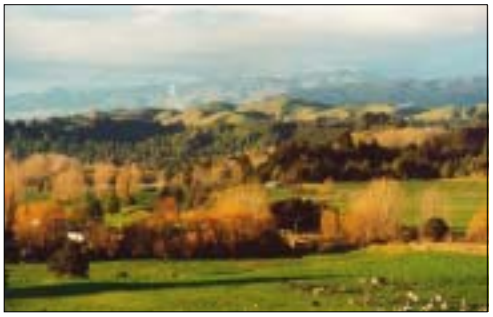
CONTENTS

Manawatu District Council

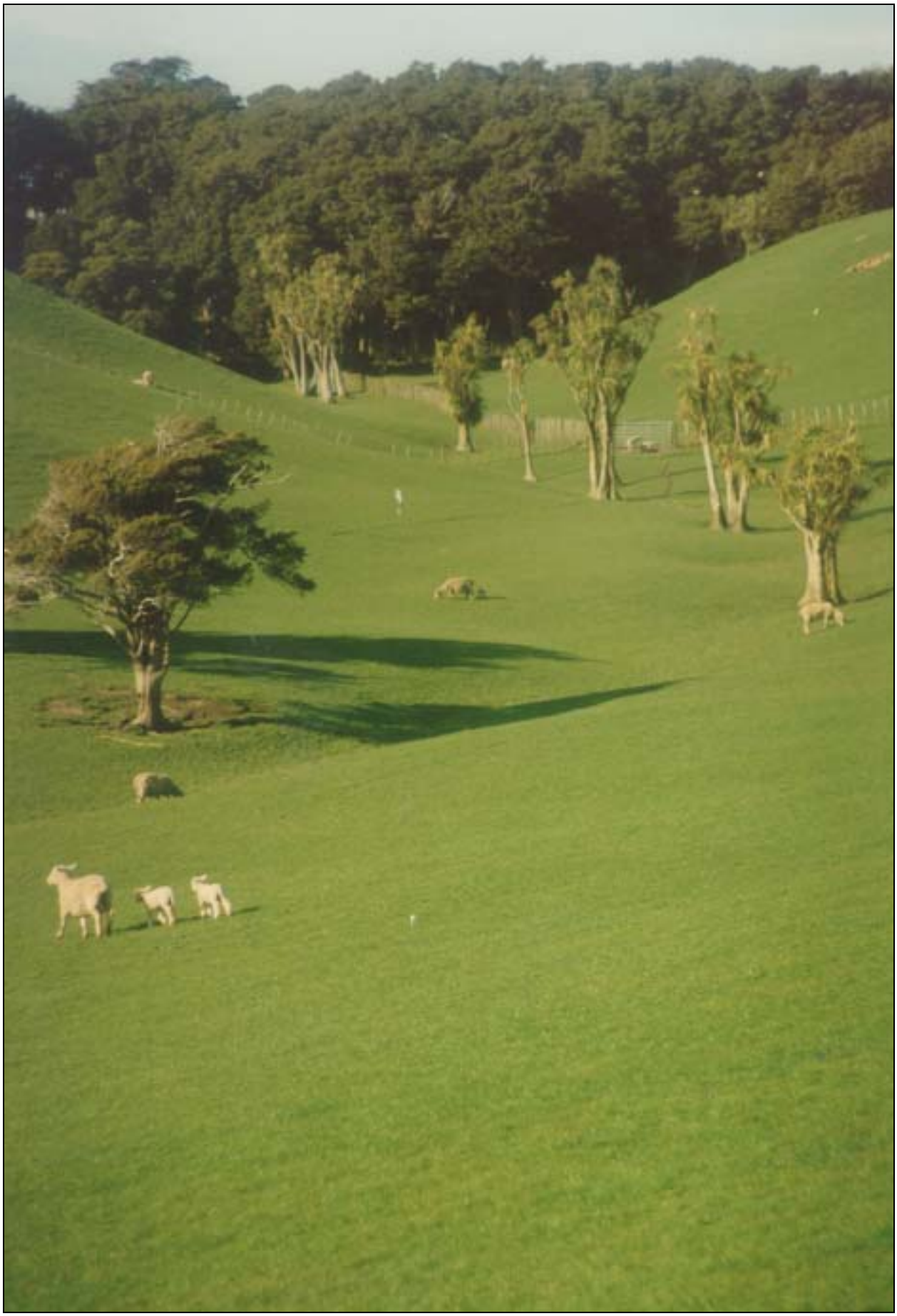
"State of the Environment" Report

for the Manawatu District

OCTOBER 2002



CONTENTS



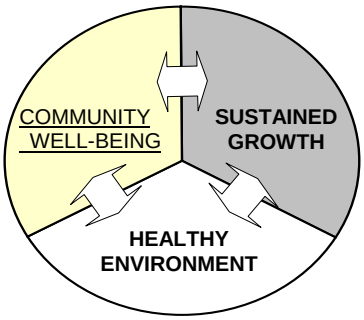
1. PURPOSE OF THIS REPORT

This document can be thought of as a “report card” on the state of the Manawatu District’s natural and built environment. It shows what subjects our environment would get a pass mark in, and where it “needs improvement”. It looks at the trends, and at some of the projects underway to improve the environment locally. In doing so, it shows whether the Council’s District Plan, (the community’s document for managing the use and subdivision of land), is achieving what it sets out to do.

The Council’s strategic plan outlines a community vision focused on three aims:

- Maintaining and developing a healthy environment,
- Protecting the well-being of the community and
- Maintaining growth in the district’s economy.

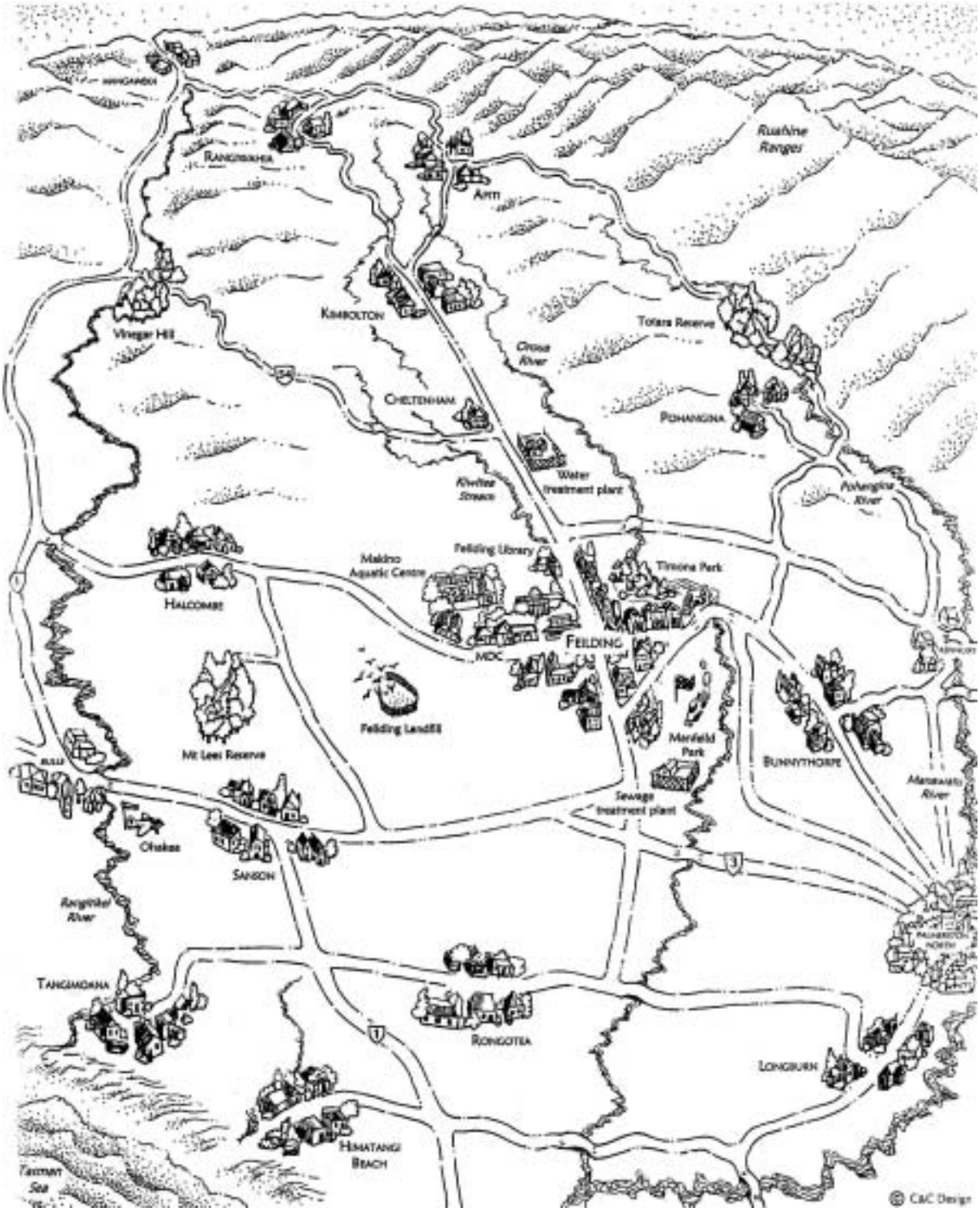
These aims are a bit like a three-legged stool. If any one of them is not strong enough, the other two will also fall over.



