

quality), tourism opportunities, and potential commercial and medical uses. Biodiversity, is significant to the people of Taranaki. It is a key component of a 'sustainable Taranaki', a community outcome which includes the importance of understanding, valuing, maintaining and enhancing biodiversity for future generations. Protecting native bush and wildlife was considered as very important by 70% of people across the region².

Biodiversity is particularly significant to tangata whenua who, through their long occupation of New Zealand prior to European settlement, have a strong relationship to native plants and animals, and to their habitats. This relationship with biodiversity is woven into Māori culture and traditions.

Safeguarding Taranaki's biodiversity is considered important for Taranaki people because some species, habitats and ecosystems exist here and no where else in New Zealand. For example, a native land snail that lives only on Mount Taranaki. Protecting Taranaki's biodiversity is up to Taranaki people who either actively support actions that will safeguard or restore that local biodiversity or conversely, support or make decisions to place pressure on our biodiversity.

The pressures placed on Taranaki's biodiversity stem from a history of human use of our native biodiversity. Before human settlement, native forest covered almost the entire region. The clearance and development of land for farming, particularly on the Taranaki ring plain and fertile river valleys elsewhere, led to the loss of large areas of indigenous vegetation. The most significant loss in indigenous habitat in Taranaki occurred on the ring plain and coastal terraces. Damage to our biodiversity goes well beyond habitat loss. The condition (or quality) of remaining areas of indigenous biodiversity has suffered from the introduction of pest plants, such as old man's beard, and animals such as possums, goats, rats, cats and stoats.

The challenge is to find ways to manage Taranaki's biodiversity within the context of a productive landscape. A carefully managed farm, for instance, with wetlands and forest remnants protected, animal pest species controlled, streams fenced and planted with riparian buffer zones, erosion-prone soils protected and with stocking rates matching the land's carrying capacity, can both restore and enhance biodiversity and be economically and socially sustainable.

3.1 SOIL EROSION

3.1.1 WHAT IS THE CURRENT STATE OF SOIL EROSION IN TARANAKI ?

The extent and rate of soil erosion in Taranaki is determined by geology, slope, climate and vegetation cover. Different levels of natural erosion rates in the region are set out in Table 3.1³.

Soil erosion impacts on water quality, increases flood risk through rivers filling up with silts and gravels, as well as reducing the general health and productivity of the soil. Land that is susceptible to severe erosion in Taranaki is illustrated in Figure 3.1. The erosion potential of land

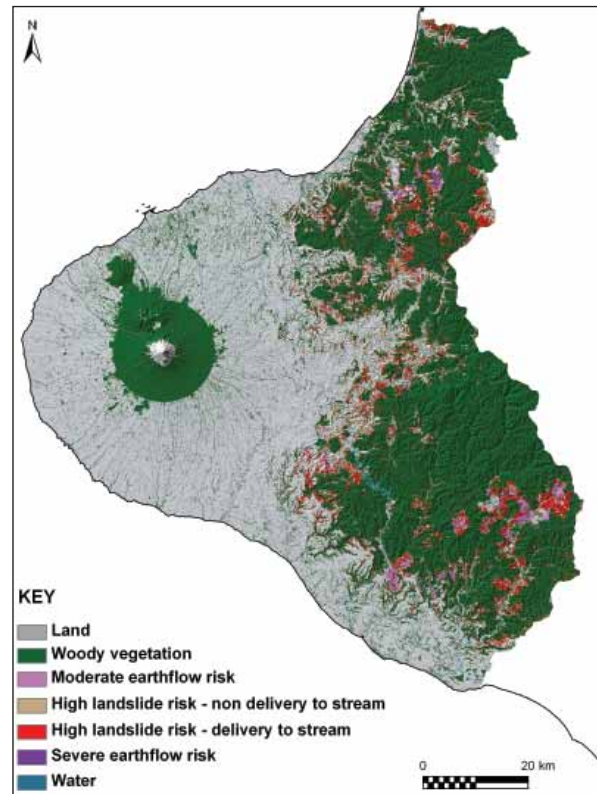


Figure 3.1: Land susceptible to severe erosion in Taranaki.

Table 3.1: Natural erosion rates in the region.

Part of the region	Natural erosion rates	Reasons for accelerated erosion rates
Mount Taranaki	High	Erosion rates may be accelerated where animal pests damage vegetation, although this is managed through the animal pest control programme in Egmont National Park.
Taranaki ring plain and western fringe of the hill country	Low	Any accelerated erosion is insignificant when compared with the long-term soil accumulation beneath vegetation that has occurred in the past, and which has been augmented by volcanic ash during eruptions of the Taranaki volcanoes.
Inland hill country	High	Erosion rates can be accelerated by land use activities – highest in areas cleared for pasture, less in areas planted in plantation forestry and even less in areas that remain bush-clad.
Coastal sand country	Moderate	Erosion rates can be exacerbated by land use activities that expose topsoil to wind causing blow-out and the re-deposition of the underlying sand in localised areas.

