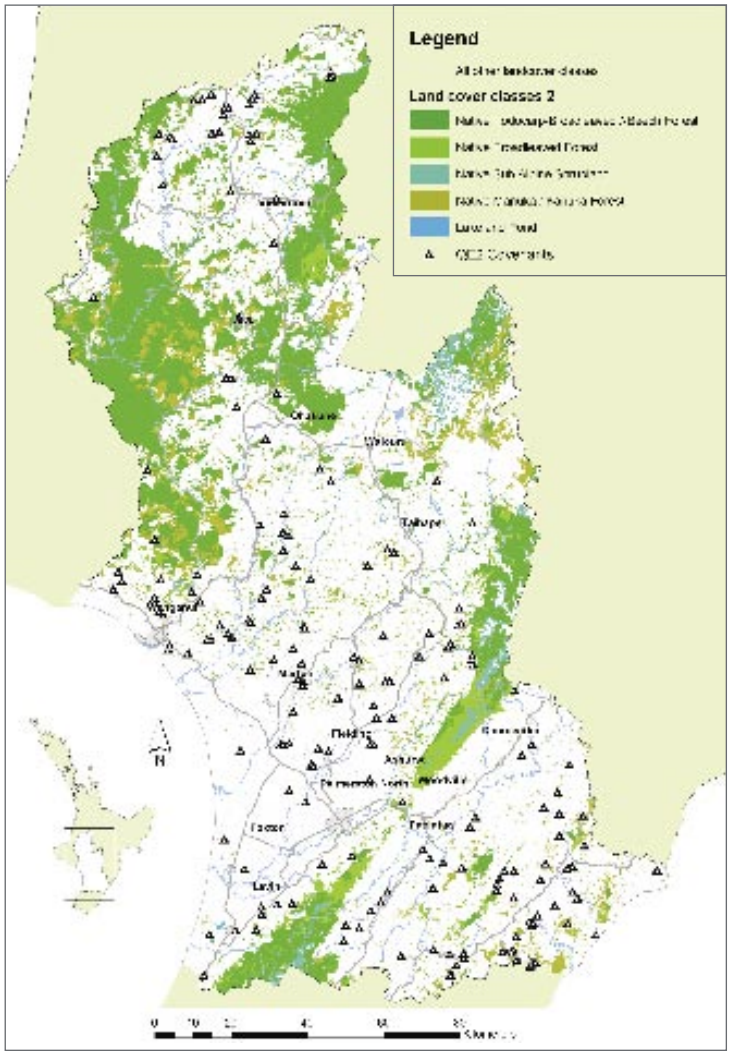
Only the Tararua and Ruahine mountain forests retain more than 70% of the original native forest cover, while the volcanic plateau, the Kaimanawa, Kaweka and Hauhungaroa ranges and the weathered Wanganui hill country, have lost over half of their original forest cover.

Other native ecosystems (particularly in lowland and hill country) exist as under-represented and threatened remnants and therefore have a high conservation value to the region. Wetlands are under the greatest threat: only 2% of the original lowland wetland area in the region remains today.

2.2 QUEEN ELIZABETH II NATIONAL TRUST

Within the region, the Queen Elizabeth II National Trust protects by legal covenant agreements 4,284 ha of native bush and wetlands. Map 6-1 shows the distribution of covenants. Over 330 km of fences exclude stock from these covenants. Sites range from 0.4 to 276 ha, with a mean size of 20 ha. Of the 212 covenant sites, 173 were registered from 1982 to 1999 and the remaining 39 sites from 2000 to 2004. Over 30 sites have registrations pending.

Mudfish (photo courtesy of Stephen Moore)



MAP 6-1: Distribution of native vegetation and Queen Elizabeth II National Trust (QE2) covenants within the region as at 2004 (from LCDB2).

2.3 ANIMAL PESTS

Predators threaten native chicks, eggs, and nesting birds. Kokako and hihi have now completely disappeared from the region apart from predator-controlled reserves, while many other native forest birds remain at risk. Kiwi populations are declining by 5% per year.

Intensive predator control is carried out in only a few reserves and mainland islands, mainly:

- Raurimu and Rangataua to protect kiwi and bats
- Manganui o te Ao to protect blue duck.
- Paengaroa, where 100 ha are being controlled to protect sensitive divaricating plants and robins.
- Bushy Park, where 110 ha are being controlled to protect kiwi and other birds.
- Mt. Bruce, where 600 ha are being controlled to protect kaka and enable kokako release.

Integrated animal pest control (predator, possum and rat) is considered necessary at regular intervals at significant native biodiversity sites.

Canopy collapse from intense possum browsing has irreversibly altered tens of thousands of hectares of Rata-Kamahi and Mountain Cedar forest in the region, particularly in the Ruahine ranges. Where possums are not controlled, possum browsing activity will ultimately devastate indigenous forest structure.

Possum control currently covers about 45% of the native forest within the region (Table 6-1).

2.4 PLANT PESTS

As landowners take a greater interest in protecting and enhancing stands of native bush, Horizons is being increasingly called upon to provide advice on the control of environmental plant pests.