This report only looks at the environment “leg”. Economic and social trends will be the subject of other reports.

Much of the information in this report has been collected for the first time. Follow-up reports in five and 10 years’ time will cover the same subject matter and will, therefore, allow us to track changes and assess where progress has been made.

This report is a summary, and is based on a lot of detailed data. If you would like to find out more about the topics in the report, extra detail may be available from Council’s Planning Department.



MANAWATU DISTRICT

2. SUMMARY

An Improved Environment

Overall the District's environment is in pretty good shape. Important parts of the environment, such as surface water quality, have improved significantly over the past few decades. There are still environmental problems which need resolving, such as waste management, but progress is being made on most of these issues. Perhaps the biggest challenge is to restore the viability of the District's natural heritage and ecosystems.

The current state of the various parts of the District's environment can be summarised as follows:

Land Resource

- Progress has been made in erosion control, but it is still a big potential problem.
- We do not have enough information about the overall health of the District's soils, but it seems that they are being degraded in some places.
- The effects of subdivision upon land use options are being minimised by new subdivision rules

Indigenous Vegetation and Habitats

- The District has its share of endangered species, and the outlook for them is not rosy.
- Most of the District's original vegetation cover and habitat has been lost, especially the wetlands and lowland forest.
- Much of what remains is not viable habitat, but restoring it and making it viable is an achievable long-term goal.

Coastal Environment

- The ocean is generally in good condition, but the water at our beaches is sometimes unsafe for swimming.
- Some unique plant communities in the sand dunes and coastal wetlands are under pressure from weeds, dune stabilisation works, drainage and forestry.
- There is little pressure for coastal subdivision and development in the District.

Water resources

- Water quality in rivers and streams is much better than 50 years ago, but is still unsafe for swimming in some places.
- Water extraction from the Oroua River is at its limit.
- Parts of some rivers do not provide good habitat for aquatic life as a result of high water temperatures and pollution.
- Groundwater is free from pollution, but groundwater levels are falling in a few places due to extraction from bores.
- There is little information on lake water quality.

Public Access to Waterways and Bush Areas

- There is currently good access to the coast.
- The amount of public legal access up rivers and streams varies from river to river.
- The amount of legal access is growing slowly as a result of esplanade strips created at subdivision time.

Energy and Water Use

- Energy use per person is increasing. Manawatu depends largely upon energy "imported" from the rest of New Zealand and from overseas.
- Transport is a major energy user. Vehicle counts and commuting, especially between Feilding and Palmerston North, are both steadily increasing, as is car ownership.
- The amount of material being recycled is growing, but the waste stream still consists mostly of material which could be recycled. The amount of waste landfilled has decreased steadily in the last 10 years and positive steps are being taken toward a goal of zero waste to landfill.

- Feilding's urban water use has increased. There is no useful "benchmark" to tell us whether the town's use is too high or not.
- The amount of water earmarked for rural use is much larger than for urban use, and is growing steadily.

Air Quality

- The District's air quality is generally high, but with some local smoke and odour problems.
- Vehicles are the main source of pollution.
- Carbon dioxide and methane emissions have implications for "greenhouse gas" limits under the Kyoto Protocol.

Heritage Places

- There is not enough information about archaeological sites, rural historic buildings or memorials.
- There is little pressure for historic buildings to be removed or demolished.
- Earthquake strengthening is an important issue for historic buildings in the Feilding town centre.

Amenity Values

- The District has some outstanding landscapes, most of which are not threatened by inappropriate subdivision or development.
- The District is well provided for with parks and open spaces.
- Noise levels in Feilding seem to be increasing, as is traffic noise generally. The number of complaints about nuisance noise has grown.
- Unauthorised dumping, especially of car bodies, is a growing problem.

Safety

- Up to eight percent of the District is subject to flooding hazards.
- For many years zoning controls have limited the amount of building in flood prone areas. This will help to minimise future flood damage.
- Coastal development has also been restricted because of possible hazards.
- The only buildings considered potentially "earthquake-prone" are the older commercial buildings in central Feilding.
- Contaminated sites and hazardous substance storage and use pose a relatively small risk to people and the environment.

3. THE TANGATA WHENUA VIEW

E mihi ana ki nga mana whenua, ki nga wai tapu, nga maunga teitei o te Manawatu. Ki nga roimata kua horahia ki te pae o maumahara. Tenei tatau te tangi nei ki o tatau mate e takahia ana te ara wairua. Whakaoma atu nei koutou I te taheke roa. E moe, okioki koutou katoa. Huri noa ki a tatau te hunga ora, tena tatau katoa.

We acknowledge the rivers, mountains and respected peoples of the Manawatu. The tears still fall upon the land in remembrance of those who have passed on to the spirit world. Return to your rest in peace. To those who walk in their footsteps today, to the living, greetings to all.

The Holistic Nature of the World

In Maori culture, people do not see their existence to be separate from the natural world, but an integral part of it. All forms of life are related by Whakapapa (genealogy) and descended from a common source. The closeness of the Maori people to nature, and their dependence upon it, led to a holistic view of the environment that recognises the sacredness of other life forms and the landscape, and melds together science and religion in a store of shared imagery. The need to realise the interconnectedness and sacredness of living things is more important for our survival than it has ever been. While we cannot turn back the clock, we can learn a lot from those who were here before us.

This SOE report is divided into separate chapters, including water and air quality. This is convenient but somewhat artificial since all parts of the environment are intertwined. Likewise while this report is mainly about the physical environment, the Tangata Whenua consider environmental wellbeing to be inseparable from the cultural, spiritual, social and economic wellbeing of people.

Te Harakeke

Hutia te rito o te harakeke	If the centre shoot of the flax bush were plucked
Kei whea to komako e ko?	Where would the bellbird sing?
Ki mai ki a au	If you should ask me
He aha te mea nui o te ao	What is the greatest thing in this world?
Maku e ki atu	I should answer
He Tangata, he Tangata, he Tangata	'Tis People, 'tis People, 'tis people

The harakeke represents people in their environment in Aotearoa. The rito - the new shoot of the flax bush is the centre of life - the child - growing up in our society - Aotearoa, where communication and understanding of cultures is most important.

Kaitiakitanga and Environmental Management

For the Tangata Whenua, "state of the environment" issues are inseparable from the issue of who actually owns and manages the District's natural and cultural resources. Tangata Whenua are the traditional keepers and caretakers of knowledge relating to natural and cultural resources and the protectors of those resources. Whanau and hapu, and sometimes individuals, are charged with the task of Kaitiakitanga in respect of particular taonga (treasures). Taonga can be physical resources, such as rivers or groundwater, sites of cultural importance such as wahi tapu, or less tangible things, such as the institutions that are part of Maori culture.

Kaitiakitanga is a broad concept that includes the ideas of guardianship, care, and wise management. It is both an environmental decision making system, and the expression of Maori authority, mana, and ethics. It is bound up inextricably with issues of Tino Rangatiratanga (chieftainship) as it may only be practised by the people who possess Tino Rangatiratanga in a particular area.

The Resource Management Act requires councils to recognise and provide for "the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga", to take into account "the principles of the Treaty of Waitangi", and to "have particular regard to Kaitiakitanga".

Councils and Tangata Whenua both, therefore, have environmental responsibilities. The Council has to carry out its duties under the Act, while the Tangata Whenua must fulfil their much more long-standing obligations to the land and to their people as kaitiaki of the District's resources.

The Council and the Tangata Whenua need to work together to identify how an appropriate partnership in the management of the District's resources can be developed. The Marae Consultative Standing Committee, which was set up in August 1998, is a useful first step in starting dialogue on these issues. However, Maori currently feel that a lack of specialist skills and resources is a real barrier to their full participation as a partner in the resource management process.

4. LAND

Background

Much of the District has been lifted up from under the sea. The coastline two million years ago was from Raetihi to Waiouru. Half a million years ago the beachfront was near Apiti, and 100,000 years ago Ashhurst had a seaside location[1]. The District, therefore, is covered in a blanket of volcanic sediments from the Central North Island, washed down by rivers and deposited on the seabed. Beneath Feilding this blanket is about 2km thick.

The District has four distinct landform types, namely sand country, plains, hill country and the Ruahine Ranges.

1. The sand country is dealt with in more detail in Chapter 6. It comprises some of New Zealand's longest migrating sand dune systems.
2. On the Manawatu plains, huge areas of wetland were drained to produce very productive farmland. The Manawatu District has 5.5 percent of the nation's highest quality (Class 1) soils, which is half as much as the entire South Island.
3. Our hill country is geologically very young. Much of the ground is soft and inherently unstable. Erosion has always occurred, but has accelerated since the land's vegetation cover was removed.
4. The Ruahine ranges have been lifted up along fault lines. They consist of hard greywacke rock that is the source of the District's gravel resource. The ranges have an extreme climate. Most of the mountain land is within the Ruahine Forest Park and is managed by the Department of Conservation.

