2014–2018

State of our environment

Summary report

HAWKE'S BAY
REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

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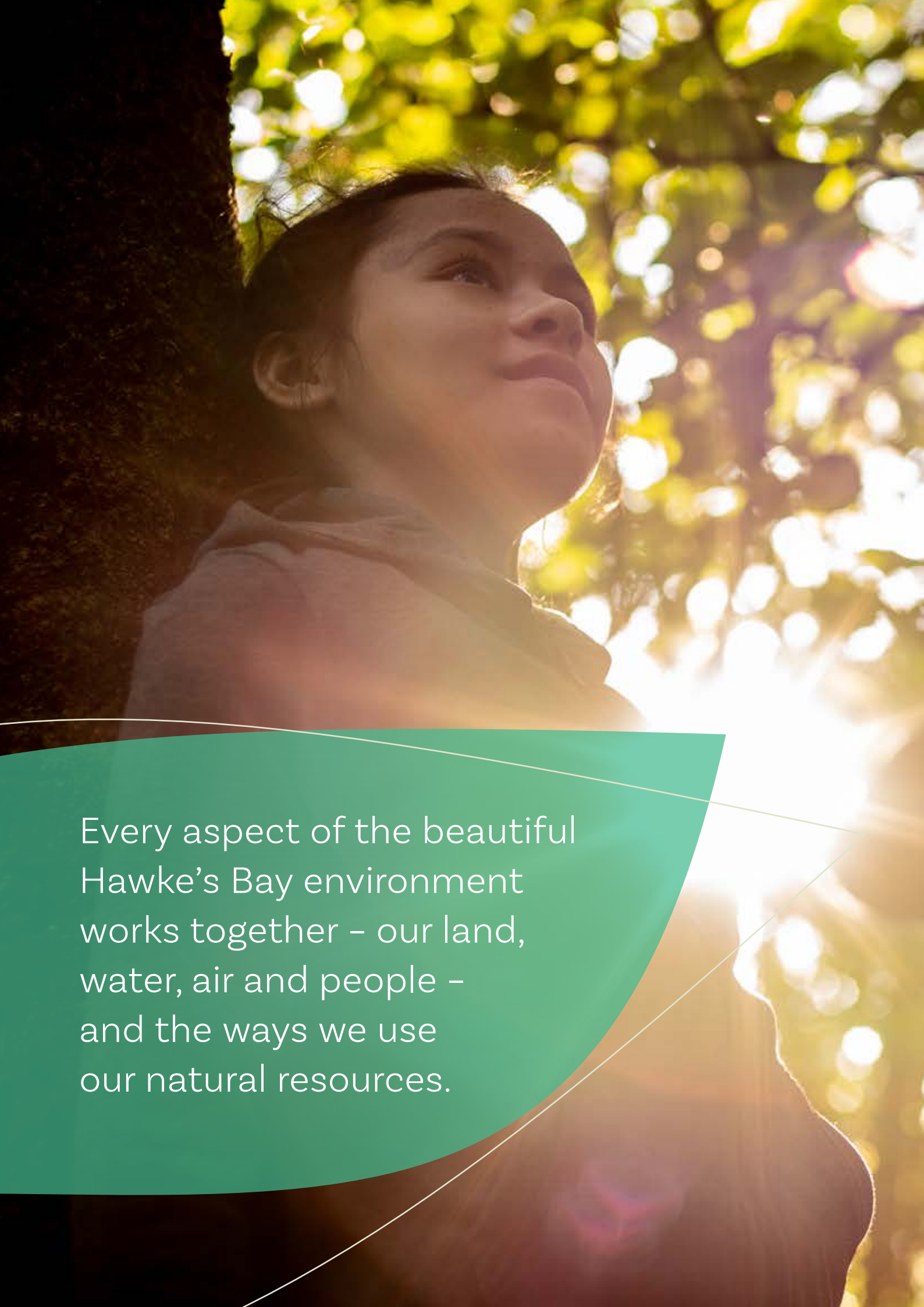

Every aspect of the beautiful Hawke's Bay environment works together – our land, water, air and people – and the ways we use our natural resources.

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INTRODUCTION

Everything is connected.

Every aspect of the beautiful Hawke's Bay environment works together – our land, water, air and people – and the ways we use our natural resources.

Our physical environment of land, water and air surrounds and supports every one of us, yet is often taken for granted. We busy ourselves with a focus on the things we own or use, such as transport and technology, homes, streets, shops, parks and local facilities. These are all big factors in where and how we live, but not as fundamental to our ongoing health and wellbeing as the natural environment.

This State of the Environment summary report provides a picture of Hawke's Bay from the perspective of our impact on the natural resources around us.

Over the last five years, the most noticeable improvement to our environment in Hawke's Bay has been to air quality. This is particularly due to the continuing focus of Hawke's Bay Regional Council on removing open fires and upgrading home heat sources in the built-up areas of Napier and Hastings.

Just as important, but often unseen, has been the gearing up of our organisation to help landowners keep more soil on the land – though farm planning, planting, good management and innovative practices. We've also deployed more and better technology to learn and share what is happening in local environments through water metering, water quality measurement and aquifer modelling.

This gearing-up has improved our knowledge base. We are using technology to track change more accurately, to help landowners and support agencies to adapt land use more quickly. Online environmental data and mapping tools are just two of the services we provide through hbrc.govt.nz.

Managing issues associated with our land, water and air will always be challenging, but – as is always true – there is no better time than right now to work together to improve our fresh water and find more sustainable ways to use and live on our land.

The Regional Council is working closely with numerous local and national agencies, and with central government, to be more aligned in areas of freshwater policy, to factor in any reform to the Resource Management Act and enhance resilience to climate change.

In April 2019, the Ministry for the Environment (MfE) gave a report based on three years of knowledge. Many of the priority issues given notice in MfE's report are common to Hawke's Bay, from ecosystems under threat, to degraded soil and water quality and the increasing effects of climate change.

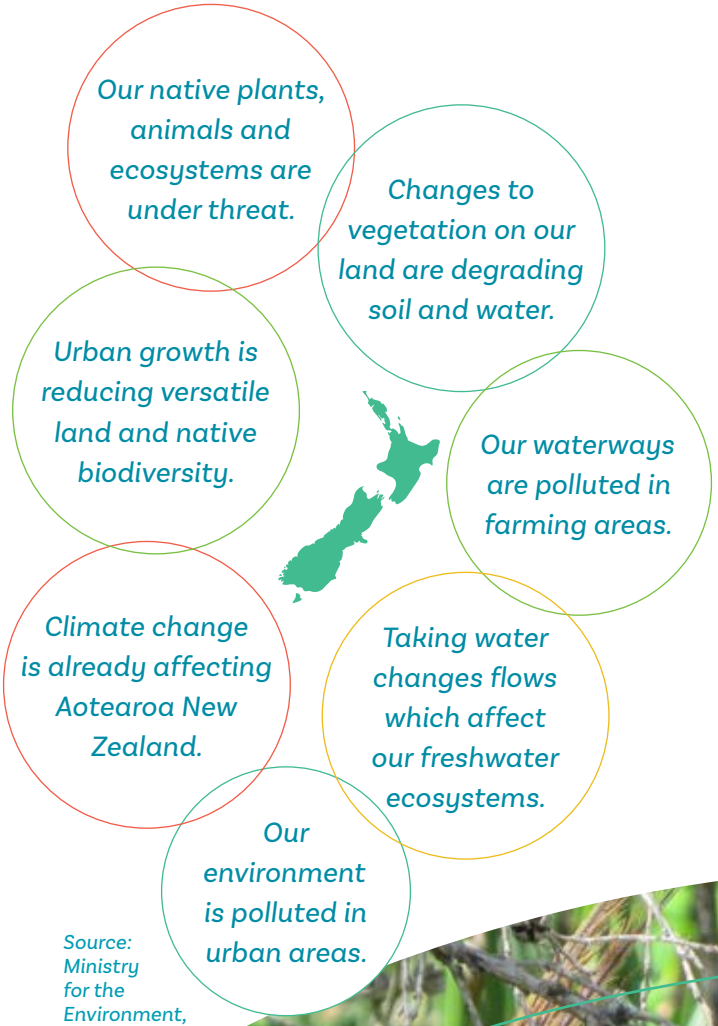
The work we do at Hawke's Bay Regional Council is long-term and ongoing. We monitor the state of our air, climate, land and waterways to understand the health of our natural resources and the pressures that are causing concerns. Through this work, we develop strategies, create plans and advise our communities on how we can better manage our environment together.

It is my hope that future State of the Environment summary reports will confirm improving trends to our water quality, stabilising erosion, healthier aquatic environments and increasingly swimmable waterways, for the generations to come. Indeed, they should expect no less from us.

