Allowing land to revert to scrub or bush can reduce the risk of erosion.

Sustainable land use

Taranaki's sustainable land management programmes and planting schemes mean that sustainable land use in both the hill country and the coastal sand country has increased considerably in the past two decades.

Key factors that influence vulnerability to erosion are the underlying geology, the type of vegetation cover, and levels of rainfall. Although erosion is a natural process, human activity can accelerate its rate. However, land that is used sustainably is less susceptible to erosion. Therefore, practices such as land retirement, planting vegetation in areas prone to erosion, and managing stock appropriately all work to minimise pressure on land resources, and ultimately ensure the region's precious soil resource stays on the land. The Council monitors sustainable land use in areas of the region prone to erosion, predominantly the eastern hill country and coastal sand areas. Long-term data allows us to analyse trends and develop effective programmes to manage land well into the future.

The eastern hill country

One of the ways the Council monitors sustainable land use in the eastern hill country is to compare the land use classification of an area with its actual physical use. In this way we can assess if land is being used sustainably—that is, used within its physical limitations. Between 1994 and 2012, the Council measured long-term sustainable land use by monitoring 25 representative sites in the eastern hill country. These sites cover 7% of the total area in the hill country. Overall, these results show that sustainable land use in the hill country has increased in the past two decades

Another way we measure sustainability in the hill country is by monitoring the implementation of soil conservation recommendations made in Council-prepared farm management plans. Most of the sediment that can end up in waterways is the result of mass-movement erosion, which encompasses various forms of landslide. Land with a slope greater than 20 degrees and sown in pasture, is most vulnerable to mass-movement erosion because shallow grass roots do not have the same capacity to hold soil as woody vegetation does. Compared with pasture, tree cover can reduce erosion by 90%. Planting open-spaced soil conservation trees can reduce erosion by 70%.

The Council captures the amount of recommended conservation work that has been implemented using the Geographic Information System (GIS). We estimate the amount of sediment generated by erosion that is likely to enter a watercourse using the New Zealand Empirical Erosion Model (NZEEM).

What's the story?

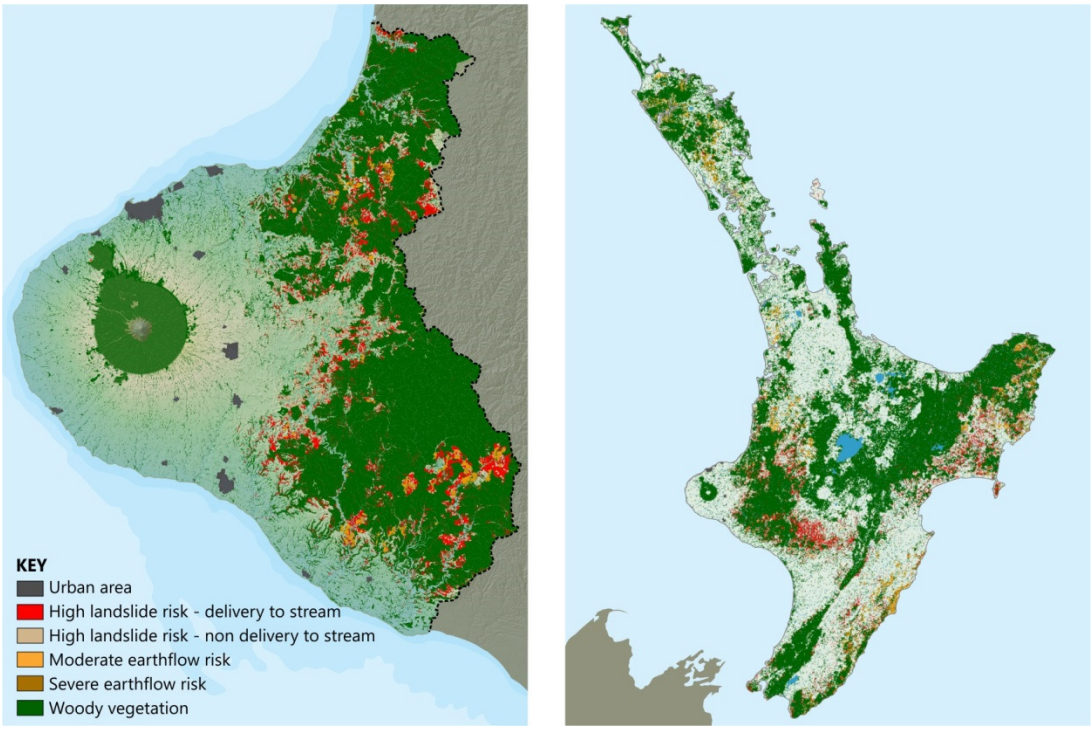
Most of New Zealand's soft rock hill country that is susceptible to the different forms of mass-movement erosion is in the south-east and west of the North Island. Of that, only about 14.5% is within Taranaki's boundaries. Even then, because much of Taranaki's hill country has woody vegetation cover, only a small proportion of the hill country actually has moderate to severe erosion potential—6.8% of the North Island's susceptible land area. The proportion of Taranaki's susceptible hillcountry area that is privately-owned is relatively high at 27%.