For Maori, the land and its covering soils are a fundamental resource as important as air and water. Actions that reduce the life-supporting capacity of soils are unacceptable. Tangata Whenua are, therefore, concerned about accelerated erosion, soil compaction and soil contamination issues in the District. In some places the recontouring of the land through filling and levelling is also of concern due to its effect on water tables, drainage and possible flood flows.

Soil Erosion

Erosion by water and wind is probably a bigger potential problem for the Manawatu District than an actual one. The New Zealand Land Resource Inventory classifies 49,600ha of the District's hill and sand country (about 20 percent of the whole District) as potentially prone to severe soil erosion. A horizons.mw study in 1999 indicated that about 40 percent of the region's hill country is at risk of accelerated erosion due to an absence of protective vegetation, and about 14 percent of the hill country consists of fresh or re-vegetating erosion scars[2].

The hill country between the Oroua and Pohangina Rivers consists of particularly soft material which has seen spectacular gully erosion in the past before protection plantings were done. A case study by Landcare Research on the Manawatu plains showed that wind erosion on cropping land can cause soil losses of up to 1mm a year[2].

It is difficult to say exactly how much soil is actually being lost by erosion in our river catchments, or to plot trends over time. Eroded areas cannot be accurately measured from aerial photos or satellite images. Factors such as the clarity of our rivers, however, indicate that actual hill country erosion rates are relatively small, especially compared to catchments like the Whanganui River. Most erosion events are caused by localised downpours and affect fairly limited areas.

After the storm events in 1992, a Landcare Research team looked at a sample of affected farms from Wanganui through to Akitio[1]. They found that:

- Ground slope was the major factor determining whether a piece of land slipped or not

- Whether the land was heavily or lightly-stocked before the storms made little difference to how severe the erosion was
- The long-term impact of erosion year after year does not threaten the sustainability of pastoral farming on most of the region's hill country, except on the very steepest land (slopes above 32 degrees)
- The erosion was much less severe in places where native forest or scrub was retained, where farm woodlots had been planted, or where spaced planting of trees in pasture had been done

Erosion control measures have been widely adopted on farms over the past 30 years, and significant areas have been planted in production trees. The District's potential erosion problem is therefore certainly smaller than it used to be. However, it is still a huge potential issue which needs continued careful management.

Soil health and other soil loss

There is evidence that over-cultivation of some cropping land in the Kairanga plain has damaged the soil's structure and capability[3]. Little is known about how widespread this problem is. Soil scientists have, however, identified certain soil types that are especially prone to it and which, therefore, need careful management. Horizons.mw has developed a simple "Visual Soil Assessment Method" that farmers can use to assess the health of their soils. This kit, which is available from horizons.mw, will aid farm management and may over time provide a useful measure of the state of the region's soils.

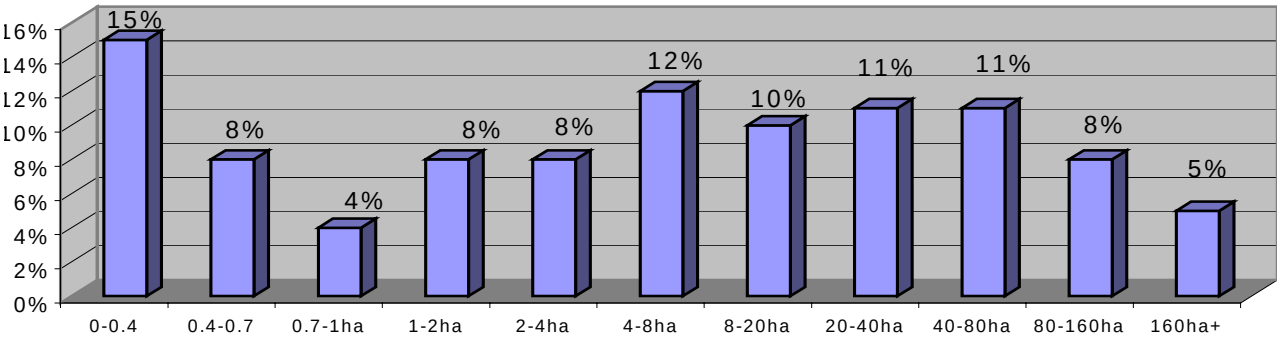
High quality farmland being swallowed up by urban growth is not a major issue in the District. The only town that has expanded onto "greenfields" land is Feilding, and almost all of its new housing areas have been built on paddocks within the 1970 boundary of the Borough. A total of 39ha of rural land in the Turners Road area was zoned to industrial in 1995, and two areas totalling 4.6ha were zoned to residential in 1999. About a quarter of the new industrial land has since been built on and the new residential land has not yet been developed.

Effect of rural subdivision on size of land holdings

Subdivision of land into smaller pieces can affect the range of possible uses for that land. Indeed some land uses which need large areas of land may find it difficult to set up or continue in the Manawatu if most of the District becomes subdivided into small pieces, each with a house on it. The District Plan's subdivision controls aim to maintain the chance for rural soils to be used for a wide range of options in the future. This is done through using an average lot size rather than a minimum lot size, and by requiring that at least 50 percent of the land in each subdivision (or 20ha, whichever is smaller) be kept in one piece.

The plan's subdivision controls also recognise that the District's high quality soils are a special resource. They are capable of being used for the widest range of potential uses, including intensive horticulture, with a minimum of artificial inputs such as fertiliser. The high quality soils, totalling 33,660ha, have, therefore, been given a "Rural 1" zoning under the plan, with more restrictive subdivision controls. An 8ha average lot size is required, compared to the 4ha average for the Rural 2 zone, which covers the rest of the District's rural areas.

There are 6412 separate rural land holdings in the District. (Some of these holdings consist of more than one land title). The percentage of the District's land holdings in various size categories is shown in the chart below.

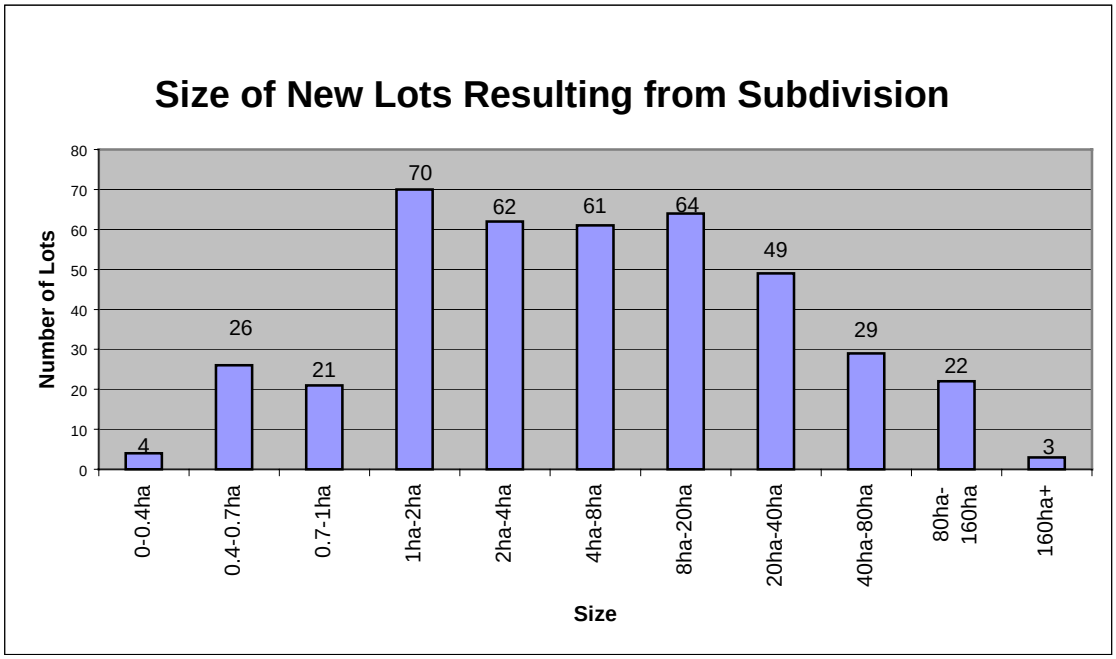


Source: Council rates records

These figures show that about 35 percent of rural holdings are under 2ha in area. Many of these are under 0.4ha (one acre) in size, partly due to former Council subdivision policies that required "surplus farm house" and "retiring farmer" house sites to be as small as possible. Holdings over 40ha in area represent about a quarter of the total.