Nāku noa, nā

James Palmer
Chief Executive
Tumu Whakarae
Hawke's Bay Regional Council

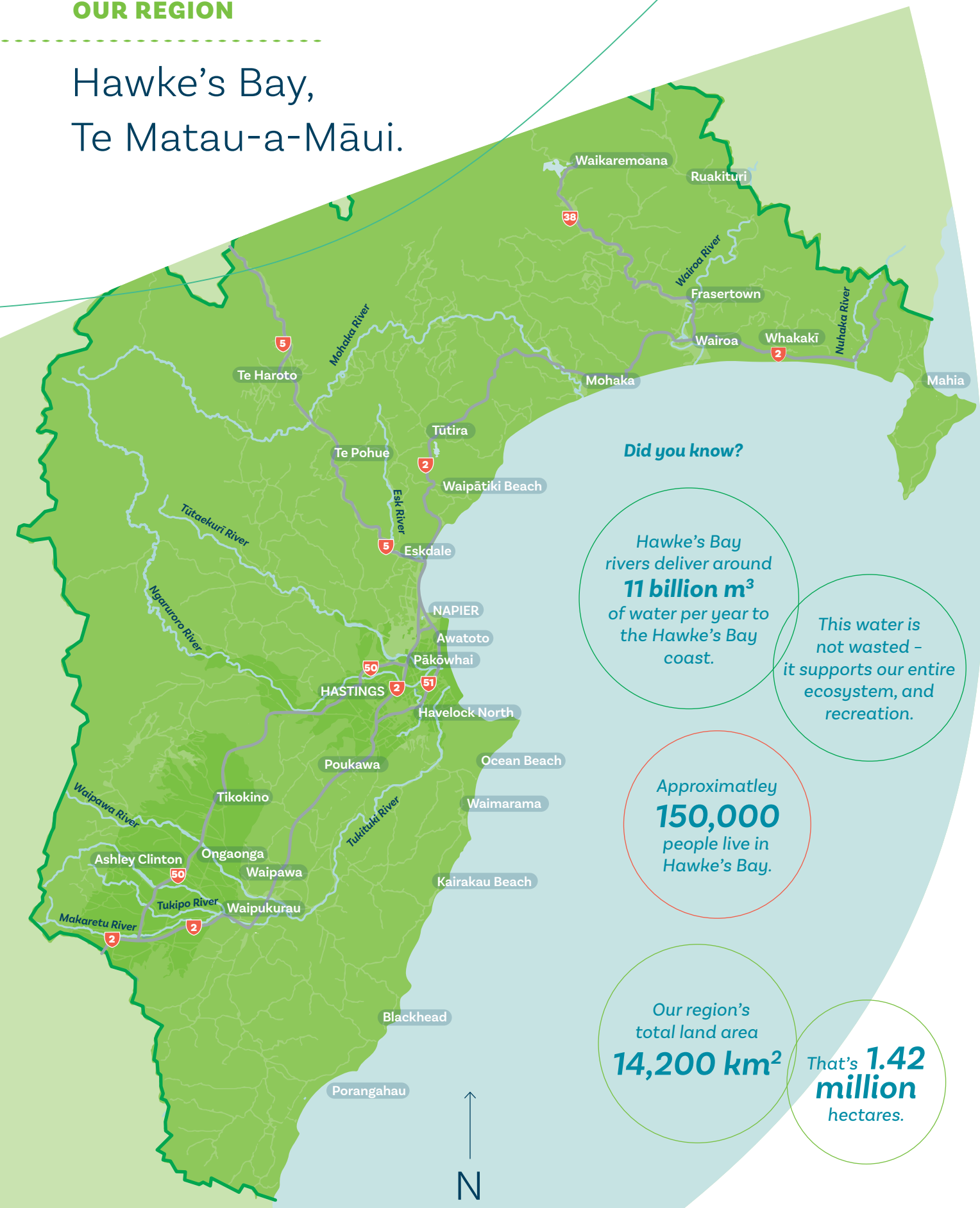
The national picture:
Environment Aotearoa 2019 tells us, in New Zealand:



Source: Ministry for the Environment, 2019

OUR REGION

Hawke's Bay, Te Matau-a-Māui.



Did you know?

Hawke's Bay rivers deliver around ***11 billion m³*** *of water per year to the Hawke's Bay coast.*

This water is not wasted – it supports our entire ecosystem, and recreation.

Approximatley ***150,000*** *people live in Hawke's Bay.*

Our region's total land area ***14,200 km²***

That's ***1.42 million*** *hectares.*

ENVIRONMENTAL INDICATORS

The Hawke's Bay picture.

HAWKE'S BAY REGIONAL COUNCIL
TE KAUNIHERA Ā-ROHE O TE MATAU-A-MĀUI

Looking good

Air – much better urban air quality, thanks to good management and community use of incentives for healthy home-heating options.

Groundwater – good quality in the region's major aquifers - some areas need work on local issues.

Recreational water – there's great swimming to be had in Hawke's Bay - a few exceptions, especially after heavy rain.

Soil – generally in good condition, noting some compaction and low organic content.

These indicators look good, but still need ongoing monitoring to see if management of these natural resources is being effective.

Not so good

Freshwater – this is a priority for Hawke's Bay. Most of the monitored sites in rivers, lakes and estuaries need to improve in at least one of the indicators for water quality. Problems are generally due to:

Sediment and erosion – fine sediment is unhealthy for fish and overall waterway health, particularly in the northern catchments around Wairoa and hill-country areas all over the region. The One Billion Trees project and Erosion Control Scheme will see less sediment in waterways and estuaries over time.

Nutrients – some rivers, lakes and estuaries have nutrients at levels above the limits for ecological wellbeing. Land use activities in some areas need to be managed to reduce the discharge of nutrients.

Groundwater – declining groundwater levels are a typical result of aquifer development. Limits and policies are in place, or close to being introduced, to balance groundwater demand with environmental needs and community values.

Wetlands – the Regional Council is building a picture of the state of the remaining wetland areas. Further monitoring will give the data to help manage these valuable sites.

Riverbanks – there wasn't much available information, so the Regional Council started monitoring to see which riverbanks and waterways can benefit most from planting and fencing.

Ongoing monitoring and science is essential. It informs management decisions and shows whether anticipated improvements are occurring.

There are ***23,000km*** *of riparian zone (where the land meets our waterways) in Hawke's Bay.*

That's longer than the entire coastline of New Zealand!

The Hawke's Bay coastline makes up ***more than 1/3 of the areas*** *that the Regional Council manages.*

This diverse and expansive area covers over ***353 km.***

THE STATE OF OUR AIR

Our air is improving but we can do better.

Overall, Hawke's Bay air quality is pretty good.
We don't have the traffic or population to cause a widespread problem.

The World Health Organisation (WHO) estimates that seven million people worldwide die prematurely each year from air pollution. Exposure to air pollution reduces life expectancy and is associated with numerous health concerns from heart to birth outcomes, respiratory to neurodevelopment and more.

So what are the air quality issues in our region?
We have been monitoring air quality across Napier and Hastings since 2005, and Awatoto since 2012.
We monitor for the National Environmental Standards for Air Quality (NESAQ) that were first set in 2004. These standards include limits on fine particulates less than 10 micrometres in diameter, known as PM10, and four pollutant gases: carbon monoxide, nitrogen dioxide, ozone and sulphur dioxide.

We have defined environmental goals for air quality in our Regional Resource Management Plan (RRMP) and Strategic Plan 2017-2021.

These goals are to meet WHO guidelines by 2025, which include limits on PM2.5.

Where do these particulates come from?
In our region, they are a mixture of natural sources and anthropogenic or human sources.

Sea salt, windblown soil and pollens all contribute to natural sources while industry, shipping, transport and home heating all contribute to human sources.

How are we doing?
We have been focusing on monitoring PM10 since 2005 and we have made great improvement on these levels in recent years. Napier did not breach NESAQ in the five years to 2018, meaning it achieved unpolluted status – well done Napier! Hastings did not breach NESAQ during 2017 and 2018, which is positive. Awatoto breached twice in the six years to 2018. Overall, this indicates improved air quality. Much of this positive result is due to an upsurge in Hawke's Bay homes transitioning to clean heating, resulting in an estimated reduction of more than 60 per cent in anthropogenic particulate emissions between 2005 and 2015.

Where to from here?
There is always room for continued improvement and maintenance of our unpolluted status in Napier and positive trends in our other airsheds. While the PM10 results are good, we are shifting focus to PM2.5. To meet our target of complying with WHO guidelines by 2025, there will need to be a reduction of PM2.5 in Napier and Hastings. Monitoring of PM2.5 in our region started in 2016, so we have limited data to date. What we do know is that we have work to do. We thank you all for your efforts so far and hope you will join us in attaining our new targets over the next five years.

