

Enviroteach

An environmental education resource for teachers



From the editor

Kia ora! This issue of *Enviroteach* focuses on beaches and sand dunes. Inside, you'll find information for teachers and ideas for activities and investigations featuring these fascinating ecosystems.

Term 1 is a great time to learn about the coast. Let the warmer weather inspire you to try something new! Field trips to the beach and messy experiments with water are enticing possibilities. Let your students reconnect with nature by taking your lessons outdoors.

If you have questions or need help, contact Environment Southland's education team. We have two full-time environmental educators who are available to assist schools with a wide range of environmental topics. We'd love to come and talk to your class, run some activities in the school grounds, or help with your field trip. These services are available to all schools in Southland, free of charge. Contact us on 0800 76 88 45 or education@es.govt.nz.

You can download this and previous issues of *Enviroteach* from Environment Southland's website – www.es.govt.nz > Document Library > Newsletters > Enviroteach.

All the best for term one!

Pat Hoffmann

Environmental education officer

◆ Mason Bay, Stewart Island.



Southland's coastline



▲ Bathing Beach, Stewart Island.

Southland's coastline is 3,400km long – the longest of any region in New Zealand. It extends from Fiordland in the west, around the south coast to the Catlins in the east, and includes the coast of Stewart Island/Rakiura and other nearby islands. Travelling along Southland's coastline you'll find a mix of flat sandy beaches, rocky outcrops and native forest.

Sand dunes

Sand dunes are a distinctive feature of Southland's coastline. Our beaches and dunes are very dynamic systems which change rapidly in response to seasonal weather patterns, storms, human disturbance, changing currents and tides. Oreti Beach is our best known beach and sand dune system; it extends all the way from Riverton to the mouth of the New River Estuary. You'll also find sand dunes at Martins Bay (near Jamestown), Wakapatu, Colac Bay, Omaui, Fortrose and Waipapa Point. On Stewart Island, dune systems can be found at Smoky Beach, Little Hellfire, Big Hellfire, West and East Ruggedy, Mason Bay and Doughboy Bay.



Native dune plants

Native dune plants play an important role in the formation, development and maintenance of dunes. They are salt-tolerant and are well adapted to living in the hostile coastal environment. They are extremely effective at trapping sand, and this enables them to reduce wind erosion and speed up recovery of dunes after storms. If dune plants are destroyed, the dunes will eventually be lost too.

Pīngao

Pīngao (or pīkao) is a native plant that grows on sand dunes. Pīngao is a taonga (treasure)

species for southern Māori as it was highly prized for weaving. The dried leaves are a brilliant yellow and were used on tukutuku panels in the whareniui (meeting house) for making kete (baskets), pōtae (hats) and whāriki (mats). The leaves were also woven to make strong waterproof pōkeka (raincoats), or protective garments worn by warriors. The young shoots could be steamed and eaten.

Where can we see pīngao?

Unfortunately, only a few remnant populations of pīngao remain in Southland in places like Martins Bay, the Three Sisters at Omaui (on private land) and Mason Bay.

The legend of Tāne's eyebrows

Read the legend of Tāne's eyebrows to find out the origin of pīngao. Go to www.doc.govt.nz and search 'The Story of Pīkao'.

◀ Sand dunes are a distinctive feature of the Southland coastline.

Why are sand dunes important?

Natural protection

Sand dunes provide a buffer between the land and the sea. They play an important role in protecting our land, homes and infrastructure from coastal hazards such as storms and tsunamis. Research has shown that when dunes are well-protected by coastal vegetation, tsunamis cannot penetrate as far inland.

Cultural, historical and heritage values

Dunes often contain important archaeological and cultural sites from early Māori and European settlements. From time to time, archaeological treasures such as pre-European tools and ovens are unearthed by coastal erosion and human development. For example:

- The New River Estuary contains wāhi tapu (sacred places), as do many of the dunes and estuaries along Foveaux Strait.
- The dunes between Colac Bay and Wakapatu contain middens and ovens originating from historical mahinga kai gathering in Lake George (Urewera).