In the past 18 years, sustainable land use in the eastern hill country has either improved or has been maintained. As of 2012, monitoring shows 87.1% of the land area in the eastern hill country being used sustainably.

'Only a small proportion of the hill country has moderate to severe erosion potential. '

Since 1994, there has been a move away from meat and wool farming on eastern hillcountry land considered unsuitable, or marginally suitable, for these uses and the land has either been planted in forestry or reverted to scrub. These changes in land use led to a 2.4% increase in sustainability between 2000 and 2007.

Favourable returns for meat and wool farming stimulated some sporadic scrub clearance on steeper land between 2007 and 2012, but there was little change in sustainable land use overall.



Most of New Zealand's soft rock hill country susceptible to mass-movement erosion is in the south-east and west of the North Island (right). In Taranaki, much of the at-risk land is stabilised by woody vegetation (left).

Category	Taranaki (ha)	North Island (ha)	% of North Island erosion categories in Taranaki
High landslide risked–delivery to stream	45,962	526,711	8.7
High landslide risk–non delivery to stream	29,766	244,995	12.1
Moderate earthflow risk	7,222	295,628	2.4
Severe earthflow risk	524	101,482	0.5
Gully risk	0	49,849	0
Total area of vulnerable land (ha)	83,474	1,218,665	6.8

Area in Taranaki vulnerable to the different types of erosion in relation to the North Island (table sourced from NZEEM).

Currently, 65% of privately-owned land area in the hill country has a Council-prepared farm plan in place. These plans include recommendations for soil conservation measures to reduce erosion, reducing the potential for sediment generated from entering the region's waterways.

'Currently, 65% of privately-owned land area in the hill country has a Council-prepared farm plan in place.'