2 Community Outcomes Project Team, 2004. *Future Taranaki: A report on Community Outcomes for Taranaki.*

3 Hicks, D.L, 1998. *Soil Erosion in Taranaki – A summary of research findings.* Prepared by Ecological Research Associates for the Taranaki Regional Council.

depends on its geology, slope and vegetation cover. Hill country makes up 414,260 ha, or 57% of the region. Of this, 306,060 ha are privately-owned with the remainder managed by the Department of Conservation.

(A) SUSTAINABILITY IN THE HILL COUNTRY

Land that is used sustainably is less susceptible to erosion. Changes in the sustainability of land use in the eastern Taranaki hill country is monitored by the Taranaki Regional Council. Every five years, aerial photographs of the region are taken, and vegetation and land use are mapped for 25 representative sites, each 900 hectares in area, spread evenly throughout the hill country.

The monitoring has now been completed in 1996⁴, 2000⁵ and 2008⁶ using aerial photos taken in 1994, 2000 and 2007 respectively. The 2008 exercise involved bringing the 1996 and 2000 mapping into line with the latest digital aerial photos. This enabled the 2008 work to continue comparing sites between years, despite the inferior accuracy of the aerial photos in earlier years. The information obtained provides a representative picture of private land use in the hill country and the way that land use has changed over time.

Changes in vegetation over the 25 monitoring sites have seen a reduction in the area of pasture (from 49.0% in 1994 to 47.6% in 2000 to 46.3% in 2007) and an increase in the area of plantation forestry, which increased from 2.4% to 4.7% over the 13 years. The total area of indigenous forest decreased slightly in the monitored sites from 3,380 ha in 1994 to 3,295 ha in 2007.

Land use changes between 1994 and 2000 were dominated by a reduction in the area of meat and wool farming from 53.9% to 51.1%, which continued to fall to 45.1% in 2007. Meat and wool farming land use shifted to either scrub (classified as 'revegetated meat and wool farming land' in the report) or plantation forestry. Land reverting to scrub increased from 24.1% to 25.5% and then to 30.8% over the three monitoring periods. The area of land changing in land use from 1994 to 2007 is illustrated in Figure 3.2.



Sheep farming, Taranaki hill country.

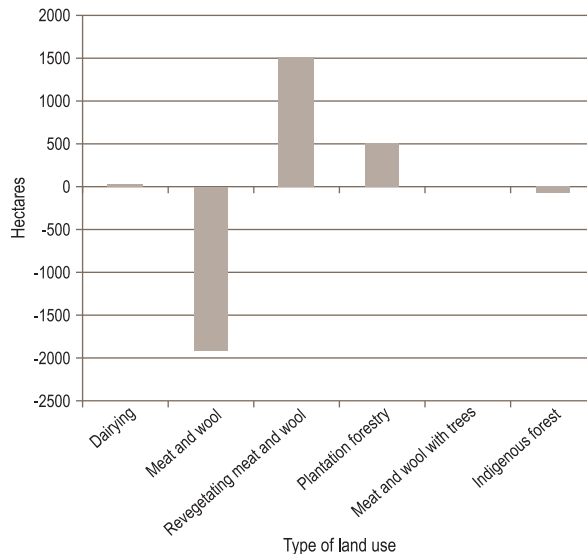


Figure 3.2: Changes in land use from 1994 to 2007.

Land is described as physically sustainable if the use of that land carries only a moderate or low risk of accelerated erosion. Unsustainable land use is that which carries a severe or higher risk of accelerated erosion into the long term. The sustainability of land use is measured by comparing the type of land use that can be physically supported by that land with what it is actually being used for.

From 1994 to 2000, overall sustainability of land use improved by about $1.1 \pm 0.7\%$. In 1994, 83.9% of the area was used sustainably, that is, almost 84% of the hill country was being used for the land use that suited its geology, slope and soil type. Land use sustainability improved to 85.0% in 2000 and to 87.4% by 2007 (an increase in land use sustainability of $2.4 \pm 1.5\%$). This means there has been a $3.5 \pm 1.6\%$ increase in land use sustainability since 1994. The improvement in sustainability of land use was the result of a move away from the meat and wool farming land use after 2000, and a reversion of that land to scrub or to forestry. The report noted that increases in the area under plantation forestry also contributed to improve land use sustainability.



Erosion in the Waitōtara catchment after the 2004 storm.

4 O'Leary, S.M.; Stephens, P.R.; Willoughby, E.J.; DeRose, R.C.; Gibb, R.G.; White, M.F.; Sutherland, A. 1996. *Land Use Monitoring in the Eastern Taranaki Hill Country*. Prepared by Landcare Research for the Taranaki Regional Council.