Did you know?
Over the last five years, through Hawke's Bay Regional Council's Sustainable Homes programme:

7,508
homes have received Clean Heat grants.

6,832
homes have had non-compliant fires replaced.

How we're tracking:
Fine particulate air pollution levels are improving, largely due to the incentivised clean heating programme, but further improvement is required.

What we're doing:
We continue to monitor air quality, including recently introduced monitoring of ultrafine PM2.5 particulate concentrations.

Hawke's Bay Regional Council is committed to our Sustainable Homes programme, which includes incentives to upgrade old fires to cleaner and more efficient home heating options that improve air quality for all residents.

Dr Kathleen Kozyniak
Principal Scientist
(Air and Climate)

"Napier has reached unpolluted status with respect to New Zealand standards, but we can't rest on our laurels, there is still room for improvement in all of our airsheds when it comes to consistently meeting both national and international guidelines and standards."

The outlook's fine and we're better prepared with our monitoring.

The climate is one of the things we love about Hawke's Bay.

The long, dry summers draw people to our region. The mostly mild winters are a drawcard too, and the temperate climate is ideal for our local orchards, vineyards and farms.

We monitor rainfall, temperature, wind speed and humidity across the region and look to see if results fall within a normal range – that is, within 20 per cent of the long term average for rainfall and within 0.5 degrees Celsius of the average for temperature.

Rainfall has been normal, with some highs and lows and a couple of significant events. These events included the tail end of the drought in 2013 and two ex-tropical cyclones, Debbie and Cook, in April 2017. Another notable rainfall event was flooding in the Esk catchment in March 2018, where the one-day total measured 325.5 millimetres.

Temperature results show annual maximum and minimum readings being near or above average. The highest daily maximum temperature recorded over the five-year period was 35.5 degrees Celsius at Wairoa North Clyde in February 2017. The lowest recorded was negative 7.9 degrees Celsius at Taharua in July 2016.

Average wind speed shows a decreasing trend at many sites. This trend goes back to the late 1990s. The strongest wind gust during the last five years was 127 kilometres per hour in July 2016 recorded in Te Aute.

Dr Kathleen Kozyniak
Principal Scientist
(Air and Climate)

"With 18 climate stations around the region we're now better geared to monitor into the future."

When it comes to climate, it's worth noting that a five-year period won't tell us much. Trends in climate come from longer periods of monitoring, up to 30 years or so. We are, however, pleased with our direction. Over the last five to seven years we have built up an enhanced network of climate stations. There are now 18 stations around the region and new sensors have been added to many of these. We are now better geared to monitor into the future and to create a long-term record of climate in Hawke's Bay. This means that as a community we can focus on the changes in climate with more comprehensive readings and findings to go by.

Did you know?

Esk Valley saw an extremely heavy rainfall in March 2018:

325.5 *millimetres of rain in total for just one day.*

How we're tracking:

Rainfall over the last five years was generally about normal, although a couple of large rainfall events occurred in parts of the region. Generally, temperatures were slightly above normal.

What we're doing:

We have ***18*** ***climate stations*** *installed around the region.*

Climate stations provide greater coverage of monitoring for generating long-term records of climate throughout Hawke's Bay.

THE STATE OF OUR RIPARIAN ZONES

Innovation is the key to monitoring our valuable land areas.

Our land science team started a new programme in January 2019 to monitor our riparian zones so we can better understand the condition of these precious areas where the land meets our rivers and streams.

Riparian zones are crucial to the health of our land and waterways. The soil and vegetation in these areas act as a buffer, trapping nutrients, sediment and pathogens before they enter the waterway and potentially harm its quality. Riparian areas are an important habitat for water and land-based plants and animals, and act as safe passageways for the movement of species. Well maintained riparian zones with dense vegetation cover and effective fencing can improve bank stability, enhance ecosystem biodiversity and support sustainable farming. Riparian vegetation also provides shading to streams, which helps to regulate water temperature.

Before starting our riparian monitoring we had limited information on these areas. Three hundred sites, each 500 metres in length, were selected across the river system of Hawke's Bay. Through this monitoring programme we hope to gain a better understanding of the condition of our riparian areas across the region. We will measure a range of things including whether or not there is vegetated growth and/or fencing present, along with other factors such as how much erosion is occurring.

The programme uses an innovative approach. Our team use handheld devices and high-accuracy GPS to monitor each 500-metre-long site in detail. The GPS we use allows an accuracy of approximately 20 centimetres compared to five metres using older technology.

Jamie Wu
Resource Analyst
(Land Science)

"Our riparian zones are our last line of defence against sediments and contaminants entering the waterway. We need to understand these areas better so that we can improve them."

Processing time is also quicker. The technology our team has chosen to use is more modern and precise than many other councils are using. This technology will deliver us more accurate data, faster.

We're looking forward to finding out more about our riparian zones so that we can better manage these precious areas through erosion awareness, restorative planting and fencing plans.

Long term monitoring will also help inform riparian management policies and national regulations.

Did you know?

There are **23,000km** of riparian zone (where the land meets our waterways) in Hawke's Bay.

That's longer than the entire coastline of New Zealand!

How we're tracking:

Our riparian field survey is still underway at the moment, providing a picture of the riparian state in Hawke's Bay. We will have a better understanding of our riparian condition and track changes through continuous monitoring in the coming years.

What we're doing:

87 riparian sites surveyed this year.

86 riparian sites to be surveyed next year.

We are surveying 87 riparian sites in Tukituki Catchment this year. Next year we will be surveying 86 riparian sites in the Tūtaekurī, Ahuriri, Ngaruroro and Karamū (TANK) catchment. Eventually this survey will cover 300 riparian sites across the Hawke's Bay region.

THE STATE OF OUR WETLANDS

Let's cherish the little we have left.

We have lost about 98 per cent of the original wetland areas in Hawke's Bay. This is compared to 90 per cent across New Zealand. These are sobering numbers when we consider the importance of wetlands to our environment.

Similar to riparian areas, wetlands are vital for a number of reasons. They are home to a range of unique and important local flora and fauna. They work to retain water, sediment and nutrients. And the soil in wetlands is home to a biological community that can process and break down nutrients and purify the water. Wetlands also retain excess surface water, a function known as flood attenuation, which is helpful in times of flooding. Hawke's Bay wetlands have been home to eel and whitebait populations and provide other resources such as harakeke (swamp flax). All of this is some heavy lifting from a patch of soggy land.

While most of our original wetland areas are gone, what remains is extremely important as a representation of what the environment in our region used to be.

The wetland monitoring programme is in two parts. The first part is the identification and classification of all of our wetlands (apart from farm ponds). More than 4,000 wetlands were identified, categorised and catalogued. This took several years to do and has only recently been completed.

Our wetlands monitoring programme (the second part of the programme) began in 2015, starting with a focus on the Tukituki catchment. Ten sites were chosen in this area. Thirteen wetland sites within the Tūtaekurī, Ahuriri, Ngaruroro and Karamū (TANK) catchments were incorporated into our monitoring in 2018.

So what are we looking for when we examine these sites? Plants are living indicators of what is going on in the wetland. We document all species within monitoring plots mapping vegetation and canopy species. Nutrients in the soil and plants are measured to understand the nutrient status of the wetland. Hydrology, or the movement of the water table (a crucial part of wetland functions), is also studied for a deeper understanding of each wetland. Wetland birds are indicators for quality of habitats and the level of predation. Spotless crake, fernbird and Australasian bittern are all specialised to wetlands and are monitored. These species are all classified as threatened or at risk due to habitat (wetland) loss and predation by introduced mammalian predators such as stoats, feral cats, rats and hedgehogs.

Findings show that the majority of the sites we monitor are in a reasonably good condition. However, many of these sites contained threats such as the presence of invasive weeds, pressure from feral and domestic animals, and high risk of sediment and nutrient input from surrounding land.

It doesn't take much for a wetland system to be altered and compromised.

As we see it, one weed is too many weeds. Through our monitoring programme we hope to better understand these precious areas and systems, and create conversations with landowners in our region so that we can all help to enhance and maintain what we have.

Did you know?