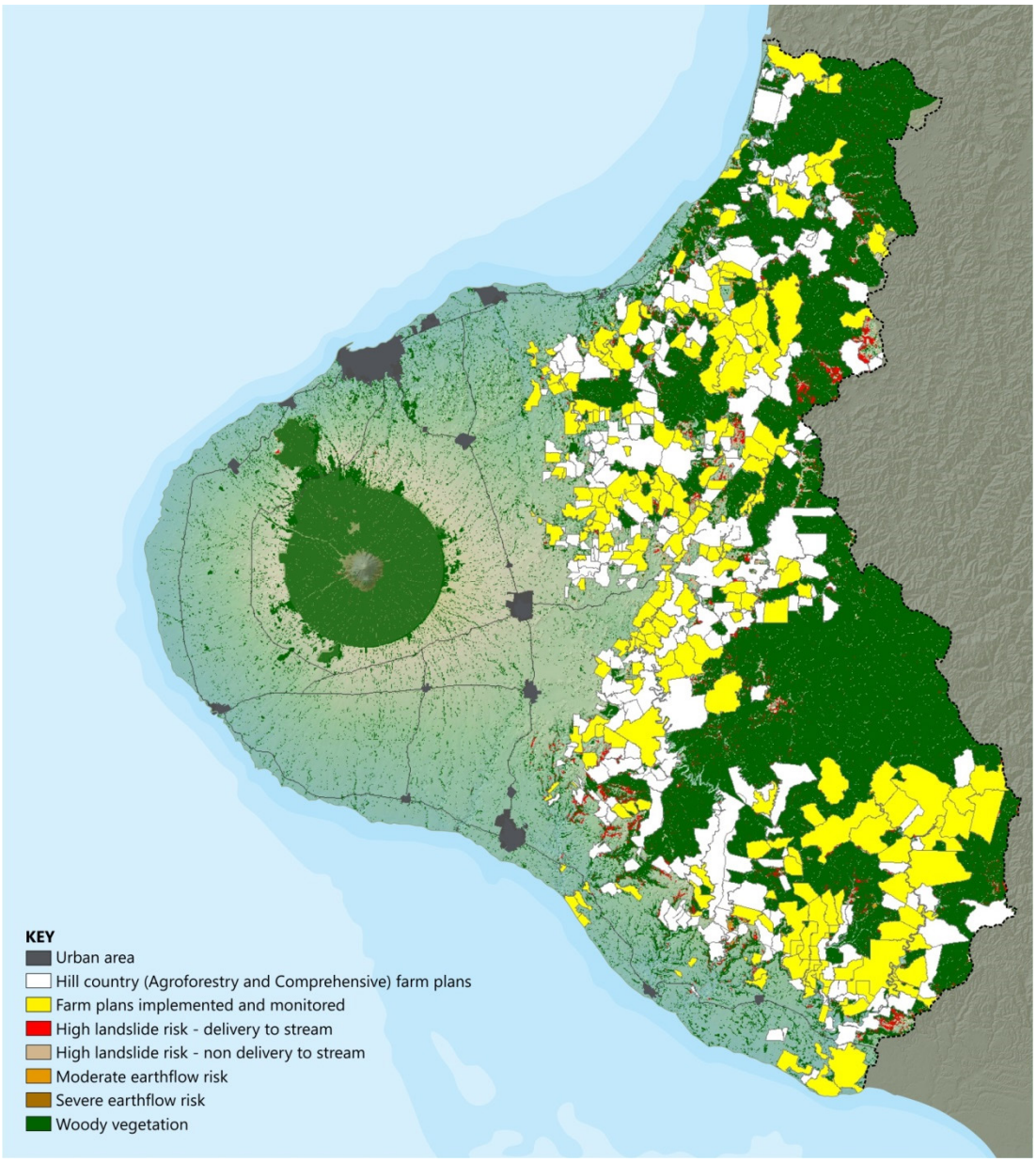
To date, 48% of the area covered by farm plans (95,616 hectares) has been monitored to determine if plan recommendations have been implemented.

Results show that 23,722 hectares of marginal land has been retired. Of that, 17,854 hectares is in existing native forest or regenerating shrubland and is largely unfenced. A further 5,868 hectares has been fenced, of which 3,444 hectares of pasture has reverted to scrub or bush.

In addition, 4,721 hectares of exotic forestry and 68 hectares of native production forestry have been established.

Estimates are that once the recommendations of farm plans are fully implemented, mature soil conservation works could reduce sediment from a calculated 2,056,000 tonnes per km^2/year to 953,000 tonnes per km^2/year.

Planting on steeper land and in gullies is shown to significantly reduce soil erosion.



A large percentage of the eastern hill country has a Council-developed farm plan in place (in yellow and white above) and almost half of the land area has been monitored (in yellow).

Regional comparisons

Of the total land area in Taranaki, 56% is hill country. As previously mentioned, despite the soft rock geology, woody vegetation cover means that Taranaki has only a small proportion of the total North Island land area vulnerable to severe to moderate erosion (6.8%). The Manawatū-Wanganui region has about 75% hill country, of which 40% has potential for moderate to severe erosion.

The Taranaki Regional Council is one of five regional councils participating in the Government's *Sustainable Land Management Hill Country Erosion Programme for Regional Councils* which was introduced following the 2004 flood events in the Manawatū. An overview of three regional schemes is presented overleaf.