The Council will be monitoring future trends in land holding size; especially to see what impact new rural subdivision has upon the overall pattern. From 1 July 1999 to 30 June 2001 the Council approved 158 subdivisions (not including boundary adjustments), which involved a total of 7944ha of land. (By comparison, the total area of the District is 253,164ha). The "balance areas" of these subdivisions totalled 6004 ha, which means that on average 75 percent of each parcel being subdivided stayed in one piece after the subdivision. This accords with the Council's objectives.

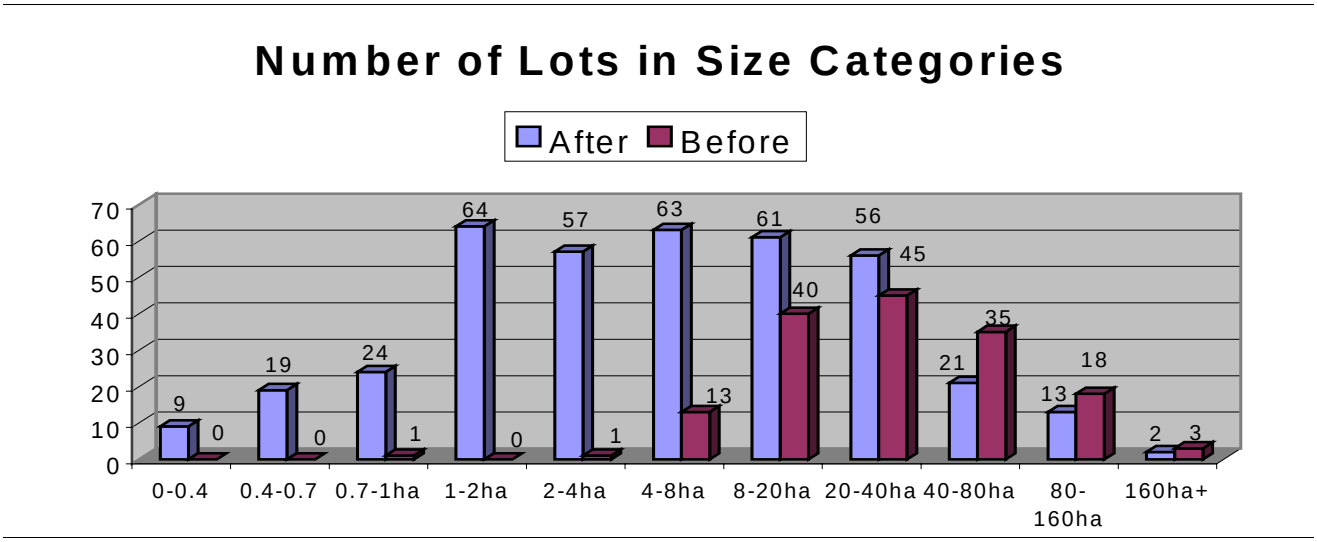
The chart below shows what size categories the 411 newly approved land titles (including balance areas) fell into.



Source: Council subdivision records

There was a reasonably even "split" in lot sizes between 1ha and 40ha, with 1-2 ha being the most common lot size resulting from subdivision. The allotments under 0.7ha in area were largely in the "nodal areas" around townships where more dense subdivision is permitted. There was no significant difference between the size of allotments created in the Rural 1 zone and those in the Rural 2 zone.

The subdivisions that were actually completed in the same 1999/2001 period are shown in the graph below. The dark column shows the size of the land titles before subdivision, and the lighter column shows the size after subdivision.



Source: Council subdivision records

This shows that the net effect of subdivision has been an increased number of titles in all size categories under 40ha. The three size categories over 40ha recorded small decreases.

At this stage, the District Plan's subdivision controls are working in the direction that the Council intended.

Outlook for the Future

- Research will continue into establishing what land uses are sustainable for different land types.
- This will be coupled with education initiatives and landcare groups aimed at promoting more compatible use of the District's land resource.
- Farmers will be making greater use of soil health monitoring techniques to look after their land and ensure that it remains productive.
- Erosion-prone land will continue to be planted, both for commercial forestry and as part of erosion control projects with horizons.mw involvement.
- Organic farming, with its emphasis on sustainable principles, will become a bigger part of the rural scene[2].

What can I do?

- Get the "Visual Soil Assessment Method" kit from horizons.mw and use it to check the health of the soils on your farm.
- Ask your local soil conservator what he can do to help you.
- Join or form a landcare group

Farmers committed to improving the environment

A group of farmers living adjacent to the Mangaone West Stream is determined to improve the stream's water quality and restore the vegetation to its original state.

While there are no direct farming benefits, all believe the overwhelming environmental and aesthetic benefits far outweigh the cost and effort.

In May 2002, with the assistance of horizons.mw, the farmers formed the Mangaone West Catchment Care Group, the first group of its type in the entire Manawatu-Wanganui region.

The group holds regular meetings on farms located in the 7000ha Mangaone West catchment in between Feilding and Halcombe. As well as being an opportunity to share information and experiences, each meeting has a theme and is addressed by a scientist or appropriate expert. Attendances vary, but are generally between 15 and 35 land owners.

Group chairman Neil Managh says the group knows that improving the water quality and replanting the banks will take time, but it is already making real progress. Fencing off the replanted areas to keep stock out of the waterways is a priority, but it is a very costly exercise.

"I am absolutely amazed with the enthusiasm within the group," says Mr Managh. "All of us are committed to the environment and to improving the condition of the stream and the land adjacent to it."

Mangaone West Catchment Care Group chairman Neil Managh shows the new plantings and fences on the section of his farm adjacent to the Mangaone West Stream.

Mr Managh estimates that he has now replanted and fenced off around a quarter of the 4km length of stream on his sheep and cattle farm. "Others are well ahead of me and some are just starting. But it's the combined effort and increased awareness that counts."

As the group is the first of its type, it has no model or formula to follow. "We're creating our own direction, but we are determined to make a difference."

5. INDIGENOUS VEGETATION AND HABITATS

Background

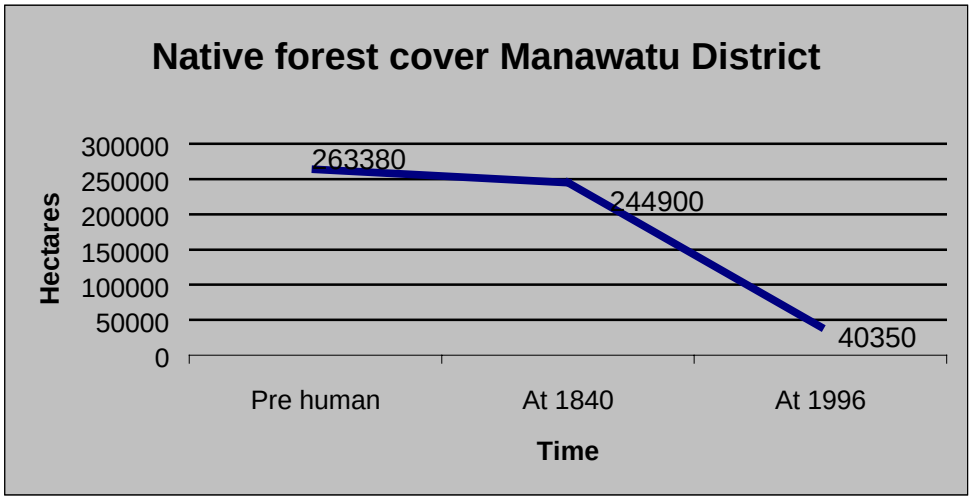
Before humans arrived, almost the entire District was covered in tall forests of one sort or another, with a wide range of plants and animals. The kahikatea swamp forest, once common on the Manawatu plains, is one of the oldest surviving forest communities on the planet, having been around for 180 million years. New Zealand has more unique species than any other island nation, and 84 percent of the region's native plants and animals occur nowhere else on earth.

These species are, therefore, globally important. There is little information on what flora and fauna may have been lost, but the Manawatu area used to be the centre of huia, hihi and saddleback habitat, and even moa were here. Now saddlebacks survive only in protected areas like Kapiti Island. More recent extinctions from our District include the North Island kokako, the once common brown teal, and probably even our national icon the kiwi.

The current state of the District's indigenous ecosystems, particularly the lowland forests and wetlands, is of great concern to the Tangata Whenua. These ecosystems have immense value as a taonga in their own right, and are a vital source of resources used in Maori cultural practices and activities. Such resources include flora and fauna for rongoa Maori (medicine), for weaving (for example pingao, harakeke, kiekie, pigeon feathers), and wood for carving. The impact of introduced plants and animals, especially pests, upon remaining forests and wetlands is a particular concern. Tangata Whenua support the idea of restoring ecological viability by supplementary plantings, improving existing habitats, and establishing corridors to connect scattered bush and wetland remnants. Maori recognise that this work is part of their duty as kaitiaki, and they want to be involved in doing it.