One of the most common wetland types in our region is ***swamp.***

Pekapeka swamp *is one of the great examples of swamp in our region.*

Wetlands can be classified based on combinations of various wetland characteristics including substrate, hydrology, nutrient status and flora:

swamp

A common wetland type in our region is swamp, which is a type of wetland developed on peatland or mineral soils, receiving water from surface and/or groundwater and often with moderate flow. Drainage of swamp is poor and water table remains above ground surface in places. Nutrient status of a swamp is generally high and so plants such as raupo that are common in a swamp are adapted to such nutrient status.

bog

Another wetland type we monitor, and less known, is bog. Bog develops on peatland, and receives water only from rain. Because of this, bog receives very little nutrients or sediment, making the system extremely oligotrophic (low nutrient) and highly acidic. Plants found in bogs look quite different from swamps or other wetland types with sphagnum moss, lichens, cushion plants and other specialised sedges and ferns dominating the system. Bogs are very uncommon in our region, and most of them are on flat land in higher altitudinal area.

Keiko Hashiba
Terrestrial Ecologist

"We have lost 98 per cent of the original wetlands in Hawke's Bay. We need to look after what we have left."

How we're tracking:

The majority of the wetland sites we monitor are in reasonably good condition. However, just about all of the monitored wetlands, regardless of their condition, contain one or more threats such as weeds, browsing or sediment and nutrient input from surrounding land.

We are still building the picture of the state of freshwater wetlands in Hawke's Bay. When the monitoring is rolled out to cover the region, we will have more monitored wetlands with different management regimes including those that are unmanaged. That is when we will have the hard data to describe and predict the fate of many of our wetlands.

What we're doing:

While our current focus is on understanding the state of our wetlands, Hawke's Bay Regional Council is also providing advice to willing landowners who want to improve their wetlands.

We are expanding out wetland monitoring programme one catchment per year:

2016/17
10 sites monitored in the ***Tukituki catchment.***

2017/18
+13 sites monitored in the ***TANK* catchments.***

2019/20
+13-15 sites to be monitored in the ***Mohaka Catchment.***

**TANK = Tūtaekurī, Ahuriri, Ngaruroro and Karamū*

THE STATE OF OUR SOIL QUALITY

Protecting our natural asset.

Soil is one of our most valuable natural assets. It is the basis of all terrestrial life and underpins the economy of Hawke's Bay.

The land science team at Hawke's Bay Regional Council monitors the state of our region's soil to understand the impact of natural and human pressures. Through our findings, we hope to advise our communities on how to protect our soil into the future and give early warning regarding any issues identified.

We have 89 monitoring sites across Hawke's Bay and these cover five land use categories and more than 40 soil types. We monitor the physical, chemical and biological properties of these soils. This can help us provide an early-warning system to identify negative effects on our soils for long-term productivity and environmental health. We measure seven compulsory key indicators at each site and compare these against national guidelines. At Hawke's Bay Regional Council we are also measuring heavy metals (including cadmium), pesticide residues and many extra soil physical characteristics not normally required.

So how are we looking? Across our 86 sites, 34 per cent were within recommended guidelines for all seven indicators and 70 per cent met guideline ranges for six out of seven indicators.

That's not bad overall. However, some individual parameters across some cropping and orchard/vineyard sites are outside recommended guidelines.

We found low organic matter content for some cropping and orchard/vineyard soils. Organic matter is essential for good soil structure, moisture-holding capacity, nutrients and providing an energy source for soil microbes, which play an important role in nutrient cycling, soil particle formation and breakdown of pollutants in the environment.

Some sites showed low macroporosity – soils that are highly compacted. This can stop soil from draining efficiently, which increases the risk of overland flow, leading to nutrient and soil loss. It can also prevent root growth, soil aeration and biological activity.

Olsen P measures plant-available phosphorus in the soil – an essential nutrient for plants. Elevated Oslen P values were found at some cropping, orchard/vineyard and pastoral sites. Too much phosphorus can lead to losses from the soil to nearby waterways where it may cause excessive algal growth. A high percentage of extensive pasture farms had low Olsen P values. This may indicate the pasture is not growing to full potential.

These concerns will be carefully monitored and landowners informed of any possible issues as soon as they are observed.

We have conducted routine monitoring of our region's soil quality since 2011. More long-term data is required to accurately determine the effect of land-use practices on soil quality. Overall, results show our soils are in good condition. We need to continue to monitor our soils and be aware of any changes in soil quality.

Did you know?

If severely degraded, it can take hundreds of years for a soil to recover.

Soil quality is closely linked to water quality.

How we're tracking:

From our monitoring of the soil quality in Hawke's Bay we have found our soils to be in generally good condition with some issues emerging around compaction and low organic content at some sites.

What we're doing:

Across the five major land uses found in Hawke's Bay:

We now have ***89*** *soil quality monitoring sites.*

We sample a different land use every year.

Tim Norris
Land Scientist

"Soil quality is closely linked to water quality. We must manage our soils carefully in order to protect the freshwater environment and the productivity and wellbeing of the land."

THE STATE OF OUR SOIL EROSION

We're losing a lot of the good stuff.

One of the most pressing issues in Hawke's Bay is soil erosion. The thing with soil is, once it's gone, it's gone. It's irreplaceable and that's a real worry, especially when we consider the long-term loss of fertile top soils.

There are many types of erosion across Hawke's Bay. The main areas of concern with soil loss in Hawke's Bay are hill country, river bank and wind erosion, all adding to increased sediment to our rivers and lakes.

Hill country erosion is the biggest contributor to the erosion issue in Hawke's Bay. All of the gully, land slips and earthflow erosion falls into the hill country erosion category, while the river bank erosion is also a large contributor to the total sediment in our waterways.

Wind erosion removes the most fertile portion of topsoil. Long-term loss of topsoil especially from the highly productive Ruataniwha and Heretaunga Plains may expose less fertile soils. It can take hundreds of years to rebuild this valuable resource.

Hawke's Bay is subject to strong winds during the spring when many paddocks are vulnerable while being cultivated. Hawke's Bay has one of the highest rates of wind erosion in New Zealand. Many of the soils on the Heretaunga Plains are at severe or extreme risk of wind erosion and if they're not managed correctly, may lose significant amounts of topsoil. Loss of topsoil through wind erosion can mean significant economic loss to farmers. It can also cause air quality issues and can impact on water quality through increased sediment.

To understand how much soil is being lost and where, we installed 10 passive dust collectors (PDC) across the Heretaunga Plains in 2018. One year of monitoring has indicated a relationship between the amount of wind-blown material and seasonal land management (ploughing and planting from September to November). It is early days, but this information will provide baseline data to inform our future investigations and landowners.

One way we can help counteract wind-blown soil erosion in Hawke's Bay is through shelterbelts.

Back in the 1980s, the Catchment Board (as the Regional Council was known then) established shelterbelts in high erosion-prone areas on the Ruataniwha Plains. In recent years, we have started monitoring to determine shelterbelt coverage in our region. This will enable us to get a better picture of the state of our shelterbelts now and into the future.

No matter how the soil is eroded it nearly always ends up in our rivers and streams. High sediment concentration negatively impacts river and estuary ecology by reducing available light for aquatic plants, altering aquatic habitats and damaging aquatic life. In 2018 we started using automatic sediment samplers (called ISCOs) to understand the effect of soil erosion and sediment on our waterways.

Shelterbelts minimise soil loss from wind.

Did you know?

Most erosion happens during storm events and we need to better understand how much soil we are losing during these events.

How we're tracking:

There is no doubt erosion is a big issue in Hawke's Bay. There are many types of erosion and each one can have a different or multiple solutions. With the introduction of the One Billion Trees project and the Erosion Control Scheme being implemented by Hawke's Bay Regional Council we hope to see a reduction of sediment in our rivers over time.

What we're doing:

As erosion takes many forms we have multiple projects looking at mitigation and monitoring. We are:

- *Encouraging and assisting with riparian planting programmes to reduce stream bank erosion.*
- *Mapping shelter belts and studying wind erosion patterns across the plains.*
- *Implementing a large tree planting project across the region to reduce hill country erosion.*
- *Setting up a sediment monitoring programme to identify how much sediment is being reduced due to our initiatives.*

Tim Norris
Land Scientist

"Shelterbelts are important for preventing soil loss from wind erosion. Once soil is lost, it's almost impossible to replace it in the short term"

Soil loss from wind near Ongaonga.

THE STATE OF OUR GROUNDWATER

Treading lightly on our vital natural resource.

Groundwater is water that exists in saturated zones beneath the land surface. This underground water moves through and fills the spaces amongst soil, sand and rock. Most areas of Hawke's Bay contain groundwater and it's one of our most important natural resources.

The largest groundwater resources in Hawke's Bay are the two aquifer systems beneath the Heretaunga and Ruataniwha Plains. We have seven smaller systems across the region in Mahia, Nuhaka, Wairoa, Esk, Poukawa, Papanui and Waipukurau/Waipawa. Water comes into these systems from rainfall and loss from rivers.