Some plant pests can expand following animal pest control operations or removal of grazing pressure (for example Banana passionfruit following possum control), highlighting the need for integrated pest control.

Generally, good progress has been made in the areas of control plants, bio-control, education and information. However, a number of areas of concern remain:

- The number of known old man's beard sites continues to increase (in part due to increased surveillance).
- Several regional surveillance plant pests are more widespread than originally thought.
- Douglas fir seedlings are naturalizing in the tussock and herb fields on Mount Ruapehu.
- Where control is not well coordinated between neighbours there is a high probability for reinvasion of pest plants.

AGENCY AND CONTROL PROGRAMME	AREA (ha)	PERCENTAGE OF NATIVE FOREST IN THE REGION
Department of Conservation	110,000	14.7%
Animal Health Board, Bovine Tb Control	219,000	29.2%
Horizons, Regional Strategy	6,000	0.8%
Total	**335,000**	**44.7%**

TABLE 6-1: Coverage of possum control programmes within the region in 2004.

The area covered by Animal Health Board operations has reduced by 25% over the past two years and this trend will continue as Tb control targets are achieved.

2.5 NATIVE TIMBER HARVEST

The past four years have seen a significant increase in both area and volume harvested from original native stands (Table 6-2).

Three sustainable forest management plans were issued in the region allowing an annual harvest of 2,054 m^3 for 50 years from the Ruapehu, Manawatu and Stratford districts, covering a total forest area of 1227 ha. Seventy-two sustainable management permits (issued for 10 years) apply to a total of 9289 ha and 86 personal use permits are operational for a 10-year period and a total timber volume of 2,887 m^3.

Sustainable permits and plans cover 10,510 ha, more than twice the area under QEII covenants. Permit breaches are increasingly controlled and prosecuted by MAF.

2.6 NATIVE FISH COMMUNITIES

There are 29 species of freshwater fish found in the region. Of these, 20 are native to New Zealand (out of a total of 35 native species in New Zealand) and nine are introduced species. One species that was historically present, the New Zealand Grayling is now extinct.

2.6.1 Extent of Fish Communities

Horizons investigated the presence of an endangered species, the brown mudfish, in 25 priority wetland sites across the region in 2004. This fish is classified in the same category as the Great Spotted Kiwi by the Department of Conservation. Three new mudfish populations were discovered which although encouraging has to be tempered by the fact that mudfish were not found in most of the surveyed wetland sites.

Native fish communities across the region's rivers were assessed at 230 river sites during the summers of the 1999-2000 and 2000-2001. Map 6-2 summarises the state of native fish communities by catchment.

Overall, native fish communities in our rivers are fairly degraded. This is particularly the case for Whangaehu, Turakina and, to a lesser extent, Rangitikei and lower Whanganui catchments. However, some excellent native fish communities have been identified, particularly in many tributaries of the Manawatu River, where some populations of the rare short jaw kokopu live. The Ohau River, and some small coastal catchments like Wainui Stream in the East Coast and Mowhanau Stream near Wanganui, also contain excellent native fish communities.

DISTRICT	ANNUAL VOLUME (m^3)			AREA (ha)		
	1998	2004	% change	1998	2004	% change
Ruapehu	1256	1256	36	1876	5208	178
Stratford	150	815	443	1043	849	-19
Wanganui	33	172	421	208	754	263
Rangitikei	32	0	-100	0	0	
Tararua	19	77	305	120	397	231
Manawatu	7	951	13486	0	532	
Unknown	75	844	1025	20	2777	13785
Total	**1240**	**4114**	**232**	**3267**	**10517**	**222**

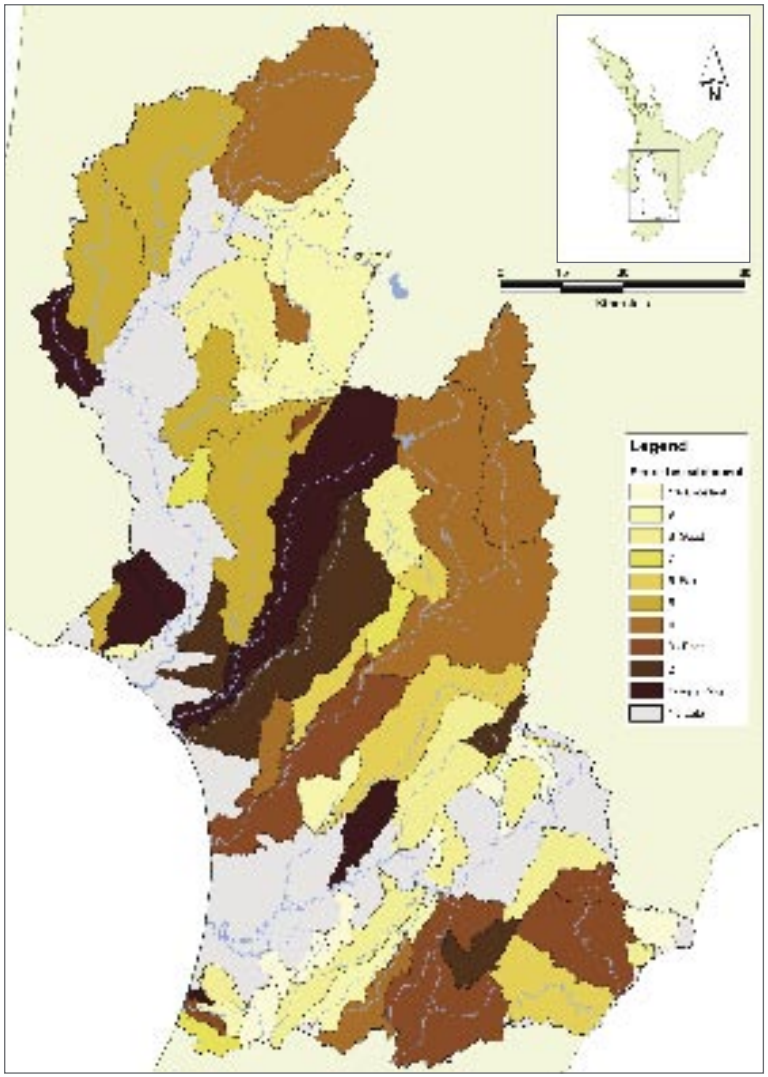
TABLE 6-2: Area and volume harvest from original native stands for 1998 and 2004 by district.