The Taranaki Regional Council delivers the South Taranaki and Regional Erosion Support Scheme (STRESS). The Greater Wellington Regional Council operates the Wellington Regional Erosion Control Initiative (WRECI) and Horizons Regional Council, the Sustainable Land Use Initiative (SLUI).

	Taranaki (STRESS)	Greater Wellington (WRECI)	Horizons (SLUI)
Region (ha)	723,610	813,000	2,200,000
Hill country in private ownership under scheme (ha)	306,000	96,600	1,391,481
Moderate to severely erodible land under scheme (ha)	92,053	56,000	272,582
Moderate to severely erodible land under scheme as % of hill country	30	58	20
% of hill country in scheme under a farm plan	65	59	26
Grant funding ($)	1,063,000	675,000	5,800,000
Area retired (ha)	3,333	88	3,431
Forest planted (ha)	204	37	7,470
Forest planted under afforestation grant scheme (ha)	734	900	1330
Poles planted	19,273	35,070	65,014

A summary of the Taranaki, Greater Wellington and Horizons regional councils' hillcountry erosion and afforestation grant schemes over the last five years (1 July 2009 to 30 June 2014).

Find out more

Basher et al. 2008. Hill country erosion: a review of knowledge on erosion processes, mitigation options, social learning and their long-term effectiveness in the management of hill country erosion. Landcare research Contract report: LC0708/081.

Regional council erosion model rollout: Landcare Research NZ Ltd and Institute of Geological and Nuclear Sciences Ltd.

South Taranaki Erosion Support Scheme—four year interim report to Ministry for Primary Industries.

Gibbs Family Trust tinyurl.com/TRC2m

Focused couple reaps the benefits

Jacqueline and Robin Blackwell with Taranaki Regional Council Chairman David MacLeod.

Robin and Jacqueline Blackwell have won plaudits for their land stewardship but they see more than environmental benefits in taking a sustainability approach to managing their 660 hectare Tariki cattle and sheep farm.

Take riparian fencing and planting, for example. It's a proven and effective method of protecting waterways and enhancing water quality and native biodiversity. But having fenced the entire Mangaotea Stream and most of its tributaries on their property, and protected the waterways with 3,300 native plants, the Blackwells see plenty of other advantages.

"It's better for animal welfare—we don't lose stock into waterways now," says Robin. "And with the smaller waterways fenced, they don't get clogged up and we don't have to spend time clearing them."

All in all, the Blackwells have fenced 14.4 kilometres of streambank and planted 4.27 kilometres in native plants. They've also put in native plants around the fringes of small wetlands and ponds, and on banks prone to soil erosion.

On steeper slopes, they have retained 21 hectares of native bush and 22 hectares of gully-head scrub to minimise the potential for erosion, and planted 700 poplar poles on erosion-prone slopes and in shelterbelts. Another 3.3 hectares of erosion-prone slopes have been planted in exotic forestry.

Most of these steps were laid out in a comprehensive farm plan prepared in conjunction with the Taranaki Regional Council in 2004. A riparian management plan was drawn up more recently and the Blackwells have already implemented 85% of it, having started this work in the 1990s well before the plan was prepared.

"As well as the environmental benefits and the aesthetic improvement, having all this in place really does make the property easier to work," says Robin. "We try to take a long-term view and when we decide to do something, we aim to do it once and do it right."

The Blackwells have also covenanted two bush blocks totalling 2.2 hectares with the QEII National Trust to protect kahikatea remnants, and have identified other areas for future protection.

'As well as the environmental benefits and the aesthetic improvement, having all this in place really does make the property easier to work...'

Their efforts have not gone unnoticed. At the inaugural Ballance Taranaki Farm Environment Awards in April 2014, they picked up the Taranaki Regional Council-sponsored sustainability award as well as the Donaghys award for farm stewardship, Beef+Lamb NZ's livestock award and the Hill Laboratories harvest award.

The wide scope of the awards won by the Blackwells demonstrates how sustainable stewardship can go hand in hand with a firm focus on production achievements. They have also done well in Beef+Lamb NZ's 'Steak of Origin' awards for a number of years running.