Our aquifers provide water for drinking, irrigation and industry.

They also help to sustain the flow of our streams and rivers, and maintain important riparian and wetland ecosystems. Anyone who wants to take water from our aquifers, for anything other than stock drinking or domestic use, requires a resource consent. There are currently 2,400 water consents operating in Hawke's Bay and approximately 83 per cent of these are for groundwater.

We operate more than 100 wells across our aquifer systems to monitor short and long-term changes in groundwater levels and quality.

We have also developed computer groundwater models to better understand our aquifer systems and how they respond to groundwater pumping, which then informs management decisions.

Monitoring is vital to understand the impact of resource development on our aquifer systems and how these stresses affect groundwater recharge, storage and discharge. Monitoring results allow us to design and implement effective management plans to limit groundwater pumping and meet overall environmental objectives.

Did you know?

*Hawke's Bay contains one of **New Zealand's largest groundwater** resources.*

*We operate **more than 100 wells** across our aquifer systems to monitor short and long-term changes.*

Simon Harper
Senior Scientist (Groundwater)

"The effects of groundwater pumping must be balanced with environmental needs and the values of public and stakeholders."

How are our levels?

Investigating our aquifer systems enables us to understand how the water flows through them. We know that all water drawn from wells is balanced by a loss of water somewhere else. When groundwater is pumped, water is taken from storage in the aquifer. This results in groundwater level declines or depressurisation. To account for this change in storage, the system may respond by increasing the volume of water entering the aquifer, decreasing the volume of water leaving, or some combination of these.

Changes in groundwater levels manifest slowly. In many areas, long-term changes are masked by natural variations between seasons. The most persistent changes we've noted are declining water levels in parts of the Heretaunga and Ruataniwha Plains. This follows previously identified changes in patterns and trends.

Many groundwater level declines are associated with groundwater pumping in response to demand: mostly for irrigation, industrial use and town supplies.

These declines are more pronounced during summer and show a small but marked recovery during April, and into autumn and winter as the peak demand period tapers off.

General seasonal declines in groundwater have also been found, correlating with an increased demand for groundwater over summer.

To address environmental impacts caused by groundwater pumping, we are continuing to develop policy to modify existing rules governing water allocation and land use activities. To assist with this, we have developed computer models to simulate the effects of pumping and potential management options for our water resources.

We will continue to take care of this precious resource by monitoring, modelling and planning in a continuous cycle.

What about the quality?

Our groundwater quality is generally good. We have issues with nutrients in some parts of the region and have found elevated levels from natural sources in some aquifers.

The data we collect is assessed against national standards for drinking water and guidelines for irrigation and household use.

We sample from wells across the Hawke's Bay aquifer systems every three months, followed by analysis and evaluation against water quality limits and guidelines. Over the last five years, drinking water standards were exceeded for Escherichia coli (E. coli) at 23 wells, nitrate at one well, manganese at 14 wells and arsenic at three wells. These standards relate to human health and indicate that health could be impacted by consuming water with certain concentrations. For manganese and arsenic, these levels are considered to be natural background and not from a contamination source. Some parts of Hawke's Bay have groundwater with elevated natural concentrations of chloride, sodium, manganese, iron and hardness.

What happens on the land does matter. By monitoring aquifer systems continuously across our region, we can understand the quality of our groundwater and the effects land use has on it.

The findings will help us to manage land use in our region through land management plans. We also advise landowners with private water supply to routinely test and treat their water accordingly.

Janine Barber
Principal Scientist (Groundwater)

"What happens on the land matters, whether it's urban discharges like stormwater, domestic septic tank discharges, or land use activities like farming or horticulture. If these activities overlie an unconfined aquifer then good management practices need to be adhered to so that the quality of the groundwater system is maintained."

Did you know?

Drinking water standards *are groundwater quality limits set for human health.*

Drinking water that exceed these limits could be detrimental.

Guidelines for groundwater quality are applicable to irrigation use, along with aesthetics, taste and odour for drinking water and household use.

The standards and guidelines provide benchmarks for the general quality of the groundwater of Hawke's Bay.

How we're tracking:

Good quality groundwater is generally available throughout the region's major aquifers for abstraction by efficient bores except where allocations have reached the limits of sustainability.

2018
the Regional Council carried out a ***pesticide survey*** *on shallow wells located in intensive land use areas of the Heretaunga and Ruataniwha Plains.*

The results found ***no traces of pesticide*** *at levels detectable by analytical laboratory equipment.*

In some locations further investigations are planned or underway to inform management options to address the effects of climate variability, abstraction or land use activities.

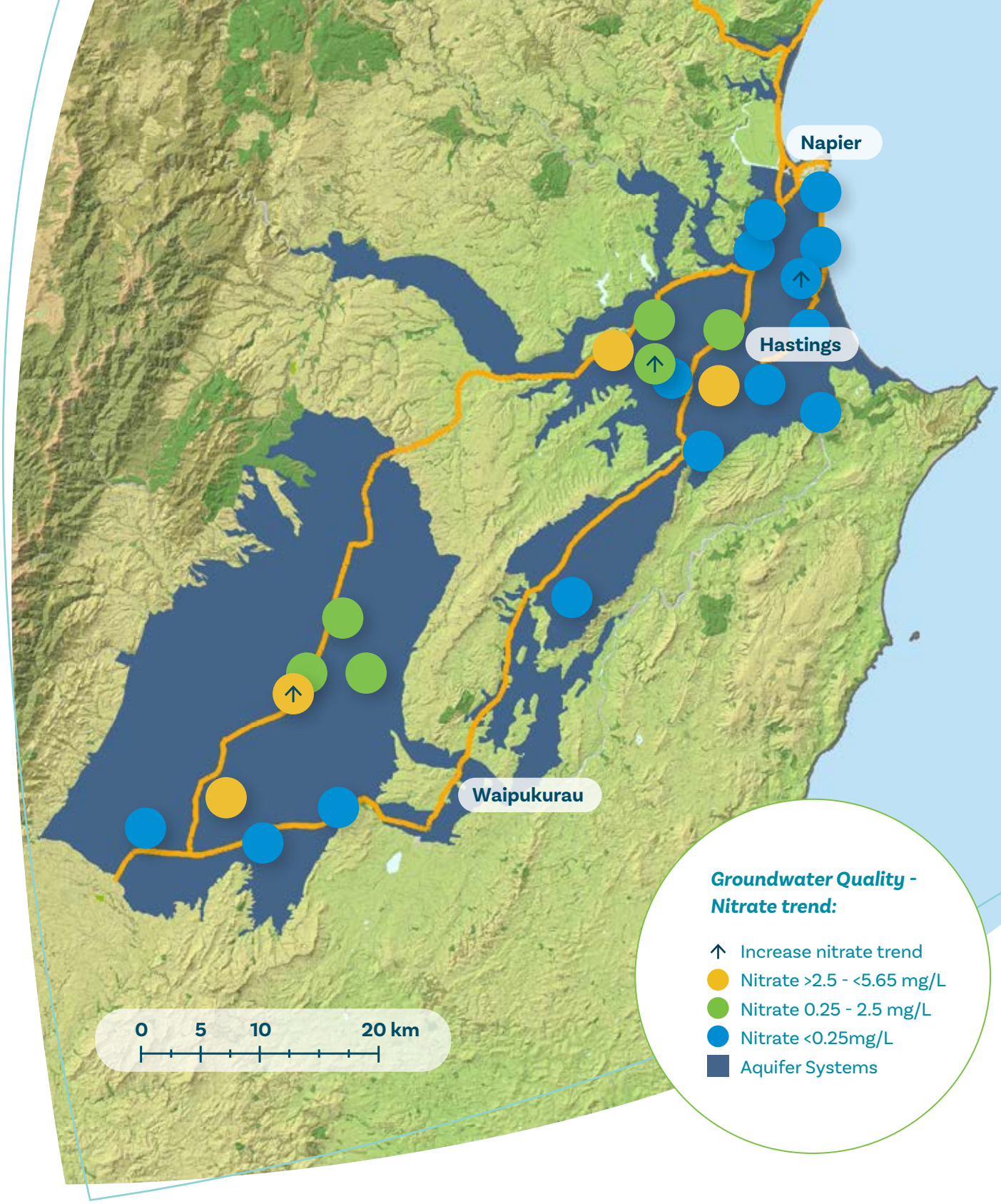
What we're doing:

Allocations and regulations for each aquifer system are used to limit the total abstraction and manage effects on other groundwater users and the environment. Along with monitoring, the Regional Council continues to develop cutting-edge computer models of our major aquifer systems. These models allow us to identify issues and then test various management options for the community and decision makers to consider.