5 Jessen, M.R.; Betts, H.D.; Sutherland, A.; Willoughby, E.J. 2000. *Sustainable Land Use Monitoring in the Eastern Taranaki Hill Country and Coastal Sand Country*. Prepared by Landcare Research for the Taranaki Regional Council.

6 Betts, H.D.; Lynn, I.H. 2008. *Sustainable Land Use Monitoring in the Eastern Taranaki Hill Country and Coastal Sand Country – 2007 Re-survey*. Prepared by Landcare Research for the Taranaki Regional Council.

Of significance also in this result is the fact that the trend towards increasing sustainability is accelerating, from the 1.1% improvement in sustainability between 1994 and 2000 to an increase of 2.4% in sustainability between 2000 and 2007. This is a very positive and encouraging result, particularly given that there had been good economic years for the meat and wool sector during the monitoring period which have in the past encouraged some unsustainable land use practices such as the clearing of steep land.

(B) SUSTAINABILITY IN THE SAND COUNTRY

Coastal sand country makes up 12,648 ha, less than 2% of the region. This type of land is mainly pasture land, but 428 ha have been identified as consisting of bare sand. The majority of sand country in the region is in South Taranaki with other areas around Cape Egmont and in North Taranaki. Almost all of this area is susceptible to wind erosion.

To measure changes in sustainability in the sand country, the Council has monitored changes in the area of bare sand at four widely separated representative sites from near Cape Egmont in the north, to north of Wanganui in the south⁷. The sites combined represent 25% of the coastal sand country, and capture the range of conditions along the coast. Aerial photos have been used since 1994 to map any change in the amount of bare sand at those sites.

Between 1994 and 2000, the area of bare sand increased at two of the sites, possibly due to tracking and treading damage, while replanting of forest at the site near the Waitōtara River mouth helped reduce the amount of bare sand at that site. Between 2000 and 2007, no significant change was recorded in the area of bare sand at any of the sites. Most of the changes noted after 2000, albeit insignificant, appeared to be related to natural causes such as blowouts of unstable dunes near the beach rather than to land management ones.

Quite aside from being a soil erosion issue, bare sand does occur naturally and can form an important habitat for threatened species such as katipō spiders and pīngao grass.



David Pearce farms to the potential of his coastal property near Waitōtara.

3.1.2 HOW IS SOIL EROSION MANAGED IN TARANAKI ?

(A) REGIONAL SOIL PLAN FOR TARANAKI

Soil erosion is addressed in the *Regional Soil Plan for Taranaki*. The plan contains policies, methods and rules addressing accelerated erosion, with the objective of maintaining and enhancing the soil resource in the region. The plan is now half way through its statutory life and will be formally reviewed in 2011.

Objectives, policies and methods set out in the plan build on the success of past experiences and involve the Council addressing soil loss in partnership with farmers. The plan focuses on non-regulatory methods, such as the Council's sustainable land management programme, to achieve sustainable land management.

Non-regulatory methods are complemented by two regional rules that target vegetation disturbance over 5 ha in area, on land that has a slope greater than 28 degrees. In these circumstances, vegetation disturbance, for example forest clearance or harvesting, is permitted only if certain conditions can be met. These conditions deal with the prevention or mitigation of soil erosion, and effects on water quality. If these conditions cannot be met, a resource consent is required and an erosion and sediment control management plan must be prepared.

Since the *Regional Soil Plan* was made operative in 2001, only one consent has been granted under it. This was for vegetation disturbances for the extraction of logs from Te Wera Forest.

(B) SUSTAINABLE LAND MANAGEMENT PROGRAMME IN THE HILL COUNTRY

The objectives of the *Regional Soil Plan for Taranaki* are delivered through the Council's sustainable land management programme. When requested, the Council will prepare comprehensive farm plans that set out options and recommendations for individual hill country properties. The plans are prepared in close consultation with landowners and are offered free of charge.



Land Management officers support landowners to implement their farm plans.

⁷ Betts, H.D and Lynn, I.H. 2008. *Sustainable Land-Use Monitoring in the Eastern Taranaki Hill Country and Coastal Sand Country – 2007 Re-survey*. Prepared by Landcare Research for the Taranaki Regional Council.

LAND, SOIL & BIODIVERSITY

A comprehensive farm plan covers all soil conservation aspects of a farming operation, including land and stock management, while maximising the property's productive capability. These plans are based on land use capability through a detailed land resource inventory, derived from soil type, geology, vegetation, slope and present erosion. Recommendations may include planting of erosion control species or exotic forestry on slopes not suited to pastoral use, or retirement of very steep land to enable regeneration of native vegetation. Agroforestry plans are prepared for farmers interested in diversification by establishing woodlots or plantations.