In the midst of dairy country, their farming operation encompasses Angus, Hereford and Murray Grey registered breeding cows to breed bulls for their on-farm beef and dairy bull auction, dairy grazing and a commercial Romney flock, Southdown sheep stud and hay sales. They winter 11,000-plus stock units.

The coastal sand country

Two per cent of Taranaki's land is adjacent to the coast and exposed to strong prevailing winds from the west. Predominantly used for pastoral farming, the coastal sand country is susceptible to wind erosion if it is not managed sustainably and vegetation cover is lost. Changes and trends in the amount of bare sand in the coastal sand country are monitored to determine sustainable land use.

Two methods were used to assess sustainable land use in the coastal sand country. One is an historical programme, where the Council engages Landcare Research to monitor areas of bare sand at four representative sites covering 3,339 hectares or 26% of the coastal sand country area. In the other, the Council digitally captured areas of bare sand using aerial photography in 2007 and again in 2012 and compared the images. Sites with significant changes in the amount of bare sand were also 'ground-truthed' to verify the vegetation cover and analysed to determine actual land use.

'An overall 11% reduction in the area of bare sand … totalling 65.5 hectares.'

What's the story?

Monitoring since 1994 shows an overall reduction in the area of bare sand in the coastal sand country. Between 1994 and 2012 there was a 26.7 hectare overall net decrease in the area of bare sand at the four representative sites. Results of the larger-scale aerial monitoring showed an overall 11% reduction in the area of bare sand between 2007 and 2012, totalling 65.5 hectares.

These decreases in bare sand area are the result of stabilisation planting, forestry planting, reduced grazing pressure, and sand dune recontouring or clay capping (followed by conversion to irrigated pasture). The Council's *Sustainable Land Management Programme* has targeted the coastal sand country, working with landowners to help stabilise and reduce areas of bare sand.

New forestry planting (in foreground), and less intense grazing have contributed to a decrease in areas of bare sand in the coastal sand country.

Find out more

☎ *Changes in Taranaki Coastal Sandblows between 2007 and 2012.*

Sustainable land use monitoring in the eastern Taranaki hill country and coastal sand country: re-survey 2012.

📽 *Longview Limited tinyurl.com/TRC2b*

A Council Land Management Officer discusses a farm plan.

Our responses

Regional Soil Plan for Taranaki

The *Regional Soil Plan for Taranaki* was made operative in 2001 and contains policies, methods and rules to improve sustainability in the eastern hill and coastal sand country.

Currently, policies 1.1-1.4 of the *Regional Soil Plan for Taranaki* encourage adopting sustainable land management practices to reduce accelerated erosion. The Council's preferred approach to sustainable land management is to engage landowners voluntarily in our *Sustainable Land Management Programme*.

The *Regional Soil Plan for Taranaki* is currently under review. In 2015, the Council proposes the current *Regional Soil Plan* and *Regional Fresh Water Plan* will be combined into the *Freshwater and Land Management Plan for Taranaki*. This proposal recognises the interrelated nature of land and water management.

Sustainable Land Management Programme

Within the *Sustainable Land Management Programme*, the Council prepares comprehensive farm plans for landowners that include property-specific soil conservation solutions. Plans cover all aspects of a farming operation including land and stock management. They specifically address management practices that protect soil and water resources while maximising the productivity of the property. If forestry is seen as part of the property's future viability, this plan can also include an agroforestry plan.

Highlights of the past five years include:

- The preparation of 70 plans covering 20,234 hectares, of which more than 6,066 hectares have a high risk of erosion.
- Council-developed farm plans are in place in 65% of the hill country in private ownership, covering 65% of the region's most erosion-prone land.
- The Council is updating its GIS databases to capture the work implemented through its farm plans and to date, almost half of all plans have been monitored and entered into the GIS database. Planholders

monitored so far are the most active and represent a significant percentage of all works implemented through farm plans.

- Calculations by economic consultants Business and Economic Research Limited (BERL) conservatively estimate hillcountry farmers have invested $1.8 million in moving towards more sustainable land management practices over the past six years.