Summer 2020
We are undertaking an airborne electromagnetic survey, known as SkyTEM, throughout the major aquifer systems.

This will enable us to manage the groundwater resources more effectively.

This survey will provide ***rich, detailed information of entire aquifer systems*** *that has never been available before.*



Nitrate concentrations and trends for Heretaunga and Ruataniwha aquifer systems:

Arrows indicate a moderate trend that suggests increased nitrate concentrations between 1995 and 2018. All concentrations are less than the NZ Drinking Water Standard for nitrate (11.3 mg/L). The Drinking Water Standard was exceeded at one bore (Burnside Road, Ruataniwha Plains), which is not shown here because there are insufficient data for trend analysis. Increasing trends have been observed in a few localised areas and generally in shallow bores (less than 30m depth).

THE STATE OF OUR SURFACE WATER

Creating resilience in our rivers and lakes.

In our region we're blessed with streams, rivers and lakes we can enjoy for recreation. The health of these fresh water spaces is vital to the overall health of our environment and the ecological systems that live within them.

We work to monitor, understand and protect our freshwater resources so that we can all enjoy using this water in our daily lives. We look into problems, threats and issues, and work to improve or mitigate these.

When we monitor our rivers and lakes, we are looking at two key things – the state of the water quality and the state of the ecological system.

What does that mean to you?
To put it simply, by monitoring these areas, we can help you understand if our rivers and lakes are safe to swim in, safe to take your dog to and safe to fish in. Our monitoring can also inform you that your local rivers and lakes are healthy places for fish and other freshwater biodiversity. We liken our freshwater resources to people. A healthy immune system can help to resist disease and recover from illnesses. It's our job to help promote ecological resilience in Hawke's Bay rivers and lakes.

So how are we looking?
We monitor 77 river sites and five lakes across Hawke's Bay. We look to understand the quality of the water and the health of the ecosystem as a whole. This helps us to understand the impact of land use and other pressures on freshwater in Hawke's Bay. It also allows us to inform our communities on management and strategies to ensure these interconnected spaces are supporting each other.

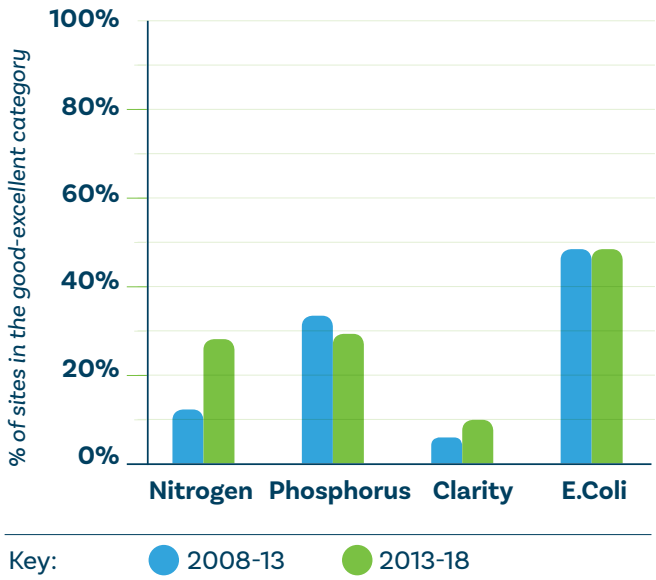
Dr Gary Rushworth
Scientist
(Freshwater Ecology)

"Erosion is the main concern for river health in the north."

It's complicated
Hawke's Bay has a diverse range of landscapes, climates and land use. Various factors influence the state and trends of water quality, with some problems being very widespread while others are highly localised to a particular set of circumstances. Trying to understand and communicate the complexities is a difficult task for scientists during council planning and implementation cycles when we collectively try to tailor appropriate solutions to manage our natural resources productively and sustainably.

It is never a one-size-fits-all approach, with different systems having different issues and options.

River Water Quality Performance:



We have a lot more work to do for our rivers

We had a low proportion of sites scoring 'good' or 'excellent' for four key indicators: nitrogen, phosphorus, water clarity and faecal contamination (E. coli).

There was some evidence that nitrogen has improved, but the other three variables showed little change. We have a long way to go, but expect to see more sites scoring 'good' or 'excellent' with increased implementation of farm environmental management plans, large investments into erosion control and tree planting across the region, and the targeted water quality mitigations that underlie the Regional Council's hotspot restoration initiatives.

Sediment is a "master stressor"

Without trees to hold the land together, a lot of sediment from the highly erodible hills finds its way into waterways. This detracts from the enjoyment of swimming, but is also a big worry for ecological health.

Fine sediment damages the health of fish and the overall health of a river.

Sediment is of particular concern in the northern catchments around Wairoa, as well as hill country areas throughout the region. With no sign of improvement, we plan to mitigate this sediment problem by investing in erosion control and planting programmes.

It's getting hot in here

The life-supporting capacity of waterways can be severely compromised when there are no trees to provide shade. The water gets too warm, excessive aquatic plant growth occurs and oxygen slumps occur overnight. This all puts stress on aquatic life and a lack of riparian shade is the biggest problem in lowland rivers like the Karamū. Strategic and large-scale planting along riverbanks is needed to provide shade and enhance ecosystem health. We have developed an East Coast Riparian Planting Guide with DairyNZ to help with this issue.

Dr Sandy Haidekker
Senior Scientist
(Freshwater Ecology)

"The water temperature in the Karamū catchment is too high and the stream channels are choked with weeds. We desperately need riparian vegetation to restore stream health in the Karamū catchment."

We have some nitrogen hotspots

Nitrogen hotspots are driven by the intensification of farming. Too much nitrogen in our waterways can create algal problems. The Ruataniwha Plains in the upper Tukituki River, the Taharua in the upper Mohaka River and parts of the Heretaunga Plains are the main areas of concern for nitrogen.

The Tukituki River Catchment Plan Change 6 sets a dissolved inorganic nitrogen (DIN) target of 0.8 milligrams per litre for rivers and streams in the catchment. It is likely that seven out of 17 sub-catchments within this area will breach this target.

Nitrogen levels are so high in some sub-catchments they are unlikely to achieve the target using conventional farm management approaches alone.

Constructed wetlands may help reduce nitrogen, so we are trying to find suitable sites with landowners who are willing to sacrifice land for wetlands.

New wetland areas will have other benefits, from enhancing our biodiversity to offsetting the 98 per cent of wetlands that have been lost in Hawke's Bay.

When looking at problems for our rivers, we need to think about the sea.

It can be easy to stop worrying about things beyond your property boundary. But water keeps flowing downstream, and contaminants being transported often cause the most problems a long way from their source. The tributaries of the Tūtaekurī and Ngaruroro rivers are a good example of this. These rivers are in pretty good condition on the whole, but the nutrient levels they carry are causing downstream problems in the Waitangi estuary. Small waterways in the Tukituki catchment may not have problems with algal growth, but the phosphorus and nitrogen they carry to the mainstem of the Tukituki river can fuel problematic algal growth there. Most sediment comes from our hill country but the worst effects are often seen in our estuaries.

Dr Andy Hicks
Principal Scientist
(Freshwater Ecology)

"Whakakī is amongst the most nutrient-rich lakes in New Zealand, but biodiversity values and ongoing restoration efforts mean there are a lot of reasons to be optimistic."

Monitoring algal bloom in our lakes

We monitor five lakes in Hawke's Bay for water quality and general health. We have two particular hot spots of concern, the Tūtira Lakes and Lake Whakakī. All of these lakes have been plagued by algal blooms. We monitor water quality and ecology to understand the causes of this growth and to help identify potential solutions. Local communities and lake users believe that algal growth has increased since the programme began to eradicate the aquatic plant Hydrilla. Work at Lake Tūtira suggests that an air curtain, which would keep the lake fully mixed and prevent release of nutrients from bottom sediments, could help reduce algal blooms. Results from an ongoing trial in Waikopiro are inconclusive so far.

Whakakī Lake has some of the poorest water quality of any monitored lake in New Zealand. Shallow lakes like this usually exist in one of two states – a clear water lake dominated by aquatic vegetation or a muddy lake dominated by algal blooms. Whakakī is muddy and has extreme algal blooms. We have prioritised Whakakī as a regional hotspot, with funding to restore its ecological health. On a positive note, bird surveys around the lake recorded a number of threatened species associated with good wetland habitat. These fernbirds, bittern and spotless crake are an indicator of high ecological value and show that ecosystem health is not just about water quality.

Did you know?

Our deep lakes stratify in summer.

This occurs when the surface layers heat up and stop mixing with the cooler and heavier bottom water.