2.6.2 Threats to Fish Communities

Threats to native aquatic biodiversity are similar to those found on land – habitat loss or degradation and animal and plant pests such as:

- The loss and degradation of coastal wetlands impacts on fish populations as many species rely on wetlands for part, or all of their life cycle, particularly for spawning.
- Most native fish are migratory species, spending part of their life at sea, then returning to rivers and lakes. Artificial barriers to fish migration, like perched culverts, result in habitat loss for species unable to overcome these obstacles.
- Riparian vegetation clearance and realignment of streams dramatically reduce habitat diversity and natural obstacles (logs, boulders) that normally provide food and shelter to the aquatic communities.
- Native fish have evolved without highly mobile predators. Perch, trout and other introduced fish can impact very heavily on native fish populations.
- Introduced aquatic weeds also threaten native aquatic communities. Many coastal areas are infested with weeds such as hornwort, Lagarosiphon and Egeria. These weeds can infest an area from only a small plant fragment.

Koaro (photo courtesy of Mike Joy)



MAP 6-2: State of native fish communities in the region by catchment.

3. WHAT IS HORIZONS DOING?

Horizons has recently completed a biodiversity inventory project that identifies prioritised wetlands for each district within the region. Information obtained from this project on threats to ecological wetland condition is being used to develop restoration plans.

In 2003-04, five wetland restoration projects were completed. Four additional prioritised wetland restoration projects have started this year, and five further projects are planned.

Horizons funded plantings of native species in 2003-04 for conservation or amenity purposes at 30 sites totalling 18 ha.

A report examining the impact of declining possum control operations on native biodiversity will be completed.

Fish communities are in a fairly degraded state, but there is hope for long-term improvement as some excellent populations remain and further surveys of lowland stream fish communities are planned.

These "biodiversity inventories" help identify key native ecosystem processes and linkages among native habitats, allowing restoration activities to be effectively targeted.

Publications such as the "Bush Vitality, A Visual Assessment Kit" (2004), "Issues and Options report for the Manawatu District's State of the Environment report" (2002) and the "Kahikatea Floodplain ecosystem report" (2002) provide useful background information to assist planning for restoration activities.

4. FURTHER INFORMATION

Janssen HJ, 2004. Bush Vitality: A visual assessment kit. Managing the seasons for the years. Horizons and Greater Wellington Regional Councils pp. 184.

Janssen HJ 2002. Native Biodiversity Information. Issues and Options report for the Manawatu District. Horizons Regional Council Report No: 2002\EXT\532.

Janssen HJ 2002. Ecological Assessment of a Forest Remnant within the Kahikatea Floodplain Ecosystem. Cloverlea Palmerston North. Horizons Regional Council Report No: 2002/EXT/507.

Joy MK, Death RG. 2002. Predictive modelling of freshwater fish as a biomonitoring tool in New Zealand. Freshwater Biology 47:2261-2275.

Leathwick J, Morgan F, Wilson G, Rutledge D, McLeod M, Johnston K, 2002. Land Environments of New Zealand. Technical Guide. Ministry for the Environment. Pp 237.

Meurk C, 1998. Natural Significance and Implementing Nature Conservation under the RMA. Decision support model to judge acceptable levels of biodiversity loss.
Landcare Research Lincoln.

Norton D, Roper-Lindsay J 1999. Criteria for Assessing Ecological Significance under Section 6c of the Resource Management Act 1991. A discussion paper prepared for The Ministry for the Environment. Pp58.

Parliamentary Commissioner for the Environment, 2001. Weaving resilience into our working lands: future roles for native plants on private land. P. 89. www.pce.govt.nz.

Taylor R, Smith I. 1997. The State of New Zealand's Environment. Wellington: The Ministry for the Environment.

Good air quality benefits the health of communities and adds to the visual and aesthetic value of a locality. Poor air quality on the other hand affects human health (e.g. increased mortality, hospital admissions and emergency department visits, school absences, lost work days and restricted activity), and detracts from aesthetic quality of life (e.g. odours and visual pollution from outdoor burning).