Future directions

With a large proportion of the most erosion-prone land now covered by farm plans, part of the Council's future focus in sustainable land management will shift from farm plan development to monitoring implementation of farm plan recommendations to manage erosion, and ultimately reduce sediment generation.

Forestry can be an alternative sustainable land use to pastoral farming in New Zealand's hill country, and is also a soil conservation measure. Currently, the Council permits harvesting of forestry provided, amongst other conditions, the land has a slope of less than 28 degrees. As part of future land management initiatives in the hill country, forest harvest is likely to be a permitted activity, regardless of slope. However, forest harvest occurring on land over 28 degrees in slope will likely require a *Site Erosion and Sediment Control Plan* to mitigate any erosion and sediment discharge as a result of harvesting activities.

South Taranaki and Regional Erosion Support Scheme (STRESS)

In 2010, the Council successfully secured $1,063,000 of government funding over four years for the South Taranaki and Regional Erosion Support Scheme (STRESS).

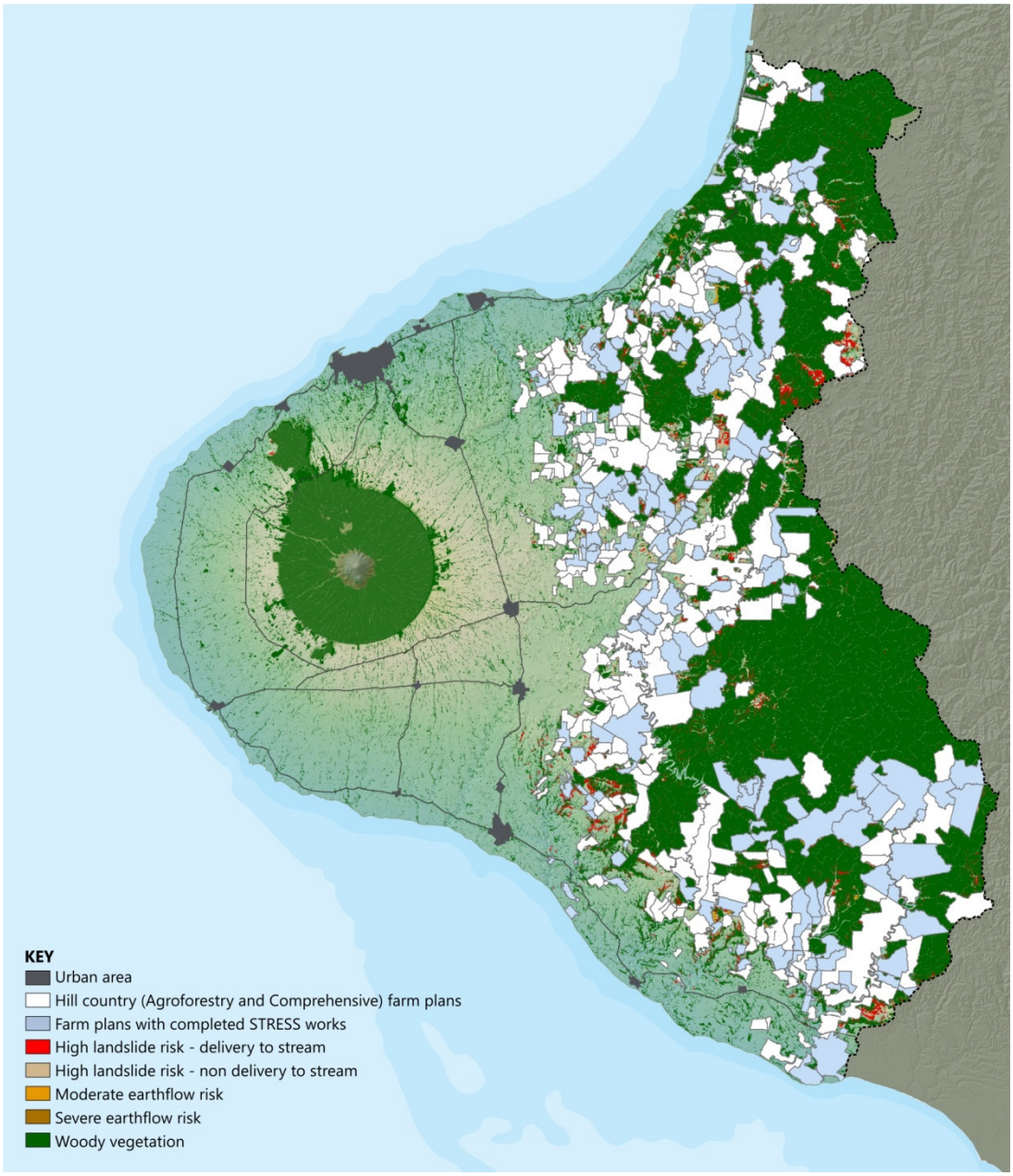
STRESS involves a programme of poplar and willow pole planting, close-spaced planting, retirement and reversion fencing targeting the Waitōtara catchment and other erodible land in the region.