State of the District's Habitats

The things that have had the biggest influence on our native habitats are forest clearance and land drainage by Europeans, and pest and weed invasions. The graph below shows how the area of native forest cover in the District has declined. By 1840, some seven percent of the forests that were here before humans arrived had been lost, mostly due to fires started by early Maori. By 1996, 85 percent of the original forest was gone, and 70 percent of what did survive was on the top of the Ruahine Ranges. Less than 10 percent of the native hill country forest ecosystems are left, and less than five percent of the District's once prolific lowland, coastal and wetland ecosystems. The only places that have fared relatively well are the mountain forests, tussock lands, wetlands and alpine areas.



Source: horizons.mw (4)

About 72 percent of the estimated 40,350ha of native forest cover is in public ownership. The Department of Conservation looks after 28,890 hectares of land in the District.

When Queen Elizabeth II Trust covenants (357 ha), Council covenants (26ha), and Council bush reserves (350ha), are added, a total of 29,623 ha of wetland and bush has some form of legal protection. This sounds like a lot, but the Ruahine Forest Park makes up 94 percent of this total. Public ownership is also no guarantee of healthy ecosystems. Even in the Forest Park, possums have completely removed the rata and kamahi canopy from more than half of the Ruahine Range since the 1950s, leaving only leatherwood, mahoe and horopito.

Most native forest remnants in the lowlands and hill country are now too small and too isolated to support a native bird population year round. The tall canopy trees in some places look impressive, but there may be barriers to these species regenerating. One example is stock grazing on the undergrowth. Another is that the "keystone species" might have gone from that forest. "Keystone" plants are the ones that provide a food supply at times of the year when food would otherwise be scarce. Keystone bird species are those that pollinate and spread the seeds of native shrubs and trees.

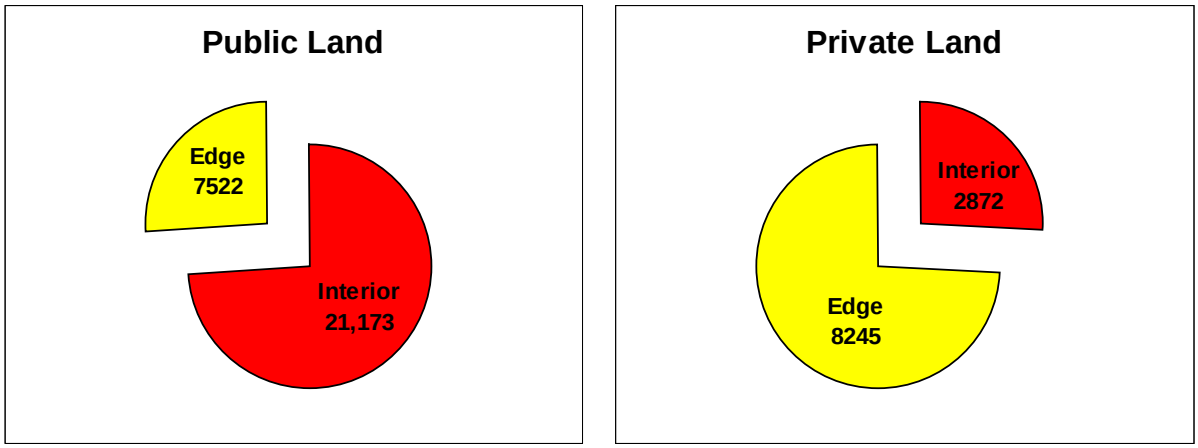
Kereru (wood pigeons), for example, are vital to the propagation of trees like matai, miro and tawa because only they can swallow the large seeds which these trees produce. If there are no pigeons, it means that once today's tall trees die, there could be no more to replace them. Bellbirds play a similar role for many small-seeded native plants. A lot more research on keystone bird species is needed in our region, since their presence tells us a lot about the long-term health of our natural areas.

Most native plants and birds have adapted to live in huge forests and prefer the inside part of a forest area. Most of our remaining native forest fragments are small, and, therefore, have little or no interior habitat. Many of the larger remnants have long and narrow shapes (usually following gullies), so the amount of interior habitat is relatively small[4]. Such areas, therefore, have little to offer native plants and birds.

By contrast, most introduced plant and animal species (including pests) prefer forest edges, and they have established very successfully, competing with native species. The pie chart below shows the estimated amount of interior and edge habitat in the District. The public forestland mostly consists of interior habitat, but native forests on private land are mainly edge habitat. Overall interior habitat has been reduced to about eight percent of the area that was here before humans arrived.

Kereru – A "keystone" species of the forest

Amount of Edge and Interior Habitat on Public and Private land (ha)



Source: horizons.mw (4)

Endangered species

When we hear this term we tend to think of the giant panda or perhaps the Chatham Islands black robin. Many people do not realise that there are endangered species right here in our District. These include coastal sedges and herbs, pingao (an important cultural resource), the North Island fernbird, and plants like Celmisia Mangaweka. (see story in box below). The region's fern bird and mudfish populations have been reduced and fragmented to such an extent that, unless their habitats are restored, they are both likely to disappear. When it comes to insects, there are probably many species that people haven't "discovered" yet, let alone checked to see if they are endangered.

Number of Endangered Species in Manawatu District, by category

Category	Plant Species	Bird Species	Fish	Bats
Critically endangered nationally. (Extinction inevitable in less than 10 years without direct intervention).				
Endangered nationally (In danger of extinction. Survival unlikely if current factors keep operating).				
Vulnerable nationally. (Likely to become endangered in near future).				
Declining plants - Still abundant, but under serious threat or undergoing declines.				
Recovering but conservation-dependent plants				
Sparse Plants (Naturally occurring within small and widely- scattered populations. Consequently vulnerable)				
Rare				
Rare but vagrant (Presence in NZ is naturally transitory)				
Local				

Source: Department of Conservation

Threatened daisy endemic to Manawatu district

Celmisia Mangaweka is the only example of an endangered plant that is endemic to the Manawatu district.

A white daisy of the Asteracae family, it is only found on a slip-prone roadside cliff in the northern part of the Manawatu district, not far from Mangaweka. It is not found anywhere else on earth.

It has large white flowers for a few weeks each year, normally in December and January.

Conservation Officer Vivienne Nicholls, of the Department of Conservation, says that recent research shows the plant is most closely related to Celmisia brevis from Mt Taranaki and a form of Celmisia gracilenta from Hihitahi Forest Sanctuary south of Waiouru.

The plants belong to the same genus as the Mount Cook daisy and such plants normally survive in higher altitudes. "It is very unusual that Celmisia Mangaweka survives on such low land."

The plant's numbers are severely threatened as the roadside cliff on which it grows is prone to erosion, unprotected and has in the past been inadvertently damaged by road maintenance crews.

"While many of the plants will disappear with the slips, others on more stable land may survive," she says. "I am pretty sure the species will survive, although probably in reduced numbers and not necessarily at this original site."

A DOC project is currently underway to collect seeds from the rare plant and attempt to grow it on more stable and protected land nearby. Of the 40 seeds planted last year, 12 survived. A further 12 plants raised at DOC's Palmerston North Area Office were to be replanted in the spring. The project also aims to identify suitable places where the plant would thrive.

ABOVE: The site of the rare plant. LEFT: Conservation Officer Vivienne Nicholls checks samples of Celmisia Mangaweka.

Despite the plant's rarity, there are no signs or information near the cliff. Botanists regularly visit the site, but Ms Nicholls says there is an extremely fine line between raising awareness of the plant and protecting it from curious people and vandals.

Pressure on Habitats

There is little demand from people wanting to clear the remaining areas of native forest. Since 1993, people wanting to mill native timber have had to obtain a permit from the Ministry of Agriculture and Forestry. This involves demonstrating that removing the trees will be sustainable in terms of the long-term future of the forest.

Three native timber harvesting permits have been granted in the Manawatu District since 1993, involving a total of 966 cubic metres of timber. MAF approval has also been granted for people to remove particular dead or wind-thrown trees. One area of native forest near Rangiwahia has an approved sustainable management plan, which enables it to be used for timber harvesting on a sustainable basis.

Most landowners appreciate the bush and wetland areas on their property for aesthetic rather than commercial reasons. There is a steady stream of people wanting to obtain permanent legal protection for such areas. For example, three privately owned bush areas containing 34ha are currently undergoing QEII Trust registration.

The North Island Fernbird, one of 20 endangered bird species in the District

The biggest long-term threat to the District's bush areas probably lies in a failure to take the active steps needed to improve the viability of these areas, rather than from any desire by people to fell them. In the case of wetlands, education is an issue since people often do not realise the importance of wetlands, or how fragile and rare some of the species concerned are.

A Way Forward?

Ecologists say that once a type of native ecosystem, such as lowland forest, falls below about 20 percent of the area that it originally covered, that ecosystem has probably become unsustainable in the long term. The Government has put forward an aim of "halting the decline of native biodiversity" in New Zealand[5]. If 20 percent of the original cover is the break-even point for having viable forests, meeting the national goal would require tripling the present area of the region's hill-country conifer-broad-leafed forest. Coastal, lowland and wetland ecosystems would need to be increased at least five to seven-fold to meet the same target.