1. ISSUES

The main causes for poor air quality in the region are emissions from combustible processes including the burning of fuels for domestic heating and motor vehicles in the urban environment. Fine airborne particles less than 10 microns in diameter (PM_{10}) are of most concern as they can be drawn into the lungs causing respiratory problems and resulting in impacts on health.

Studies in the United States have attributed a one percent increase in mortality with every 10 $\mu g/m^3$ increase in PM_{10}. In New Zealand, an estimated 40 to 70 deaths per year could be attributed to elevated PM_{10} concentrations in Christchurch (Wilton, 1999).

2. WHAT'S HAPPENING

Key Points:

- Over 2001-2003, only Taumarunui and Taihape exceeded national guidelines for PM_{10} concentrations in winter.
- Transport is a major contributor to CO, SO_2 and NOx, emissions, while domestic home heating is a major contributor to PM_{10} levels.
- The number of current discharge to air permits is low for the size of the region.

2.1 MONITORING 2001-2003

Over a three-year period Horizons carried out a winter (12-week) PM_{10} monitoring programme covering 11 towns in the region. The results are shown in Table 7-1. Note the mean weekly concentration results shown are not directly comparable to the NZ guideline (50µg/m^3) but they are a good indication of potential occurrence of PM_{10} excedence.

The monitoring results across the region showed that only Taumarunui and Taihape exceeded the national guidelines for PM_{10}. Concentrations of PM_{10} recorded at Ohakune, Feilding and Pahiatua potentially exceeding the 24-hour standards. Therefore, air quality was a health risk to susceptible local residents for a few days during cold winters.

Winter air quality in Wanganui, Palmerston North, Levin, Marton and Ashhurst were all well under the guideline concentrations and posed no environmental risk to public health.

2.2 AIR EMISSIONS INVENTORY (2004 UPDATE)

This year Horizons commissioned an air emissions inventory for the region (Sinclair Knight Merz, 2004) to update the 1998 inventory. The 2004 update confirmed that transport continues to be a major contributor to total emissions of CO, SO_2 and NO_x in the region. Area sources, in particular domestic home heating, are the main contributor to PM_{10}. Natural sources of PM_{10} were not estimated.

The key change since 1998 is that there has been an increase in the number of vehicle-kilometres travelled and an increase in the number of domestic dwellings thus increasing the domestic emissions contribution. Total emissions from these sources are offset, to a degree, by changes in emission factors which reflect changing technology and fuels; for example, the contribution of NOx from the transport sector has decreased.

2.3 RESOURCE CONSENTS

The total number of current discharge to air permits remains low (91) for the size of the region, but this is rising steadily; 33 permits were for landfills, 5 for wastewater treatment plants and 5 for aggregate handling or extraction.

Major industry is a minor contributor to regional emissions, other than for particulate (as confirmed by the Emissions Inventory).

LOCATION	PERIOD OF SAMPLING	MEAN WEEKLY PM_{10} CONCENTRATION (µg/m^3)	RANGE ON CONCENTRATION (µg/m^3)
Taumaranui (Taupo Road)	June - July 2001	59	49 - 77
Taumaranui (MAF)	June - July 2001	40	29 - 54
Taihape	June - July 2001	58	39 - 75
Wanganui	August - Sept 2001	14	6 - 18
Levin	August- Sept 2001	11	8 - 17
Palmerton North	August - Sept 2001	9	3 - 14
Ashhurst	June - August 2002	12	5 - 17
Dannevirke	June - August 2002	7	13 - 23
Ohakune	June - August 2002	17	13 - 28
Marton	June - August 2003	14	8 - 20
Feilding	June - August 2003	15	7 - 30
Pahiatua	June - August 2003	20	4 - 35

TABLE 7-1: Comparison of Horizons Winter PM_{10} Monitoring Data

2.4 COMPLAINTS - OUTDOOR BURNING AND ODOUR

The number of air discharge complaints has steadily declined since a couple of major offenders have cleaned up their operations. However, air discharge complaints make up the highest percentage of complaints to the Pollution Hotline, with odour complaints being the most common air discharge complaint.

Incidents of burning household rubbish, farm rubbish and green waste causing nuisance to neighbours, is on the increase throughout the region.

2.5 NATIONAL ENVIRONMENTAL STANDARDS FOR AIR QUALITY

In October 2004 the Resource Management (National Environmental Standards Relating to Certain Air Pollutants, Dioxins and Other Toxics) Regulations 2004 for ambient air quality came into force. They are aimed at improving ambient air quality and controlling landfill gas emissions and cover:

- Dioxins and toxics - banning certain activities that emit hazardous pollutants to air, e.g. open burning of tyres.
- Ambient (outdoor) air quality - PM_{10} , sulphur dioxide, carbon monoxide, nitrogen dioxide and ozone.
- Design of new home wood burners in urban areas to minimise harmful emissions to air.
- Landfills (over one million tonnes) to collect and destroy landfill gas to help reduce greenhouse gases.