When works are mature, sustainable land use in the hill country will improve, leading to a reduction in sediment generated and delivered to waterways.

Highlights include:

- Investment in STRESS totalling $3.9 million.
- Council's delivery and implementation of $1,063,000 of STRESS soil conservation grants.
- The establishment of 22,757 poplar and willow poles, 257.5 hectares of forestry, and 118.6 kilometres of fencing to retire 3,337 hectares of marginal land.
- Delivery of STRESS through Council's *Sustainable Land Management Programme* over the past five years achieving a significant increase in the implementation of soil conservation works.

An example of an at-risk area planted with poplars to reduce erosion as part of STRESS.



Areas prone to erosion, and farm plans with implemented STRESS works are mostly in the hill country.

Afforestation Grants Scheme

The Government introduced the Afforestation Grant Scheme (AGS) to encourage planting forest on Kyoto-compliant land in exchange for carbon credits. Regional councils can deliver a portion of the scheme where forest planting also has environmental co-benefits. Since 2009, 732 hectares of new forestry have been established through the Council's pool of the AGS.

CASE STUDY

Lyall Bunn (right) with a Council Land Management Officer among pine trees planted on land retired from pasture.

Turning talk into action

Lyall Bunn knows trees, likes trees and understands their important role in hillcountry stewardship. And for him, the South Taranaki and Regional Erosion Support Scheme (STRESS) is as much about turning talk into action as it is about the financial side of sustainable land use.

"It puts a timeframe around things," Lyall says of the scheme. "I'll have an idea about what I'd like to do next, then the Council Land Management Officer will get on the phone and we'll meet together to tease out the details and see where it all fits in with STRESS. Then all of a sudden the idea has become a plan complete with actions and dates—a move from thinking about it to actually doing it."

Motu Maniapoto at Tarata is the original Bunn family farm, now run by a manager jointly with a neighbouring property Lyall and Andrea Bunn acquired more recently. Together, the two properties total more than 900 hectares. The work is part of a family tradition. Several generations of Bunns have taken a number of sustainable land management initiatives, notably by establishing 34 hectares of production forestry and maintaining 347 hectares of indigenous bush on the original family farm.

Now it's the turn of Lyall and Andrea, who are focused on implementing farm plans developed with the Council for the original property in 2002 and for the new property in 2013.

Plans are afoot to erect a further 420 metres of fences and plant another 4.7 hectares of forestry on the new property, again with STRESS support. In addition to that they are maintaining 12.5 hectares of indigenous bush on the new property.

"It's typical hill country, really," says Lyall. "There are some areas where you know they should be in trees. That's always been the attitude of our family."

'Several generations of Bunns have taken a number of sustainable land management initiatives ...'