This target sounds like a big ask, but ecologists believe it is achievable, and that in fact we can move toward it quite quickly. This goal does not involve having to turn large areas of pasture back into native forest. Instead it can be met largely via supplementary planting and fencing to improve the shape of our current forest and wetland remnants, plus planting corridors of trees to link scattered remnants. Improving the shape of bush remnants helps to expand the area of valuable interior habitat, and this supplementary planting need not be done in native species. Some production trees can serve just as well. Likewise corridors of some exotic trees can still provide useful pathways for birds to move between bush areas.

Introducing some native plantings to the production landscape, for example in fenced-off strips between paddocks, can result in economic benefits to farming operations. These include habitats for insects which pollinate crops or help control pests, weed suppression, nutrient retention and shelter[6]. The Parliamentary Commissioner for the Environment has, in fact, recommended that landowners' expenses in conserving indigenous biodiversity be tax deductible to recognise that such work enhances the commercial productivity of working lands.

Despite the size of the biodiversity task, there are a number of practical things which are already being done, and which point the way forward. Horizons.mw has recently made pest control in "high value conservation areas" a high priority. People have recognised the benefit of programming possum and plant pest control together. This achieves a far better result for wildlife than when the two operations are done separately. Horizons.mw has also established an Environmental Grants Fund that includes money for habitat restoration as well as for other things like erosion control. Last year the demand for grants was much larger than the available funds[7].

There have been some good examples of improvements to the habitat value of specific natural areas. Some of these have been DoC or Council projects (such as the Kitchener Park restoration), while others have been driven by local residents.

Kitchener Park, a rare remnant of Manawatu's 54,000ha kahikatea floodplain forest.

Outlook for the Future

The general public is likely to become more interested in biodiversity, and to place more value on the District's remaining natural areas.

- Continuing research will improve our understanding of natural ecosystems and how best to help them recover. Pest management techniques will become more effective.
- The amount of land protected by covenants and other natural methods will continue to increase.
- The Council may consider acquiring important natural areas for reserves, depending on the merits of each area.
- There is a current proposal by horizons.mw to set up a community trust similar to the Taranaki Tree Trust to champion biodiversity initiatives in the region. As noted above, a substantial response from landowners and governmental and conservation bodies is required. Having a single body as a focal point would be the most effective way to co-ordinate this response.
- The Council, via its Heritage Strategy, will provide a source of assistance for owners of natural areas.

What can I do?

- Fence off areas of bush, wetland and regenerating scrub
- Improve the shape and usefulness of remnant habitats by additional planting
- Run over a possum whenever you can do so safely.

Integrating production and protection the key

The Manawatu district's native biodiversity is unique both internationally and nationally, says respected horizons.mw ecologist Helmut Janssen.

Internationally, several endemic species are of interest, while nationally there are unique kahikatea wetlands, podocarp-tawa lowland and conifer-rata-broadleaf forests.

"Species in this district's native lowland ecosystems are more dependent on one another and are linked in more complicated ways than in the beech or kauri forest ecosystems of other parts of New Zealand."

The role of an ecologist is to study the inter-relationship of living organisms and their environment. Mr Janssen has a particular affinity with the district as he has chosen to live here.

His vision for the Manawatu district is to have more areas looking like the Pohangina Valley, which he says has compact native forest habitats and an abundance of good riparian corridors within a well looked after farming landscape.

"I'm sure this is achievable. The key is to integrate both production and protection in the landscape and to effectively control animal and plant pests,"
he says.

Horizons.mw ecologist Helmut Janssen

"If multiple purpose tree species are planted alongside or connecting with native forest remnants, then native species can thrive. Providing planted trees are selectively harvested, the forest maintains functionality and farms can sustainably produce high value products."

The brown mudfish - a native species which is likely to become endangered nationally

6. COASTAL ENVIRONMENT

Background

The District's coastline is about 11.5km long. It runs from the Rangitikei River mouth to 2km south of Himatangi Beach. The shoreline is "aggrading" rapidly. In fact, the high tide mark is moving seaward by more than half a metre per year. The sand country is part of the largest sand dune system in New Zealand, which by nature is ever changing. Sand has been blown off the beach year after year with the prevailing wind, to form a series of parallel dune ridges running west. These dunes extend inland nearly 20km until their way is barred by the Oroua River. Sand plains, lakes and wetlands have formed between the dunes. The natural cycle is that lakes and wetlands appear, shift, and are filled in as the dunes move and as new dunes are formed. There are some plant communities that are specially adapted to live on bare shifting sand.

The most recent stages of dune building in the Manawatu are attributed to early Maori and then European settlers clearing vegetation[8]. This caused blowouts in the dunes and led to a whole set of new dunes being formed. In recent years pine and marram planting has stabilised the dunes. Pine planting has become such a feature that Ernslaw One's forest is now the most dominant part of the District's coastal area.

Two streams make their way through the dunes from Lake Kaikokopu and Pukepuke Lagoon to the sea. The Rangitikei River estuary is just outside the District for planning purposes, but includes a salt marsh that is an important habitat for plants and birds.

The domain of Tangaroa has great spiritual significance to Maori, and is an important food basket. As such, practices and elements that defile the mauri and the mana of the sea are seen as abhorrent. The discharge of pollutants into the sea, particularly human sewage, is an obvious example. There are no direct discharges within the District, but pollutants brought down via the Rangitikei, Manawatu and other rivers are seen as having an unacceptable impact on sea water quality in the region's estuaries and beaches. Contamination from boats also has an adverse effect.

This pollution is considered by the Tangata Whenua to have had an adverse effect on shellfish stocks, especially toheroa. The state of mataitai (food provided by the sea) is a reflection of an iwi, hapu, or Whanau duty of kaitiakitanga. Where they are no longer able to protect these resources, Tangata Whenua suffer a loss of mana in being unable to fulfil their role as kaitiaki.

State of the Resource

There is little scientific information on species number and diversity in coastal waters. The Department of Conservation manage the whitebait fishery, but don't collect data on stocks locally. Overall the coastal marine area (seaward of high tide) appears to be in good condition.

The seawater quality at Himatangi Beach and Tangimoana is generally good. Sometimes, however, usually after floods in the Rangitikei River, the seawater is not regarded as safe for swimming. This tends to be related to contaminants brought down the river in floodwaters and distributed along the beach. Shellfish gathering bans have also been in place a couple of times, due to the nationwide problem in recent years with algal blooms.

Whitebaiting still fun, but catches well down

Ken Pedley has been whitebaiting and sea fishing at Tangimoana for more than 60 years. Both activities are still just as much fun as ever but, as with most fishing, he says it is nowhere near as successful as it used to be.

"Even 30 years ago, you could go with a conventional net and get 30 pounds of whitebait in a day without any problem. Now, even if you lived there and fished every day, you would be unlikely to get that much in an entire season."

Mr Pedley blames the dramatic decline in whitebait numbers on greed. "Most of the whitebaiters are people like me who treat it as recreation and take only as many as they need. But there are a small number of commercial whitebaiters who think about the profit and not the fact that it is killing whitebaiting off for others."

The solution, he says, is three or four closed seasons so the whitebait stocks can replenish. "This worked with toheroa and I'm sure people would respect such a ban because it would be for all the right reasons. I certainly would."

A recently published report by the National Institute for Water and Atmospheric Research (NIWA) says other reasons for the decline of the whitebait fishery include deforestation, pollution, the introduction of exotic species and farm culverts, which are the most common barrier for upstream migration.

A recent NIWA study showed that whitebaiters caught only a small proportion of the available fishery but that only about 20 percent of whitebait escaping past the anglers' nets survived to reach adulthood.

Mr Pedley says long lining off the coast is still reasonably successful, but twin trawling close to the coastline means catches are only a fraction of what they used to be.

ABOVE: Searching for the elusive whitebait RIGHT: Ken Pedley

"We used to get at least six snapper every time we put a line out. Now you would be lucky to get one or two, but the gurnard and kahawai numbers are still reasonably good," he says. "Forty years ago I had never seen a paddle crab, but now that the snapper are not there to eat them they are breeding like wildfire."

A possible solution: "I would like to see protected zones introduced along parts of the coastline prohibiting commercial trawling within three miles of the coastline."

The Department of Conservation has purchased 159ha of land immediately south of Tangimoana Beach Road that is an important habitat for fern birds and several rare dune and wetland plants. The Council manages the foredune at Himatangi Beach as a reserve. The Foxtangi dune area south of the beach is listed for protection under the District Plan.

The coastal dunes are now largely stabilised by marram planting and forestry, though local blowouts are still possible. The only place in the District where some of the "natural" sand migration processes can still be seen in operation is the DoC land south of Tangimoana Road. Almost none of the original coastal forest remains, with the best remnant being a 1ha area at Bainesse. In many places introduced plants have displaced native ones, and all the dune areas have major weed problems. Endangered plants include sedges, sand daphne and pingao.

A few dune lakes survive, with the most notable ones being Pukepuke Lagoon and Lake Kaikokopu. Pukepuke Lagoon is a DoC reserve, and Lake Kaikokopu is privately owned but subject to a QEII Trust covenant. The District's basin lakes are shallow and migrating eastward with sand movement. Major drainage works carried out over the last 100 years have had a dramatic effect on the dune lakes.