3. WHAT IS HORIZONS DOING?

Overall, the air quality in the region is high i.e. people are able to see long distances on clear days, almost all of the time. However, air quality in Taumarunui and Taihape is compromised during cold, still winter nights, as may be the air quality in Ohakune, Feilding and Pahiatua.

Horizons will be reviewing the monitoring programme to reflect new requirements in line with the National Environmental Standards. Horizons will also be releasing educational material to reinforce the requirements under the recently implemented National Environmental Standard for Air Quality and are in the process of developing protocols with the region's district and city councils to better manage outdoor burning incidents.

4. FURTHER INFORMATION

Wilton, E.V. 1999. Update: The health effects of suspended particulate. Canterbury Regional Council Technical Report U99(51). 21 pp.

Ministry for the Environment. 2002. Ambient air quality guidelines. 2002 update. Air Quality Report No 32. 58 pp.

Sinclair Knight Merz. 2004. Horizons Regional Council air emission inventory 2004 update. Sinclair Knight Merz Client Report. 26 pp.

The region has a total of approximately 160km of coastline - 120km on the west coast (from Wainui to Waikawa Beach) and 40km on east coast (from Cape Turnagain south to the Owahanga River mouth). The west coast of the region includes narrow sandy beaches backed by up to 50m high cliffs to the north of Mowhanau township and sandy beaches backed by a dynamic dune system extending to Manakau to the south.

1. ISSUES

The east coast is characterised by wave-swept rocky platforms backed by a cobbled or sandy beach dotted with boulders. The sand country suite (some 79,000 ha) comprises 3.6% of the region's landforms.

The main issues and pressure for the coastal environment are:

- Modification of coastal processes due to human activities including inappropriate subdivision, land use intensification (forestry and dairying) and recreational activities (motor vehicle usage on the beach and in the dune system).
- This increase in activity is putting pressure on coastal water resources resulting in the degradation of coastal water quality (both surface and groundwater) and loss of biodiversity (habitat and species diversity).
- Sand country erosion.
- Emerging issues including the potential development of aquaculture industry and the uncertainty of future seabed ownership and foreshore access.

2. WHAT'S HAPPENING?

Key Points:

- Overall the region's coastal environment is in good health, largely due to lack of development. However, pressure is increasing in localised areas as a result of property development and dairy expansion.
- Mowhanau Stream next to Kai Iwi beach has a very poor interim grading for recreation with consistently high bacterial levels.
- Support of beach care groups is continuing.

2.1 COASTAL RESOURCE CONSENTS

Over the last few years there has been an increasing demand for the development of the sand country areas for forestry, intensive dairying, lifestyle / hobby farms and beach homes with ocean views. Beach properties in small coastal settlements north of Wellington and in the northern part of the region have been fetching premium prices.

The number of coastal permits since the last State of the Environment Report in 1999 has increased from 26 to 46. The majority of the consents granted are for the laying of telecommunication cables, oil exploration activities, management of port activities (Wanganui), weed control (Manawatu estuary), stream works and for the discharges of stormwater and treated municipal waste. Only five permits are for structures in the coastal area.

2.2 SUB-DIVISION

District councils processed sub-division applications resulting in the creation of 187 lots. On the west coast, 79 lots were processed by Wanganui District Council and 88 lots were processed by Horowhenua District Council. On the east coast Tararua District Council processed 20 lots.

2.3 RECREATIONAL BATHING BEACH GRADINGS

Six high use coastal swimming have been graded on an interim basis for suitability for recreation (Table 8-1) based on Ministry for the Environment guidelines (2002). Waiterere Beach has the best grading where no samples exceeded the guidelines. Kai Iwi, Castlecliff, Himatangi and Foxton Beaches were graded lower, although the beach with the lowest grading was still suitable for swimming over 80% of the time.

The biggest risk to water quality at all beaches is the adverse effect of rivers discharging sediment and bacteria into the sea after rainfall events. In general terms, this work has confirmed the "rule of thumb" advice to wait a few days after heavy rain before swimming.

Three waterways next to popular beaches were also identified as "high use" because they are used as a safe area for children to play in. There is not enough data to grade these, except for the Mowhanau Stream that has the lowest interim grading of very poor. None of the bacteria tests met the swimming standard at this popular Wanganui site and further investigation to determine the source of the bacteria is underway.

SITE	SUITABILITY FOR RECREATION GRADE	PERCENTAGE OF SUITABLE SAMPLES
Akitio Beach	*	*
Akitio River	*	*
Castlecliff Beach	Fair	95
Kai Iwi Beach	Poor	82
Mowhanau Stream	Very Poor	0
Himatangi Beach	Poor	87
Foxton Beach	Poor	87
Waitarere Beach	Good	100
Wairarawa Stream	*	*

TABLE 8-1: interim suitability for recreation gradings for high use coastal bathing sites in the region

3. WHAT IS HORIZONS DOING?

Horizons has responded to these increasing pressures on the coast by:

- IMPOSING REGIONAL RULES THROUGH THE RESOURCE CONSENT PROCESS.

  The total number of current coastal permits remains low reflecting the relatively low demands placed on the coastal marine area. Only four coastal permits were granted in 2003-04. Illegal dumping of household rubbish and car bodies appears to be on the increase along our western coastline, as does the number of complaints of cars on the beach and dunes. Protocols are being developed with local authorities to expedite removal.