In eutrophic lakes, the bottom water contains a lot of organic material from algal blooms which decay like a compost heap. The decay uses up a lot of oxygen. Because the lake is not mixed, there is no way for atmospheric oxygen to reach the bottom of the lake, and the bottom water runs out of oxygen. Without oxygen, the chemistry of the lake sediments change and release legacy nutrients. The released nutrients fuel future algal blooms, which in turn decay and consume more oxygen, and so the cycle continues.

Air curtains mix the lake like in an aquarium. The intention is to prevent the bottom water running out of oxygen, and so stop the legacy nutrients being released, which should help prevent future algal blooms.

How we're tracking:

Most of our monitoring sites need improvement in at least one freshwater ecology attribute.

What we're doing:

Freshwater science helped identify solutions and secure over ***$3 million*** *of national funding to* ***revitalise two iconic lake systems:***

Lake Whakakī

Lake Tūtira

THE STATE OF OUR RECREATIONAL WATER

Hawke's Bay is great for water play, most of the time.

Hawke's Bay is a great place for recreational water activities such as swimming, kayaking and paddling. But, at times, the quality of our water is compromised making it unsafe for people to use.

The factors that make our water unsafe include faeces from animals, people and birds. We monitor to measure indicators of contamination to understand the risks and help to advise everyone in our community.

On the whole, our beaches tend to have excellent water quality. Our rivers can have faecal material enter them, especially in the few days following rain. Estuaries and lagoons in Hawke's Bay can have low flows and high density of bird life, meaning these waterways can exceed national guidelines more often.

Over the last five years of monitoring our region's marine sites, we've found that our beaches have been suitable for swimming 98 per cent of the time. At lakes and rivers, it has been similar, with conditions suitable for swimming 89 per cent of the time and for our estuary and lagoon sites, it's a bit lower but still good, with swimming suitable for 81 per cent of the time.

This means that, overall, our recreational water quality is pretty good. Our rivers can be compromised after rainfall.

When it comes to lagoons and estuaries, we need to be aware that, as many of these areas are important wildlife reserves, bird faeces is a factor. These waterways are not always suitable for swimming.

How can we improve our recreational water quality? To put it simply, the big issue is poo getting into our waterways. When it rains, poo from sheep, cows, birds, dogs and more can wash into our waters. We can't do much about bird poo but when it comes to other sources, we can manage to keep this out through stock exclusion and fencing along our riverbanks, and always picking up after your dog.

Suitability for swimming 2013-2018

98% Suitable for swimming
1% Caution advised
1% Unsuitable for swimming

[1] 15 sites monitored: 1,394 times over 5 years

89% Suitable for swimming
6% Caution advised
5% Unsuitable for swimming

[2] 8 sites monitored: 780 times over 5 years

81% Suitable for swimming
9% Caution advised
10% Unsuitable for swimming

[3] 10 sites monitored: 755 times over 5 years

How we're tracking:

Overall Hawke's Bay waters can be a great place to swim. Our freshwater and lagoon recreational areas are still showing that some sites are deteriorating, and we are working to find out what sources of faecal contaminants are causing this.

What we're doing:

We are working on finding the sources of faecal contamination in waterways and working within the catchment to reduce these. Where this includes cows, fencing and planting waterways within the catchment are being supported to reduce stock access and filter contaminants before they reach the water.

To find the latest data on the quality of our recreational water in Hawke's Bay visit the 'Can I Swim Here?' tab on our website.

Anna Madarasz-Smith
Principal Scientist
(Marine and Coast)

"We're pretty lucky in Hawke's Bay. Overall our coastal beaches have excellent water quality. Rivers are more affected by rain and lagoons can hold a lot of birdlife that can contribute to poorer water quality."

Protecting our precious coastline.

Hawke's Bay has a diverse and expansive coastline. We monitor our marine and coastal area to understand the state of the ecology and water quality in these zones, and to identify the impact our land use has on these important habitats.

While we are still finding out about much of our coastal area, we have monitored the plants and animals that live in our intertidal areas for more than 10 years. In general, our intertidal reef systems, while diverse and complex, can be under threat from expansion of non-native species such as the invasive kelp *Undaria pinnatifida*. Our sandy beaches and expansive dune systems help to protect the land from the effects of large sea swells, but can be compromised by the presence of plant and animal pests. We are still exploring much of our underwater area and working out ways to best measure its health.

Sediment is causing our estuaries stress

Hawke's Bay has a number of coastal estuary systems that form the combined mouth of the land and freshwater drainage system before this goes to the ocean. Much of the stress we see in these estuaries comes from the nutrients, contaminants and sediments delivered to the estuary by the rivers and streams.

Clearing of vegetation, slips and erosion can cause sediment to enter our waterways. This is one of the key stressors on our coastal environment.

When our estuaries get muddier, some sensitive animals can't survive. This changes the make-up of animals living there, which can affect the food supply for birds and fish.

Everything is connected. Together, we need to understand the impact of what we do on land, and work to better manage our actions where we can.

We monitor the aspects of the estuary sediment that can affect the animals and plants. This includes how much mud is in the sediment they live in, as well as how much more accumulates on top of the surface every year.

The Ahuriri, Waitangi and Wairoa Estuaries all show signs of sediment stress. In the Ahuriri, areas at the top of the estuary and adjacent to stormwater inputs show levels of sediment that prohibit some sensitive species from thriving. This means some species that are important for keeping the sediments full of oxygen, or provide food for birds and fish may not be present in areas where muddy sediments are high.

To stop the flow of fresh sediments into the estuaries and coastal environment we need to keep our soils on the land. This means planting to stabilise sediments, fencing and planting waterways to stop stock access and stop sediments from flowing into the waterways that contribute to our estuaries.

Did you know?

Hawke's Bay's diverse and expansive coastline is **353km long** and includes:

- gravel beaches
- sandy beaches
- mudstone intertidal reefs
- underwater landscapes made up of soft-sediments and expansive reef and gravel structures.
- coastal cliffs

How we're tracking:

While trace metal contaminants in our estuaries are low, many of our estuaries are showing signs of sediment stress. This can alter the way the estuary functions, and cause problems for the animals and plants that live there.

Anna Madarasz-Smith
Principal Scientist
(Marine and Coast)

"Sediment coming into our estuaries is our major concern at the moment. It has a huge impact on the types of animals and plants living in these important systems, and the roles that they play to keep these areas healthy."

What we're doing:

In the last two years, under the Ahuriri Environmental Enhancement project, we have worked with local landowners to:

- **Fence** **11.1 km** of waterways.
- **Plant** **18,365** native trees.
- **+ 1,090** additional trees for soil stability.

Every little bit helps. We will continue to monitor and work towards enhancing these important parts of Hawke's Bay.

Two years on the Marine Hotspot programme habitat mapping has been completed for approximately two thirds of the Wairoa Hard and the Clive Hard areas using specialised equipment from NIWA. These sites have also been videoed to look at the type of seafloor we have and what lives there.

This project has also supported the **fencing** of almost **3km** of the Porangahau Estuary.

This has been done to protect sensitive seagrass beds.

A mirror to all we do on land

Our estuaries and coastal environment are the final receiving environment for the combined land and fresh water system – making it sensitive to the issues we see on land and in fresh water. Sediments, nutrients and contaminants can all make their way into our coastal systems, altering the way those systems work, and the animals and plants that live there.

In Hawke's Bay we have major river systems that can deliver large quantities of sediments and nutrients to our estuaries and coastal waters.

We monitor nearshore coastal water quality every six weeks at 14 sites along the coast. In general our coastal waters have similar nutrient and sediment profiles to those observed elsewhere throughout New Zealand. At times, large algal blooms can occur that use the nutrients from both the oceanic and land-based sources. When these die off they can cause oxygen levels to decline in the coastal waters.

Our estuaries have quite varied nutrient levels depending on their catchment and origin. We monitor our estuarine water quality monthly to gain understanding on the catchment and ocean contributions to our estuarine water quality. Ahuriri Estuary has high levels of phosphorus coming into the waterways, although more work needs to be done to determine whether this is natural for this catchment based on its history as a coastal lagoon.

Nitrogen levels are relatively high in the Mohaka, Waitangi and Tukituki catchments, although more work needs to be undertaken to identify whether this is resulting in ecological effects.

Anna Madarasz-Smith
Principal Scientist
(Marine and Coast)

"It's not just the level of nutrients that determines whether coastal waters become too nutrient rich. It also depends on the combination of different nutrients, and the flow of the estuary."

Did you know?