In the past 10 years or so the Council has achieved good coverage of property plans and has maintained ongoing liaison with plan holders to assist with implementation of plan recommendations and work programmes over time. The extent of farm plans prepared by the Council to the end of June 1995 was only 42,000 ha or 13% of privately-owned land in the hill country (Figure 3.3a). This has quadrupled to 178,580 ha or 58 % of privately-owned hill country land by June 2008 (Figure 3.3b). A total of 269 comprehensive farm plans and 24 agroforestry plans have been prepared by the Council.

Land management officers from the Council support landowners to implement their farm

plans. Areas where recommendations have been implemented are noted in a database and will be analysed in the future to monitor the rate of implementation of farm plans.

A recent review of the level of community investment in environmental improvements found that the average farmer expenditure is over \$13,400 per year on implementation of sustainable land management practices such as environmental planting, forestry/ agroforestry development, or fencing and retirement of erosion-prone land⁸. The annual cost was adjusted according to the *Farm Expenses Price Index* published by Statistics

New Zealand. Thus the total annual farmer expenditure under this programme is \$2.2 million per annum on hill country protection.

The Council intends to continue its sustainable land management programme into the future. Further improvements in land use sustainability will be required to meet the *Regional Soil Plan* target of 89% sustainability by 2011 – a further increase of 1.6% by 2011. Given the increase in sustainability over the most recent monitoring period, and economic disincentives for farming unsustainable land (such as rising fertiliser costs) there is a good basis for optimism that this target can be achieved.

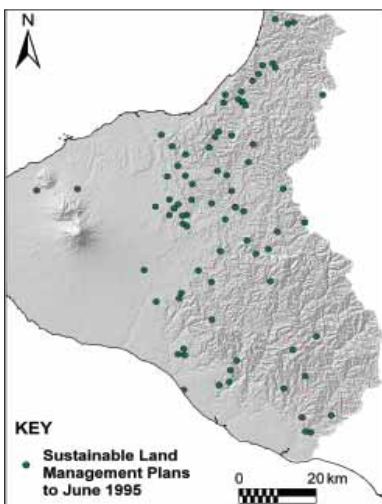


Figure 3.3(a): Number of sustainable land management plans prepared up to June 1995.

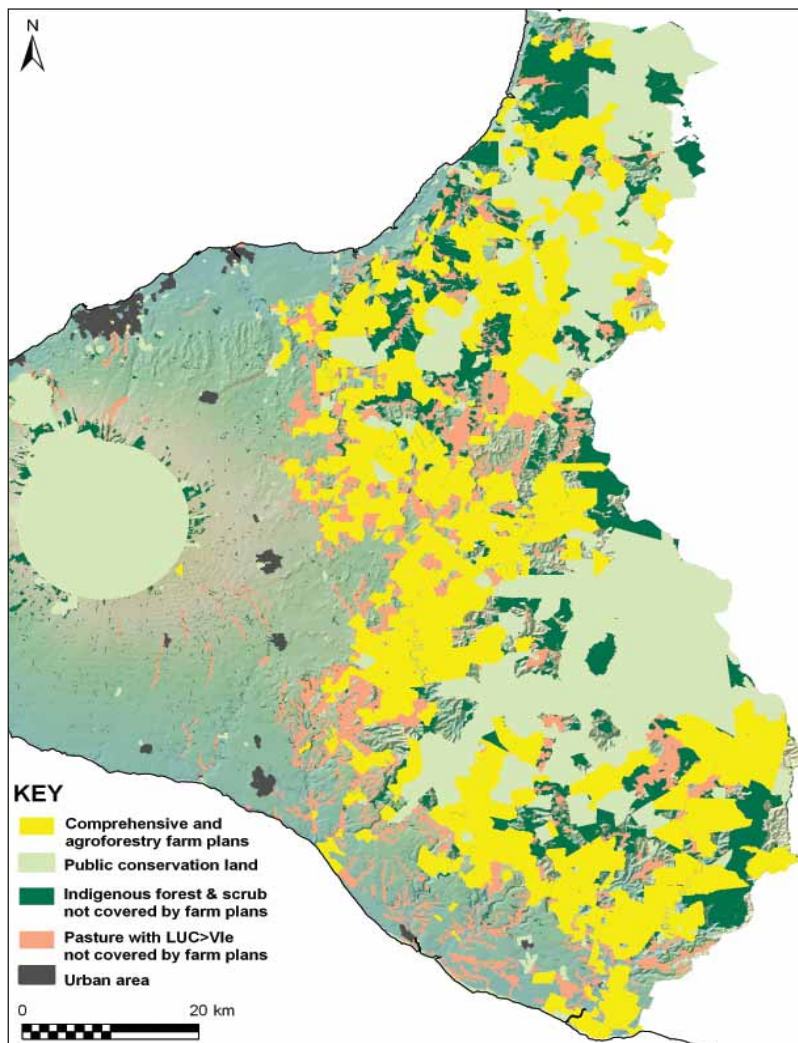


Figure 3.3(b): Coverage of comprehensive and agroforestry farm plans in the hill country up to June 2008.