- DUNE SHAPING AND STABILISATION WORKS

  A small number of new dune stabilisation and reshaping works continue to be undertaken by Horizons. A number of sand binding species are used to stabilise the dunes, although the Department of Conservation is increasingly concerned about the use of introduced species over native species in planting programmes. The works were completed in conjunction with territorial authorities, private landowners, and beach care groups.

- SUPPORT COASTAL CARE GROUPS

  Beach care groups made up of local residents and other interested parties in several coastal communities were supported with advice and information. Such groups are actively involved in dune stabilisation planting projects, keeping the beaches clear of rubbish and vigilance with vehicles damaging dunes and beach habitat.

- COASTAL PROFILE MONITORING

  Twenty-seven coastal profiles, located along the western coastline between Kai Iwi and Kuku Beach, are re-surveyed at 10-year intervals. An upgraded network of benchmarks has recently been established for incorporation into the new cross-section survey scheduled for next financial year.

4. SUMMARY

In general the region's coastal environment is in good health, which is largely attributed to its mostly undeveloped nature. However, pressure is increasing in localised areas as a result of property development and dairy expansion. This development has lead to a host of associated pressures on the coast such as a detrimental impact on water resources (quantity and quality), added vehicular traffic on the beach, unsightly rubbish dump sites and the loss of aesthetic value. While this scenario is not widespread at present, long-term it will pose a threat to the coastal environment if it progresses unchecked. The formation of beach care groups reflects the community's interest and desire to be involved in protecting the coastal environment.

Mowhanau Stream has been assessed as having a very poor suitability for recreation grading.

At a national level the issue of coast and seabed ownership has significant implications for the region in terms of community access and for emerging industries such as aquaculture.

5. FURTHER INFORMATION

Ministry for the Environment. 2002. Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas.

Waste is basically anything we don't want or don't value and then discard - it may be a liquid, solid or gas. Waste is included in this report as an overall indicator of pressure on the region's natural resources. Direct pollution impacts on specific natural resources are covered in other chapters (e.g. sewage discharge to water, discharge to air).

1. ISSUES

Territorial Authorities (TAs) are responsible for providing waste management services including refuse collections, landfills and sewerage systems. Horizons is responsible for managing the effects of discharges of wastes to air, land and water through regional plans. Both Horizons and the TAs have responsibilities for hazardous wastes.

Communities need to start managing waste better, first by reducing, re-using and recycling where possible. If this is not possible, then disposal and treatment methods need to be safe and managed appropriately.

Key issues facing the region include:

- The number of landfills in the region is declining but rubbish is still thrown out at a rate of 500 kg per person per year.
- Information to assist individuals and companies to reduce waste is sparse, and options for waste disposal and opportunities for waste minimisation vary between District and City Councils.
- There is no regionally consistent approach to the collection of agrichemicals and the registration of contaminated sites.
- Burning of waste and illegal dumping continues
- The location and management of cleanfills[1] is largely unknown.
- National issues, such as disposal of bailage wrap and agrichemical containers.

[1] Cleanfill is a term used to describe a "landfill" that only accepts wastes that do not cause environmental problems. Wastes that go into a cleanfill should not be toxic or hazardous or combustible and not decay and breakdown. Examples of cleanfill wastes are clean soil, bricks and concrete (with no reinforcing).

2. WHAT'S HAPPENING?

- If no new landfills are developed in the region there will be a reduction from 11 municipal landfills (2001) to only 4 landfills (late 2010). The landfill life remaining in the region is estimated to be 22 years.
- On average each person in the region generates 500 kg solid waste each year. That's a total of 113,000 tonnes per year, equivalent to more than 18,000 commuter-sized buses.
- There are 41 municipal sewage treatment plants or sewage pond sites in the region, most of which discharge to water.

- There are 53 industrial discharge-to-air permits (out of a total of 91).
- There are 90 industrial/trade sites that have consents to discharge a variety of wastes to water or land.
- There are over 1000 consents for the discharge of agricultural wastes to land or water (for example, dairy and piggery effluent).

3. WHAT IS HORIZONS DOING?

REGULATION

Horizons manages the effects of waste on the environment through regional plans and rules. For example, landfills and sewage treatment plants require consents, as do industrial and agricultural discharges. This process allows Horizons to ensure that the effects on the environment are avoided or minimised.

FACILITATION

Following the launch of the New Zealand Waste Strategy, Horizons helped establish the Regional Territorial Authority Waste Forum in November 2003. Members include all the region's TAs and Horizons. Horizons role is as a coordinator/facilitator for regional waste issues. A list of generic regional waste issues has been developed and a priority list produced. Implementation of initiatives so far includes the Stock Take on Waste, Waste Awareness Forum Series, and the Hazwheel reprint.

EDUCATION

- Horizons coordinated the regional input to the National Reduce Rubbish Campaign, April - August 2003.
- In August 2004 Horizons and the region's TAs launched the Hazwheel, an information brochure on the safe disposal of household hazardous substances.
- Horizons and the region's TAs jointly funded the first of a series of Waste Awareness fora. The Hazardous Waste Forum was held in August 2004. It provided best practice education to the general public, interest groups and territorial authority staff with regard to the collection and disposal of hazardous wastes, such as agrichemicals and household hazardous substances.