Hawke's Bay rivers deliver approximately ***11 billion m³*** *of water per year to the Hawke's Bay coast.*

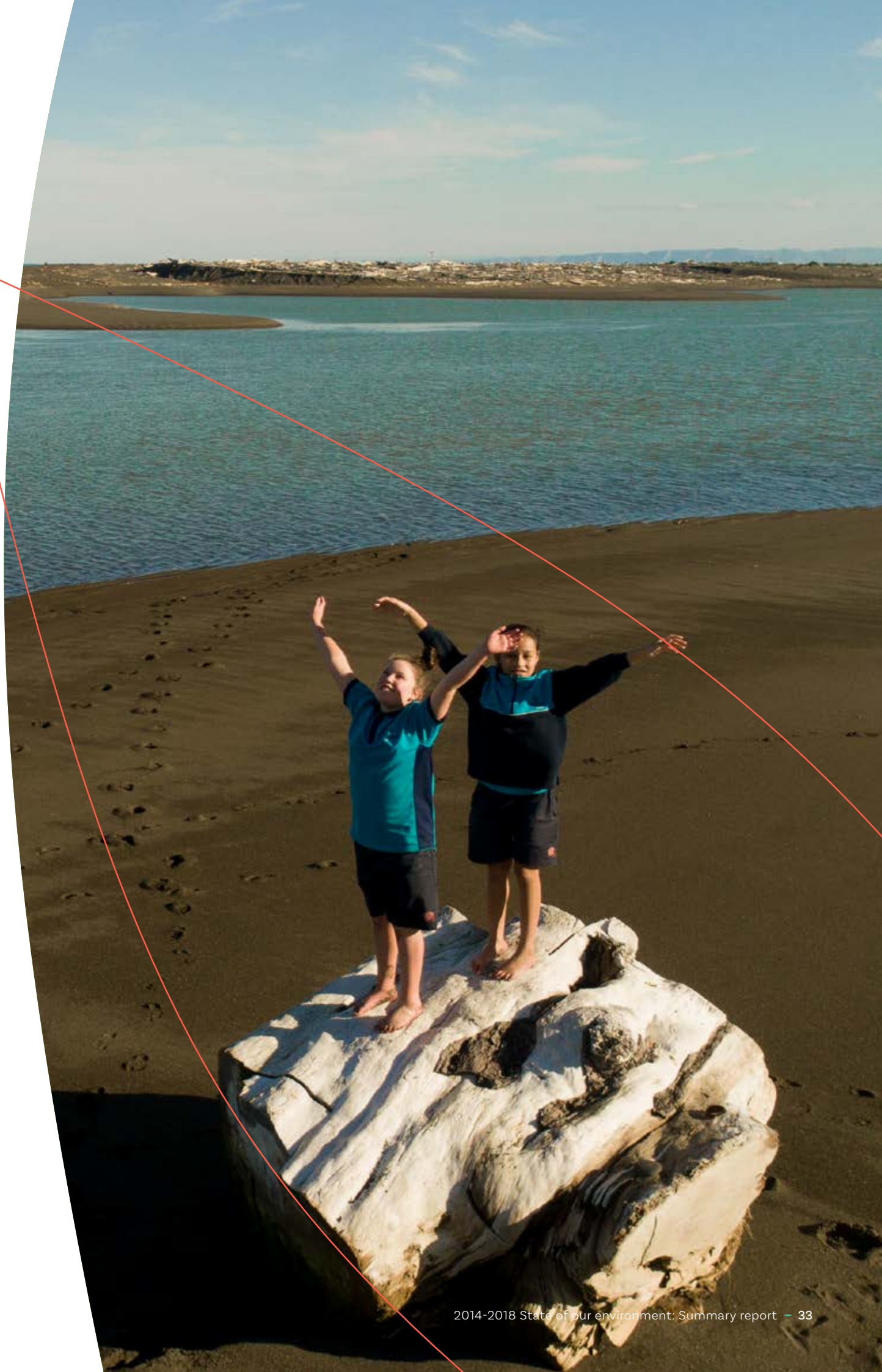
This is not wasted, because it forms part of the water cycle that supports our entire ecosystem, and recreation.

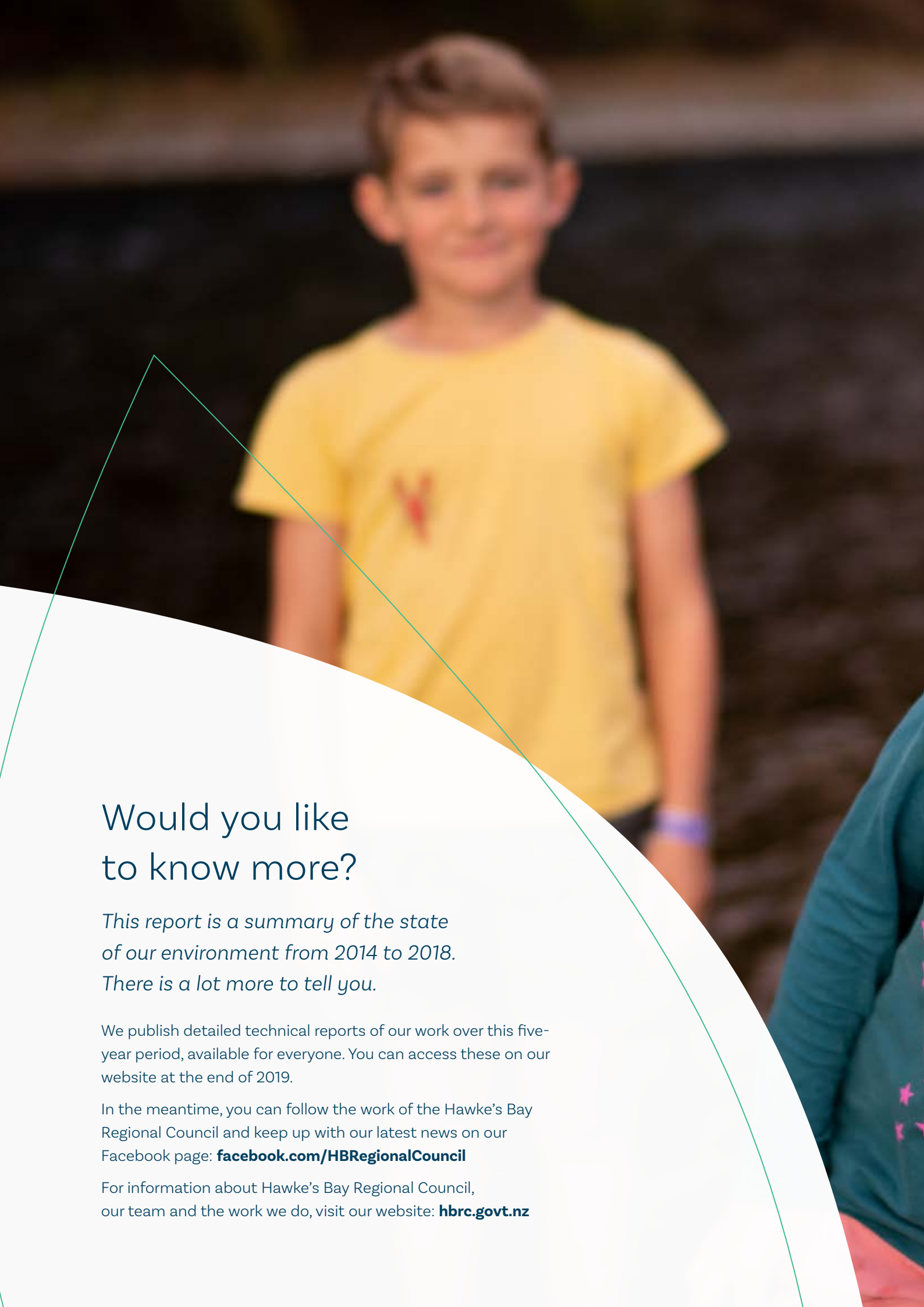
How we're tracking:

We have improved our understanding of the nutrient regime in our different estuaries, as well as our wider Hawke Bay coastal waters. Work is ongoing to understand whether the nutrients delivered to Hawke's Bay estuaries are impacting the ecology of the estuary.

What we're doing?

The Draft TANK plan change has proposed water quality guidelines for estuary systems, as targets for future state. Reductions in sediments and nutrients are a major target for the plan.





Would you like to know more?

This report is a summary of the state of our environment from 2014 to 2018. There is a lot more to tell you.

We publish detailed technical reports of our work over this five-year period, available for everyone. You can access these on our website at the end of 2019.

In the meantime, you can follow the work of the Hawke's Bay Regional Council and keep up with our latest news on our Facebook page: **facebook.com/HBRegionalCouncil**

For information about Hawke's Bay Regional Council, our team and the work we do, visit our website: **hbrc.govt.nz**

Te whakapakari tahi i tō tātau **taiao**.

Enhancing our **environment** together.

hbrc.govt.nz