⁸ Wu, J; Sanderson, K. June 2008. *Community Investment in Environmental Improvements in Taranaki*. Prepared by Business and Economic Research Limited for the Taranaki Regional Council.



Land Services Manager Don Shearman with Cam and Sarah Collier.

POLES WITH A PURPOSE

Their aim has always been simple: controlling erosion and providing shade and shelter. But along the way, sheep and beef farmers Cam and Sarah Collier have become award-winners and role models for sustainable land management.

With nearly two-thirds of their Mangamingi property identified as susceptible to accelerated erosion, the Colliers have established exotic forest on 480 ha of the steeper land and planted hundreds of poplar poles – 50 to 150 a year for the past two decades – on the more productive pasture land.

The poles are young tree stems 3 m long, which root and sprout when planted. Planting so many has been a big effort but Cam is pleased with the result – “they’ve been good”.

The poles anchor soil with their roots, effectively controlling hill slope erosion and reducing the sediment entering watercourses. By keeping

soil on hillsides, they maintain pasture production at a good level, and by helping to prevent slips and gullies, they reduce damage to farm assets, and the cost of repairing damage after storms.

The pole planting is among sustainable land management measures the Colliers are carrying out under a Comprehensive Farm Plan prepared for them by the Taranaki Regional Council. They also have an Agroforestry Plan, under which their exotic forest was developed.

All this work continues soil conservation work started by Cam’s father in the 1970s, when a 223 ha block of near pristine lowland, podocarp-hardwood native forest on the property was protected with a QEII National Trust covenant.

Annual pest control operations aimed at possums and goats are carried out in this block in conjunction with Forest and Bird. Cam said the dividend is the increased birdlife and rejuvenation of native species.

And the Colliers’ efforts haven’t stopped there. Another 10 ha of the property have been enhanced with amenity plantings, the establishment of blackwoods, wetland retirement and riparian planting, and shelter belt establishment.

Cam believes fencing and planting waterways, even on the flat, not only make the property safer for stock but are also more economic in the long run than trying to keep these areas drained.

“Once the initial cost is out of the way, it’s cheaper than getting a digger in every few years to keep the drains clear.”

The Colliers were recognised in the 2008 Taranaki Regional Council Environmental Awards, the award’s citation noting their commitment to sustainable land management.