Some lakes have not been drained directly, but have still had their water level affected by the drainage of nearby swamps. Shallower water levels and nutrient runoff from surrounding farmland has accelerated raupo growth in some places, which in turn has reduced the area of open water for birds and caused infilling of some wetlands.

Pukepuke Lagoon supports good numbers of two globally threatened bird species, the NZ dabchick and the Australasian bittern. It also has a scientifically and biologically important population of the short-finned eel[10]. It continues to be of considerable importance to Ngati Apa in particular, who once had a fortified pa near the lagoon.

Pressures on the Coastal area

Vehicles can drive onto the beach at both coastal towns. This creates few problems in itself, except from off-road vehicles driving over the sand dunes. An option that has been talked about for a long time is providing an alternative area for offroaders, so that the adverse effects on the ecology and stability of the dunes can be minimised.

The Council and horizons.mw have re-shaped the foredune at Himatangi Beach to make it more aerodynamic and less prone to blow out. Ernslaw One has a similar ongoing programme to help protect its forest. Planting usually follows any re-shaping, and the best species for this task from an ecological viewpoint are the native spinifex or pingao. Marram grass is sometimes used instead for cost reasons.

There has been a debate over managing the level of the dune lakes. Adjoining farmers are keen to prevent their pasture being covered by water in winter, but conservationists see this as a natural cycle that supports specific plants adapted to being wet for part of the year.

The old Tangimoana refuse tip is located behind the foredune. The tip was closed in 1995, and the Council now runs a detailed “aftercare” programme to check its impact on the environment and minimise any effects.

There has been little demand for housing and subdivision in the coastal area since the Te Kiri Street area of Himatangi Beach was developed in the 1970s. This sort of development has, therefore, had little impact on the coast’s “natural character”. Only two subdivisions were approved in the coastal area in 1999-2001, creating a total of five rural allotments. The District Plan’s policy is to limit the outward growth of Himatangi Beach and Tangimoana, and the area of residential zoning at Tangimoana was in fact reduced by about 4ha in 1998.

Outlook for the Future

- The quality of the coastal area is unlikely to be compromised by further subdivision and housing development.
- The future of the coast’s unique plant communities is uncertain. The Council wants to be involved in discussions with coastal landowners about protection and enhancement of their natural areas. One possibility is not replanting pine trees in the strip behind the foredune to allow dune wetlands to re-establish.
- Sand dune stabilisation will continue to be an issue and native species, such as spinifex and pingao, will be increasingly preferred for this work.
- Bylaws and education will help to minimise the impact of off-road vehicles.

What Can I Do?

- Join a Dune Care Group
- Avoid trampling on sand dunes
- Be careful about any excavations in the coastal area, eg for buildings. Approval may be needed from horizons.mw’s soil conservators.

7. WATER RESOURCES

Background

Historically the quality of water in our rivers and lakes would have been high, with sediment loads in the rivers much lower than today. The waterways used to be full of fish, eels and other aquatic life. Groundwater quality in the past would likewise have been high, although high levels of iron and manganese occur naturally in the groundwater under large parts of the District.

As agriculture and industry developed in the Manawatu, the easiest way to dispose of waste was to dump it into the nearest river, stream or farm drain. Likewise with town sewage, which had only basic treatment before discharge. As a result, many rivers were heavily polluted. As an example, in 1956 the total pollution loading in the lower Manawatu River (not including the Oroua) was estimated to be equivalent to sewage from a population of 212,000 people. Today, although the actual population in the river catchment has almost doubled, the loading on the river is equivalent to only about 88,000 people[2].

The improvement in water quality is due to a number of factors, including better treatment for town sewage and industrial waste, an increase in dairy shed effluent being disposed onto to land, and the downsizing of the local meat and milk processing industries. Despite the improvements, some stretches of our rivers are still unsafe to swim in.

At the same time, the demands on our surface water as a resource have increased. All of the available water in the Oroua River, in particular, has been "spoken for" by agriculture, townships and industries. This has got to the point where, when river flows fall in summer, users must cut back how much water they take from the river.

Groundwater has also become an important resource. The bores sunk to supplement the Feilding town supply are a recent example of this. Groundwater is used as the sole supply of town water for Bunnythorpe, Himatangi Beach and Longburn, while the Sanson scheme extracts water from a bore beside the Rangitikei River. Much larger quantities of underground water are used for rural houses, farms and irrigation.

Water – The Maori Dimension

Water is an essential element of life. It is a very significant taonga to Maori and plays a central role in both the spiritual and secular worlds. The condition of the water is a reflection of the state of the land, which in turn reflects the well-being of Tangata Whenua. Water is central to activity in Maori society: tradition, transport, fish/shellfish populations, religious ceremonies and recreation.

Rivers have a mauri, mana and tapu of their own. They are entities with which iwi identify. Tangata Whenua view the continued discharge of human sewage into the District's rivers as culturally unacceptable. The quality of our river water will, therefore, never be able to be regarded as "good" until these discharges have ceased.

Tangata Whenua have further concerns about the impact which dairy shed and other agricultural or industrial run-off is having upon water quality. This includes, for example, cleaning substances. The District's rivers and streams have been severely depleted as a foodbasket. Tuna (eels) and watercress are no longer abundant, and cannot gathered from many places due to concerns about pollution. Planting stream banks, particularly with native species, is viewed as essential to help deal with run-off issues.

The impact of substantial water abstractions from the Oroua River and more recently the Rangitikei River is also of concern to Maori. Run-off and abstractions have affected the mauri of these rivers and the habitat of traditional fish species and spawning sites. Likewise there is concern about the effects of increasing groundwater abstractions in the District.

Water Quality Issues - Surface Water

Horizons.mw regularly tests the water quality in most of the District's larger rivers. The testing uses a range of "indicators" to tell us about different water quality issues. These include:

Issue	Indicator
Disease risk to humans during recreation	Levels of enterococci (a bacteria)
Water clarity	Black disc visibility
Toxicity to stream life such as fish	Ammonia levels
Excessive growths of green algal slime	Dissolved reactive phosphorus levels
Life supporting capacity for stream life	Dissolved oxygen Water temperature

Source: horizons.mw, (2).

Most of the sites where the water is unsafe for swimming due to high enterococci levels are located below sewage outfalls. For example the Manawatu River at the Fitzherbert Bridge has good water quality, but downstream of the city it is unsuitable for swimming. The Mangaone Stream is affected by agricultural pollution and general runoff, but should see some improvement with the recent piping of Bunnythorpe sewage to Feilding. The Oroua River has poor water quality both downstream and upstream of the Feilding sewage outfall. Horizons.mw is unsure why the upstream quality is poor, and is planning further research. The Mangaone West Stream was regarded as quite severely polluted, probably due to high nutrient loadings from agricultural runoff[9].

The Rangitikei River at Vinegar Hill and Scotts Ferry has fair water quality and is safe for swimming. The Pohangina River is sampled three-yearly at Piripiri and Raumai, where results show that the water quality is good. Water quality in the Makino Stream has not been regularly sampled in the past, but has recently been added to horizons.mw's programme.

Water clarity is checked by recording how far away a black disc of a certain size can be seen through the water. Clarity in our rivers is generally good at low flows, and is excellent in the upper reaches of most waterways. The sites that have only fair clarity tend to be those below sewage discharges.

Ammonia levels in the District's rivers are not generally a problem for stream life, except just below sewage discharges. The same goes for soluble phosphorus. High levels of this substance can result in excessive algal slimes when river flows are low. These slimes are unpleasant for swimmers and waders. They can also deplete oxygen levels in the water and threaten stream life.

Recent surveys of oxygen levels over a four to five-day period showed that the water's life supporting capacity is potentially compromised downstream of Feilding and Palmerston North during low flows[2]. The pH level at these places approached 9.0 during the day, which is worrying because alkaline water can make any ammonia present more toxic to fish.

Water temperatures over 20 degrees affect key insect life, such as mayflies. If the river water exceeds 25 degrees, it can adversely affect fish such as trout. Ammonia is more toxic to fish when the water is warm, and increased temperatures reduce the amount of oxygen in the water. Since many of our streams are wide and shallow, without much tree shade along the banks, they are prone to overheating in summer. The problem can be aggravated if stream flows are being further reduced by water extraction from the river.

The Oroua River – a water resource in high demand

Daily maximum temperatures in the Oroua River at Almadale and in the Kiwitea Stream regularly exceed 25 degrees, and sometimes in the Oroua the water reaches 30 degrees. Water temperatures in the Makino Stream at Boness Road are not as extreme, with maximum temperatures barely reaching 25 degrees. This is largely due to the influx of cooler waters from the Mangaone West Stream, which did not exceed 20 degrees during horizons.mw's survey[9].