GATHERING INFORMATION

A "Stock Take on Waste" report was completed in October 2004. This report collates region wide information on waste and waste minimisation – a first for the region. It is a resource that will aid in future regional planning and the progress of initiatives through the Regional Territorial Authority Waste Forum.

IN-HOUSE PRACTICES

Horizons undertakes the following activities to reduce waste at work:
- recycling paper, cardboard, plastic, ink cartridges

- The Horizons website includes a section on waste and continues to be updated. Information available includes:
- recycling and disposal facilities in each district
- waste minimisation tips (at work, environmentally friendly shopping, recycling, and composting)
- the Hazwheel
- Stock Take on Waste report

- recycling scrap metal
- printing double sided
- composting scraps from the cafeteria
- using more efficient lighting.

4. FURTHER INFORMATION

Further information and related links on waste are available from the Horizons website: www.horizons.govt.nz

TEN | NATURAL HAZARDS

Natural hazards in the form of floods, storms, earthquakes, landslides and volcanic activity are an inevitable consequence of New Zealand's geological setting along an active tectonic plate boundary, steep and unstable landforms, and weather systems of the surrounding oceans.

1. ISSUES

As the frequency and magnitude of these hazards are (mostly) beyond human control, the main issue is how best the impact of these events on the regional community can be managed.

Foremost in the community's mind is the February 2004 storm event that caused region-wide erosion and flooding, and the ongoing recovery that will span many years. The damage caused to the region has been well documented in the publication "Storm".

2. WHAT'S HAPPENING?

2.1 NATURAL HAZARD EVENTS

A total of 1,611 claims to the Earthquake Commission were made between 1 July 1999 and 30 June 2004 for floods and storms, earthquakes, landslides, totalling approximately $3,084,000 in payments (Table 10-1). The majority of these claims were for earthquakes; claims from earthquakes were scattered throughout the region (Map 10-1). A breakdown of claims by district is given in the technical report. There has been no significant volcanic activity since 1996.

[1] Contact Horizons Regional Council Asset Management Engineer (0508 446 749) for copies of Scheme Asset Management Plans.

2.2 PREVENTION AND READINESS

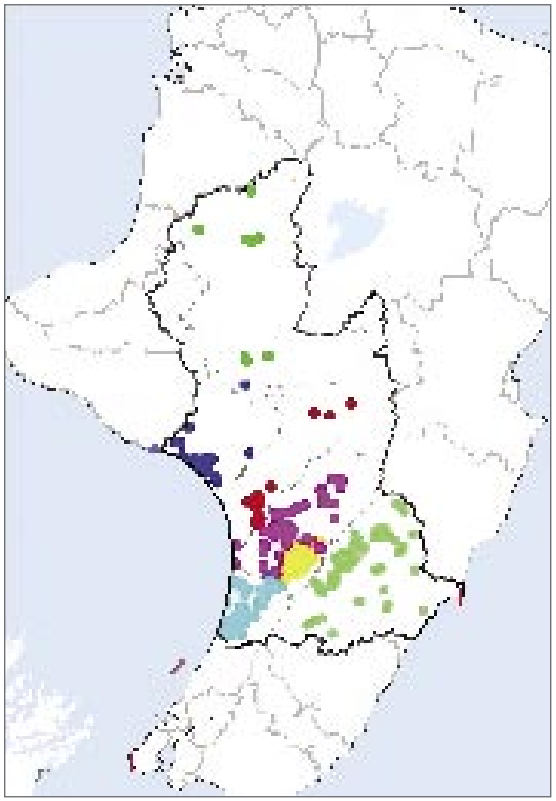
An advance warning system for rainfall and/or river level is in place for the Manawatu, Rangitikei, Whanganui, Whangaehu and Turakina Rivers. The system uses a network of automatic monitoring sites that allows accurate prediction of river levels hours in advance (Map 10-2). On-site measurements are transmitted to Horizons and registered landowners are automatically alerted by telephone when the river reaches a trigger level.

Flood protection (via stopbanking, spillways, detention dams and other works) is a major component of Horizons river and drainage schemes that are established under the Soil Conservation and Rivers Control Act 1941, parts of the Land Drainage Act 1908 and the Local Government Act 1974. The schemes are described broadly in the publication "River and Drainage Schemes of the Region" (Horizons Regional Council, 2000), and in detail in the Asset Management Plans[1] for each scheme. Approximate zones covered by the schemes are shown in Map 10-3.