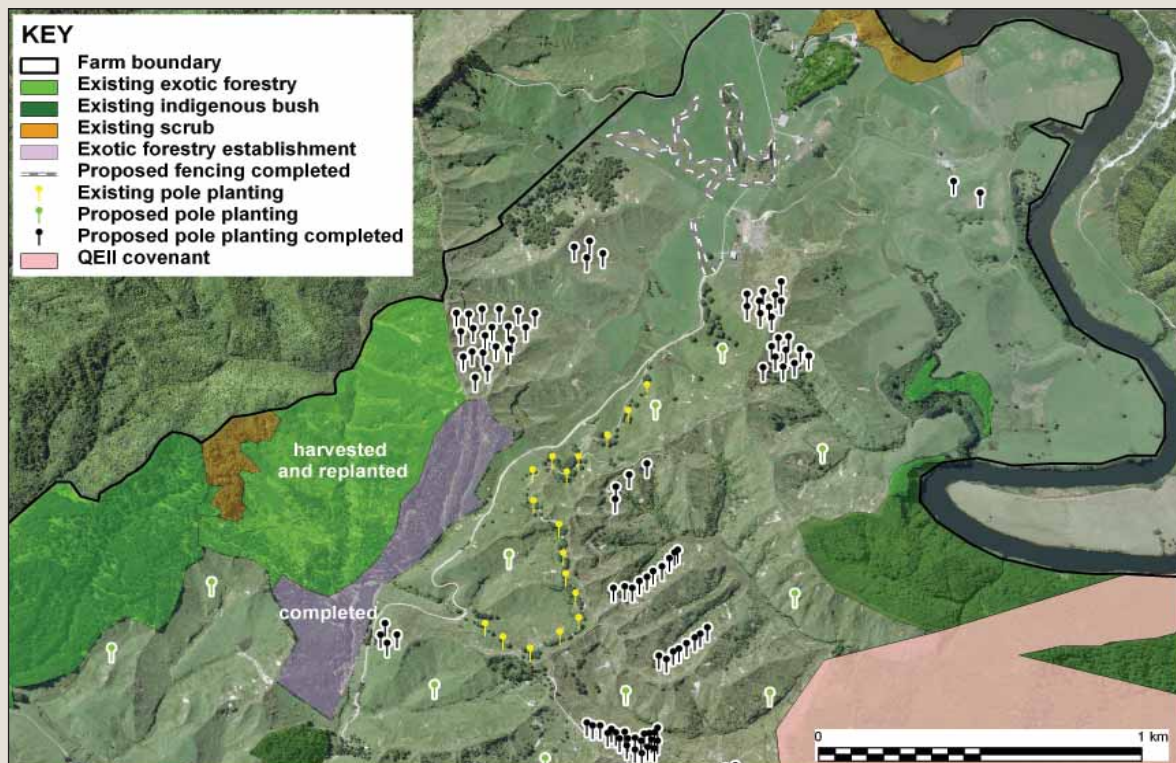


Figure 3.4: An extract from the Colliers’ farm plan showing recommended and implemented works.



A comprehensive farm plan is one of the tools Rod Pearce uses to sustainably farm his Waitōtara sheep and beef property.

HINTS TAKEN IN THE HINTERLAND

When Mother Nature speaks, it pays to listen. And landowners and Taranaki Regional Council staff have been all ears in the Waitōtara Valley following successive floods that highlighted some hard geological facts.

And soft geological facts. The valley varies from consolidated sandstone in the upper reaches where erosion is related to rock hardness, to mudstone, siltstone and moderately consolidated sandstone throughout the catchment – where the erosion potential is governed by the type of vegetation and a soft sandstone belt further down which are highly vulnerable to erosion. There's also a mixture of slump-prone hill country.

After the flood in 2004, Landcare Research analysed satellite imagery to find 465 ha of landslides in the Waitōtara catchment. Of this, 20% to 25% was made up of slip scars and the rest was trails of debris spread approximately 10-20 cm thick. Compared to pasture, closed canopy forest (both exotic and indigenous) reduced landslides by 90%, while scrub reduced the incidence by about 80% and space-planted trees by 60%.

On the ground, the Council's land management staff and landowners could see there was more erosion on the northerly (sunny) faces of steep, moderate to hard sandstone country higher in the valley.

Gully erosion was also severe throughout the catchment, regardless of geology or vegetation type, and resulted in many culverts or bridges blowing out, and logs and debris forming log jams in confined channels or being widely scattered on flood plains. There were also large areas of deep-seated slumps in the mid to upper catchment.

With the land speaking so eloquently, there was clearly a need to do more than listen. The Council took an action plan to landowners, built around the assistance available through its sustainable land management programme.

The Council draws up comprehensive farm plans at no cost to landowners, and also supplies at-cost poplar and willow material to help stabilise land.

The plans are based on a detailed land resource inventory and include an analysis of the property's soils, geology, vegetation, slope and erosion. This gives landowners a good indication of the options for

using their land sustainably, and the plans also recommend measures to stabilise and protect the soil's productive capability. More recent plans also indicate production potentials for different parts of the property and provide some basic economic analyses. The idea is to match land use to the potential of the land.

By understanding the land's potential for sustained production, inputs can be increased on better classes of land and soil conservation measures can be implemented so that pastoral farming can continue where suitable. Land that is not sustainable under pastoral farming can be assessed for alternative land uses such as forestry, or retired if only suitable for conservation purposes. Generally, farm plans highlight sustainable land management practices without an overall loss of productivity on the farm.

It's an approach that has found ready acceptance in Waitōtara Valley, and Figure 3.5 shows how well the farm planning services have been taken up.

After another heavy downpour in July 2006 resulted in significant flooding and silt deposition, particularly in the Moumahaki and mid to lower Waitōtara catchments, landowners were offered a Council relief package of up to \$8,000 for plants to promote land stability and up to \$10,000 for half the cost of grass seed.

The plants to promote land stability were mainly 3 m poplar and willow poles and grass seed for the revegetation of slip erosion debris trails - not for the re-sowing of flats covered in silt. The 2006 flood also resulted in more demand for information on soil conservation options.

This sustainability option involves working with Mother Nature so she is less prone to angry outbursts in the form of erosion and floods.