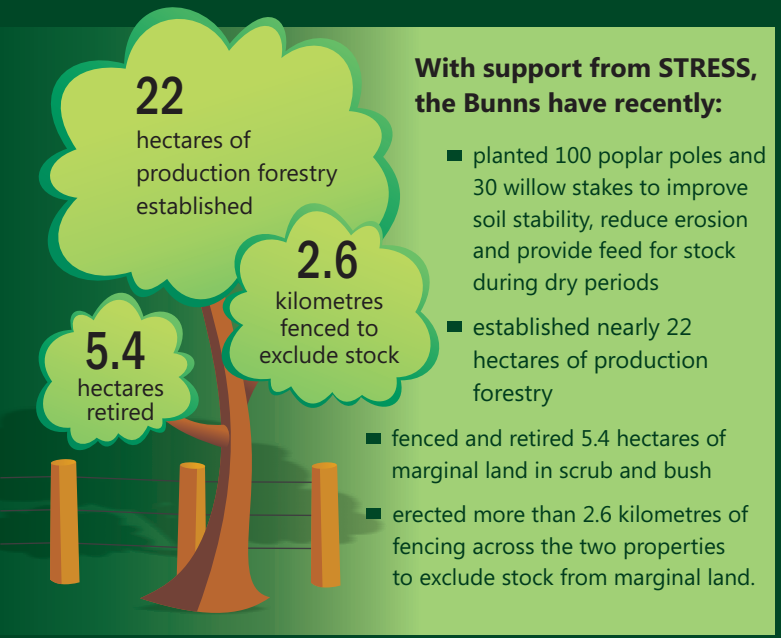
The indigenous bush being maintained on the original family farm covers 48% of the property, and on the new farm it covers 12.5 hectares, accounting for 5.7% of the area.

The Bunns are considering a QEII National Trust covenant on the latter, jointly with a neighbour who has an adjoining bush block. "I'm pro covenants and that sort of thing on land that obviously shouldn't be in production," says Lyall.

Under STRESS, financial assistance is available for soil conservation pole plantings, forestry and retirement fencing on hill country properties. These reduce the risk of accelerated erosion and the subsequent sediment that ends up in waterways and the marine environment.

The scheme has assisted many landowners to implement their farm plans drawn up in conjunction with the Council.

Bunn family farm tinyurl.com/TRC2h



With support from STRESS, the Bunns have recently:

- planted 100 poplar poles and 30 willow stakes to improve soil stability, reduce erosion and provide feed for stock during dry periods
- established nearly 22 hectares of production forestry
- fenced and retired 5.4 hectares of marginal land in scrub and bush
- erected more than 2.6 kilometres of fencing across the two properties to exclude stock from marginal land.

Plant provision schemes

The Council operates two plant provision schemes in which quality conservation plants are grown or obtained and made available to property planholders at cost. This is a key component in the success of the Council's soil conservation and riparian management programmes.

Since the scheme began in 1996, the Council has facilitated the supply of more than 3.6 million riparian plants to land owners. In the past five years we have supplied more than two million plants for riparian planting and 54,100 low-cost poplar and willow plants for soil stabilisation.

In 2013/2014 alone, the Council contracted nurseries to supply in bulk 467,328 native riparian plants, reducing the cost of plants for landowners. We also facilitated the supply of 6,850 sand stabilisation plants for four coastal sand country sites. For more information on the riparian planting programme (see Chapter 3—Fresh water, *page* 84).

Landowners collect low-cost plants from the Council depot at the Stratford A&P Showgrounds.

Information, education and advice

Each year the Council receives and responds to numerous requests from the public for information on sustainable land management relating to vegetation clearance, native logging, the implementation rate of the *Sustainable Land Management* and *Riparian Land Management* programmes, aerial photography, planting advice and new property plan enquiries.

In 2013/2014, the Council received and responded to 226 requests for advice and assistance on a wide variety of land management issues. Most of these requests related to land management practices, and, to a lesser extent, information requests from other agencies. Planholders also get information directly from Council officer visits as a part of Council servicing their plans. We also distribute a large number of pamphlets and other educational material to interested individuals and organisations in relation to sustainable land management.

Find out more

Community investments in environmental improvements in Taranaki 2008–2014 tinyurl.com/TRC2n

Regional Soil Plan for Taranaki tinyurl.com/TRC2d

Sustainable land management and plant supply annual report 2013/2014 (TRC) tinyurl.com/TRC2f

Transforming Taranaki: Riparian Management Programme tinyurl.com/TRC2g