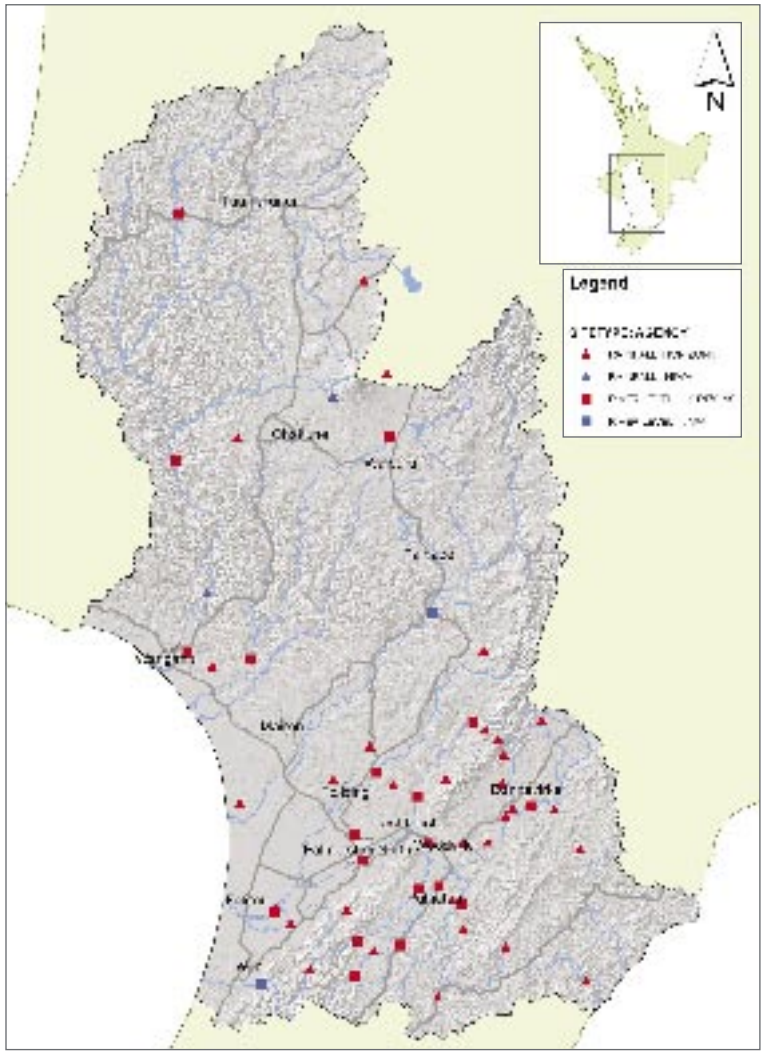
HAZARDS	NO. OF CLAIMS	PAYMENTS ('000 $)
Floods & storms	548	1,585
Earthquakes	982	1,233
Landslides	81	266
Total	**1611**	**3,084**

TABLE 10-1: Number of natural disaster claims made to the Earthquake Commission and payments between 1999 and 2004 in the region.

[1] Contact Horizons Regional Council Asset Management Engineer (0508 446 749) for copies of Scheme Asset Management Plans.



MAP 10-1: Location of earthquake claims in the region between 1 July 1999 and 30 June 2004 (colours represent different Territorial Authorities). Data from Earthquake Commission.



MAP 10-2: Location of telemetry network for advance warning for flooding in the region.

MAP 10-3: Approximate zones for river and drainage schemes in the region.

3. WHAT IS HORIZONS DOING?

Horizons is the administering authority for the Manawatu-Wanganui CDEMG, a consortium of all seven territorial local authorities within the region, Horizons, police, fire, ambulance and defence forces. The CDEMG members work together to take steps to reduce the risk from all hazards as well as respond to, or undertake recover activities from, any event.

A Hazard Analysis Manual series was completed in 1999, covering volcanic, earthquake and flooding hazard assessments for the region. This information complements the Manawatu - Wanganui CDEMG plan, the first Group Plan approved and implemented in New Zealand.

Horizons, police, and the Ministry of Civil Defence Emergency Management have assisted Ruapehu District Council prepare a response plan for lahar flows from the Mt. Ruapehu Crater Lake. Horizons is also enhancing river height warning systems near Tangiwai and installing a web camera to assist residents and responders during the event.

Horizons will also be developing flood-forecasting models for the Manawatu, Rangitikei, Whangaehu and Turakina catchments. These models will predict what level of rainfall will cause flooding and which areas will be most affected. Advanced warning can then be given to land users downstream. New water recording sites on the Turakina, Whangaehu and Mangawhero Rivers will be installed and running by mid next year and the flood forecasting models will be completed within the next five years.

Other work in progress includes the Lifelines Project (impact assessment of natural hazards on civil, transport and communications infrastructure), and a study assessing the risks that meteorological hazards pose to the region and the potential changes to those hazards due to climate change.

4. FURTHER INFORMATION

Horizons Regional Council. 2004. Storm. Civil emergency – storm and flood report. Report No: 2004/EXT/591. 50p.

Horizons Regional Council. 2000. River and drainage schemes of the region. Report No: 2000/EXT/409. 30 p.

Horizons Regional Council. 1999. Hazard Analysis Manual. Volumes I -III. Report Nos: 1999/EXT/373, 1999/EXT/383, 1999/EXT/374.

Earthquake Commission

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Phone: (+64 4) 499 0045

www.eqc.govt.nz

Manawatu-Wanganui Region Civil Defence Emergency Management Group

Email the Manager of the CDEMG Office, at emo@horizons.govt.nz or ask your local council for more information.

The Horizons website also contains information on the Mt. Ruapehu Lahar and river level and rainfall: www.horizons.govt.nz

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