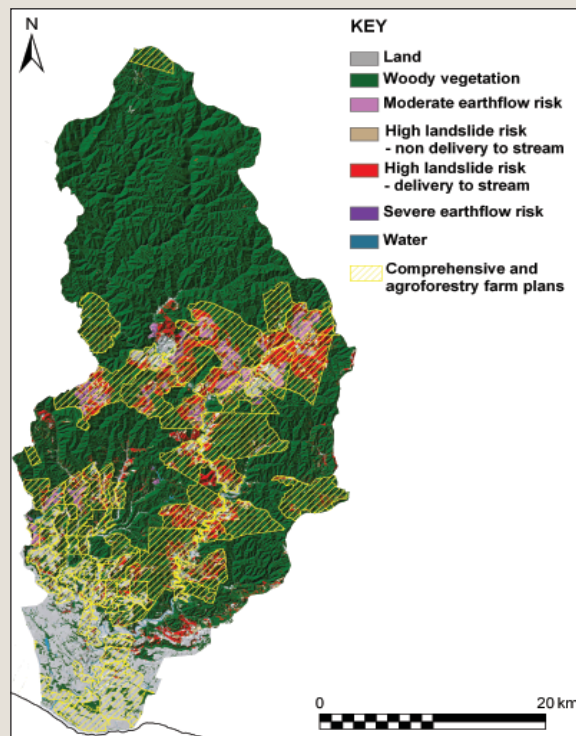


Figure 3.5: Coverage of farm plans in the Waitōtara catchment in relation to land susceptible to erosion.

(C) CARBON FARMING IN THE HILL COUNTRY

The previous Government introduced policies to promote the removal of carbon from the atmosphere including several schemes to encourage landowners to retain land in trees or grow in new trees, and thus earn carbon credits (see case study in Chapter 6: Atmosphere). While the emission trading scheme is being reviewed, schemes which encourage the retirement or planting of marginal hill country, making its land use more environmentally sustainable, will complement the Council's sustainable land management programme.

(D) SUSTAINABLE LAND MANAGEMENT IN THE SAND COUNTRY

The Council also works with landowners of sand country by preparing property plans to provide information and advice on managing sand country sustainably. Conservation plans specifically addressing sand blow problems and riparian plans make recommendations for the retiring and planting of waterways and for the provision of shelter belts which can minimise the risk of sand blow outs. The Council has prepared property plans covering 5,233 ha, or 41% of the region's coastal sand country, the extent of which in South Taranaki are illustrated in Figure 3.6.

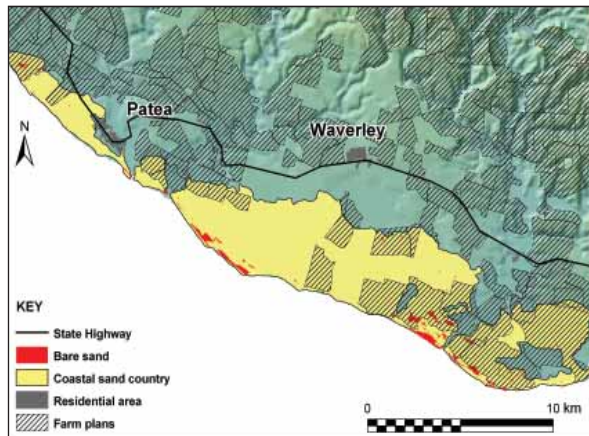


Figure 3.6: South Taranaki showing coverage of property plans and extent of bare sand.

(E) INFORMATION, EDUCATION AND ADVICE

The Council receives and responds to numerous requests from the public for information on sustainable land management and has prepared a number of pamphlets and other educational material. By way of example, in 2007-08, the Council liaised with existing property plan holders on 2,487 occasions (over twice the number in 2000-01) and received and responded to 554 requests for advice and assistance on a wide variety of land management related issues. The Council will continue to provide the community with information on sustainable land management.

(F) PLANTING MATERIAL

The Council operates a scheme involving the supply to property plan holders of low cost poplar and willow plants for soil stability purposes. During the 2007-08 year the Council provided 12,569 poplars and willows to 73 landholders. Over the past 10 years, the Council has supplied over 90,000 poplars and willows to landholders (Figure 3.7). The provision of planting material at cost is a key component in the success of the Council's sustainable land management programmes.

(G) SUMMARY OF PROGRESS

A summary of progress in implementing regional objectives and policies on soil erosion is given in Table 3.2 below.

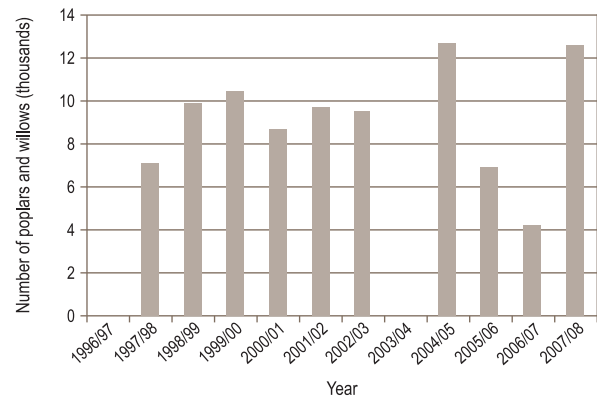


Figure 3.7: Plants provided to landowners at cost for soil stability planting over the past 10 years.