A recent survey by horizons.mw looked at the 'health' of native fish communities at 230 river and stream sites throughout the region[11]. Whether a site was classed as 'healthy' depended on whether different species of native fish were present or not. The study found that many of the expected fish species are absent, particularly in sites in modified rural landscapes. The same situation, however, occurs in rivers running through forest areas. This perhaps shows that areas of pollution downstream, or high sediment loads, may act as barriers to fish migrating further upstream. At least three native fish species found in the Manawatu River are absent in the Oroua River system, suggesting that there is some sort of physiochemical deterrent to these species moving up the Oroua.

Fish communities in the Rangitikei catchment were found to be in a poor state, which is surprising since the Rangitikei is otherwise considered to have high quality water. One area which did have a good number of native fish species was the Kaikokopu Stream catchment at Himatangi Beach.

The sort of water sampling information available for our rivers is not collected for the lakes within our District, namely Pukepuke Lagoon, Lake Omanuka, Karere Lagoon, Hamilton's Bend Lagoon and Lake Kaikokopu. Some research was, however, done by NIWA in 2001, looking at underwater plants in Pukepuke Lagoon and three lakes outside the District[12]. The idea was to use the growth and types of plants as an indicator of what ecological shape the lakes were in compared to an earlier survey in 1977.

This research showed that there have been no significant changes in the vegetation status or condition of Pukepuke Lagoon in the past 25 years. The lagoon is dominated by native species, with no sign of the invasive exotic weeds which cause problems in other places. The diversity and health of the vegetation indicates that the lagoon's water quality is high and that it is in very good condition.

Coastal lagoon home to rare birds, fish and plants

A costal lagoon pushed 2km inland by moving sand dunes is one of Manawatu district's natural treasures.

Pukepuke Lagoon, located part way between Tangimoana and Himatangi Beach, is a dune lake with associated swamps and is an important wetland habitat for native and introduced birds, freshwater fish and native plants.

Dune wetlands are one of the most threatened ecosystem types in New Zealand. Now known as the Pukepuke Conservation Area, the lagoon is managed by the Department of Conservation.

The sand dunes have now stabilised and DoC believes the shape and location of the lagoon and associated swamps is unlikely to change dramatically.

Pukepuke Lagoon, which is the largest of a series of coastal lagoons, covers an area of around 82ha and measures just 1.2m at its deepest point. It is also the site of a fortified pa occupied by Ngati Apa until about 1840.

Pukepuke is a diverse wetland habitat for more than 60 bird species, including two nationally-threatened species – the New Zealand dabchick and the Australasian bittern. A number of regionally uncommon species also live at Pukepuke, including the North Island fern bird, spotless crane, New Zealand shoveler and New Zealand scaup.

Pukepuke is home to a large population of short-finned eels, while long-finned eels, brown mudfish and inanga are also present. Three small herbs, which are regionally uncommon, have been found at Pukepuke.

Pukepuke Lagoon

DoC carries out control of raupo, a bulrush type plant that thrives in shallow, nutrient-rich waters and encroaches into areas of open water. Power boating and fishing are not allowed in the conservation area and visitors may only enter the area with a permit from DoC.

Nearby landowners have been concerned in the past about flooding onto their farmland. This problem has been resolved with the construction of a sectioned weir across the lake outlet, which helps maintain water levels in the summer and minimises flooding in the winter. It is part of the fine balance between conservation and protecting nearby land.

Water Quality Issues – Groundwater

Most of the deep ground waters around Palmerston North meet the national drinking water standards. Over much of the rest of the District they do not, however, due to naturally high levels of iron and manganese. Horizons.mw checks nitrate-nitrogen levels in bore water, as an indicator of contamination. These levels are within acceptable limits. Likewise no evidence of pesticides has been found. Sampling around Tangimoana has identified a number of bores with manganese and arsenic levels higher than the drinking water standards. The reason for this is unknown, and further research is needed to better understand the groundwater dynamics in the area, and the source of the contamination.

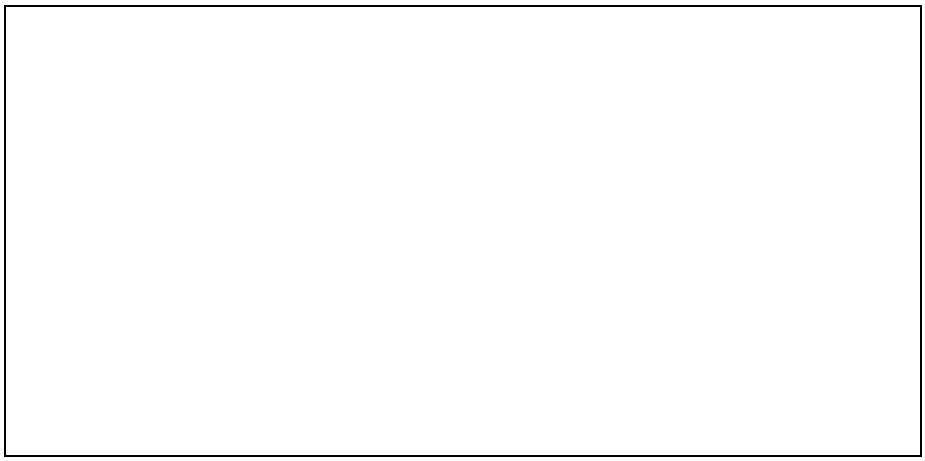
Water quantity issues

The District gets sufficient annual rainfall, so water "shortage" issues tend to be seasonal ones. As noted above, the Oroua River is currently at its allocation limit. No extra consents are therefore being granted for people to take water from this source. This situation hampers current and potential users, and delivers the bare minimum in terms of the river's habitat values. The Council's new bore supply is a positive move in this regard, as it will reduce Feilding's reliance on the river at times of low flow.

The amount of surface water drawn off in the Rangitikei and Pohangina catchments has increased substantially in the past couple of years, with more applications to come[13]. This increase is largely for dairy conversions, and for pasture irrigation to intensify existing dairy farms. The volume of water taken from the lower Rangitikei could well double by 2004 but, like the lower Manawatu, it is still a long way from being fully used.

The amount of groundwater extracted is probably greater than the total taken from rivers and streams. Monitoring shows that the groundwater level in bores has remained stable throughout most of the District.

This means that enough water is entering the underground system to replace the water being extracted. Water levels have, however, dropped by around five metres in one bore just south of Feilding, and this fall is continuing. The drop is probably due to increased water use in the area. Groundwater levels at Whakarongo and near Milson Airport have also dropped in the past, but have now settled at a new lower level[2].



Campbell Road bore – One of two wells drilled to augment Feilding's water supply

Responses

Over the next 10 years or so, sewage plants and industrial waste treatment systems will be improved significantly, in line with a growing public desire to clean up our rivers. This public demand is reflected in horizons.mw's Regional Water Quality Plans, which require waste discharges to be treated to a higher standard in the future. The Council is looking to improve all of its town sewage treatment plants. Ultra violet light disinfection is being phased in at the Feilding plant, and the feasibility of sewage disposal onto land during summer months is being trialled.

Piped discharges of waste are fairly easy to deal with, unlike "non-point-source" pollution such as runoff from pasture. Special management for areas along the edge of streams and drains probably offers the best hope of limiting such pollution. This would usually involve fencing these areas to keep stock out, and fostering a strip of vegetation along the water's edge.

Strips of vegetation along rivers help to filter out excess nutrients and chemicals in runoff from adjacent land. If trees shade the water, they help to provide better water temperatures for aquatic life. They can also be a breeding ground for fish, a nesting area for birds, and can provide "corridors" for seasonal movement of birds.

The influence of riparian (water's edge) vegetation on stream habitats and water quality is greatest in small streams because the amount of edge vegetation is much greater compared to the water area. To get real water quality benefits in main stem rivers we need to give attention to all of the small streams in the catchment.

Horizons.mw has prepared a land and riparian management strategy, which uses a non-regulatory approach to this issue. In terms of water quantity issues, horizons.mw will be developing a new water allocation strategy over the next few years. This will include encouraging people to make efficient use of the water that they extract. Groundwater levels will continue to be checked, especially around Feilding.

Outlook for the Future

- Water quality in streams and rivers currently affected by sewage and industrial discharges will continue to improve.
- A shift toward more intensive forms of agriculture is likely to result in an increased demand for irrigation, possibly a greater use of fertiliser, and production of more effluent. The resulting risk of runoff into waterways will have to be carefully managed.
- More research will be put into methods of dealing with non-point sources of pollution.
- Groundwater quality is likely to remain much as it is at present.
- Increasing demand for groundwater extraction in some places will result in limits being placed on the amount of water taken.
- Demands for extraction from rivers and streams is also likely to be limited.

What can I do?

- Plant the banks of waterways on your property to provide shade and to filter runoff
- Adopt a local stream
- Look at putting farm effluent onto land instead of into drains or watercourses.
- Examine ways of using groundwater from bores more efficiently.
- Exclude stock from waterways and provide stream crossings
- Avoid over-fertilisation

Boardwalk access at the District's largest lake, Pukepuke Lagoon