Table 3.2: Summary of progress: implementing regional objectives and policies on soil erosion.

Issue	What do we want to achieve?	What are we doing about it ?	Where are we at ?
Accelerated erosion	<ul style="list-style-type: none"> • 89% of privately-owned hill country sustainably managed. • A 50% increase in forestry or plantings on steep land (Class VIe and VIle). • No net loss in the area of indigenous forest on steep hill country land. • A 5% reduction in the area of bare sand in the coastal sand country. • 50% of privately-owned hill country and sand country covered by farm plan. • 70% of property plans implemented in whole or in part. 	<ul style="list-style-type: none"> • Implementing the <i>Regional Soil Plan</i>. • Preparing property plans through the sustainable land management programme. • Hill country and sand country monitoring. • Providing advice and information. • Providing planting material. • Developing methods for monitoring implementation of property plans. 	<ul style="list-style-type: none"> • 87.4% of the hill country is managed sustainably. • Area of plantation forestry in the hill country has doubled. • 3% decrease in area of indigenous forest on monitored sites. • Overall decrease in area of bare sand at monitoring sites. • 58% of privately-owned land in the hill country is in the sustainable land management programme. • 41% of privately-owned land in the coastal sand country is in the sustainable land management programme. • 269 comprehensive farm plans and 24 agroforestry plans have been prepared.

Table 3.3: Area of pasture on erosion-prone hill country by region between 1997 and 2002.

Region	Erosion-prone area (ha) in pasture in 1997 (LCDB1)	Erosion-prone area (ha) in pasture in 2002 (LCDB2)	Percentage of total regional land area (%)	Area (ha) change from pasture (LCDB2)	Percentage change (%)
Northland	67.723	65.832	5.10	-1.691	-2.50
Auckland	13.101	12.988	2.49	-53	-0.40
Bay of Plenty	27.000	25.855	2.20	-1.104	-4.09
Waikato	116.049	112.315	4.58	-3.680	-3.17
Gisborne	169.141	158.382	19.01	-8.151	-4.88
Hawke's Bay	113.128	110.416	7.80	-2.537	-2.24
Manawatu	230.585	223.535	10.08	-6.793	-2.95
Taranaki	40.580	38.444	5.30	-2.136	-5.26
Wellington	54.281	51.387	6.33	-2.794	-5.15
Nelson	1.612	1.535	3.52	-76	-4.74
Tasman	24.249	22.697	2.39	-1.012	-4.17
Marlborough	75.042	71.946	6.84	-3.107	-4.14
Canterbury	113.995	113.770	2.52	-220	-0.19
West Coast	4.623	4.592	0.20	-16	-0.35
Otago	101.531	101.236	3.17	-294	-0.29
Southland	26.083	25.437	0.80	-646	-2.48
North Island	829.587	799.154	N/A	30.433	-3.67
South Island	347.134	341.213	N/A	-5.291	-1.71
Total	1.176.721	1.140.367	N/A	-36.354	-3.09

Notes:

1. Figures rounded to the nearest 200 hectares.

2. Pasture classes from the erosion risk data used for this analysis limited to the Land Cover Database 'Primarily Pastoral' classes for reporting.

Data: Landcare Research, from MFE, 2007.

3.1.3 HOW DO WE COMPARE?

The Ministry for the Environment has compared areas of erosion susceptible land in New Zealand and the at-risk area being farmed by region by comparing satellite images between 1997 (LCDB1) and 2002 (LCDB2)⁹. According to the Ministry's analysis, Taranaki has 5.3% of its region in erosion-prone land in pasture, compared to neighbouring regions such as Waikato (4.6%) or Manawatu-Wanganui (10%) (Table

3.3). The amount of erosion-prone land in pasture recorded in 2002 decreased nationally by 36,000 hectares. In Taranaki there was a 5.4% reduction in the amount of erosion-prone pasture land between 1997 and 2002 (this figure differs to that determined through the Council's own monitoring due to the different methodology used but is still of a similar magnitude and in the same direction). This was the highest percentage of change recorded for all the regions, followed by the Wellington region (showing 5.2% reduction in erosion-prone pasture land) and the Gisborne region (which demonstrated a 4.9% reduction).



East Taranaki hill country.

3.2 SOIL HEALTH

3.2.1 WHAT IS THE CURRENT STATE OF SOIL HEALTH IN TARANAKI?

(A) INDICATORS

Soil health refers to the biological, chemical and physical state of the soil and the maintenance of soil ecosystems. It includes aspects such as the structure of the soil, the levels of organic matter, nutrients and trace elements and levels of any contaminants. Ecological processes

⁹ Ministry for the Environment. 2007. *Environment New Zealand 2007*. Note: LCDB = Land Cover Database.