Conservation values

Sand dunes provide habitats for native insects, lizards and birds, as well as specialised coastal plants that are adapted to cope with sand movement and exposure to the elements. For example:

- The toheroa beds at Oreti Beach are thought to be the largest and most resilient in New Zealand.
- The Three Sisters dunes in Omaui have a rich community of plants and insects including rare pīngao, an endangered plant (*Gunnera hamiltonii*), and some rare and newly-discovered species of moths.
- The dunes at Fortrose Spit contain a diverse community of invertebrates, as well as pīngao and threatened sedge (*Poa trioides*).
- The dunes at Mason Bay are particularly significant as they support around 30 nationally threatened and uncommon plant species. The rarest-known invertebrate in Southland is a sand daphne moth, which lives nowhere else but in the dunes at Mason Bay. The beach, creek

Want to know more?

Read more about Southland's coastal archaeological treasures and the efforts being made to protect them in the March 2016 issue of our *Envirosouth* magazine, available on our website – www.es.govt.nz

mouths and dunes provide habitats for the New Zealand dotterel and the banded dotterel, and the sandy shore provides habitat for large beds of unexploited tuatua.

▼ This midden at Porpoise Bay has been exposed by erosion.



▼ Midden at Fortrose.





▲ Mason Bay.

Natural character and landscape values

Some of Southland's dunes are an intrinsic and recognisable part of our landscape. The dunes on Stewart Island, for example, are some of the finest examples remaining in New Zealand and are considered to be both nationally and internationally significant.

- Big Hellfire Beach has an extensive dune system rising to 220m above sea level.

- Mason Bay has one of New Zealand's largest remaining unmodified dune systems, including a 19 kilometre long beach. Visitors standing amongst the dunes gain an experience of remoteness, space, natural quiet and solitude as they view the vastness of the Southern Ocean.

Coastal water quality

- Sand dunes can also enhance and maintain coastal water quality by acting as filters for rain water and groundwater.



▲ Three Sisters dunes at Omaui. This viewing point is reached by following the new track through Omaui Reserve to the top of the hill (2.4km).

What is happening to our dunes?

Sadly, intact sand dune systems are now rare in New Zealand. About 70% of New Zealand's dunes were lost during the latter half of the 20th century. Most of those remaining are infested with exotic plants and pest animals such as rabbits.

One of the main causes of their decline is marram grass, which was originally imported from Australia to stabilise active dunes near major cities.

Agriculture, forestry, urbanisation, infrastructure development, residential subdivision, golf courses, sand mining, waste disposal and military activities have also contributed to the destruction or modification of dunes.

In many parts of New Zealand, restoration groups are replanting dunes with native sand-binding plants such as pīngao, spinifex and euphorbia. On Stewart Island, the Department of Conservation has a long-term project to manage the effects of marram grass on the dunes at Mason Bay.

Field trips to the beach

Field trips are fun and provide a wealth of opportunities for learning. Here are some suggestions for investigations at the beach, and activities you can do in preparation and to follow-up. Before you settle on a time for your beach visit, remember to check the tides!

Prior to the field trip

- Group discussion – invite students to share their experiences and knowledge about beaches and sand dunes. Prompt students to talk about plants and animals they've seen. Some students may not have had much experience, so you could begin by showing some pictures and discussing their features.
- Read some information or a story from a journal e.g. *Save Our Sand Dunes*, by Philippa Werry, School Journal, Part 2 Number 3, 2010.



▲ Omaui.

Recommended locations

Oreti Beach is probably the best beach in Southland for a school field trip. Options include:

- the main entrance, accessed via Dunns Road
- the south entrance, accessed via Christie's Road
- the Riverton end, accessed via Princess Street in Riverton township

Other recommended beaches are:

- Te Waewae Bay and Monkey Island
- Colac Bay
- Omaui



▲ Oreti Beach.

Investigations

Beaches and dunes provide ideal settings for students to investigate spatial patterns such as dune profiles, soil characteristics (e.g. organic content, colour, texture, moisture, pH, temperature and salinity), distribution of vegetation and animal life, air temperature, wind speed and human impact.

Field sketch

Get students to climb to a high point and make a field sketch of the beach and sand dunes. The sketch can be annotated with information including natural features, evidence of management, human impact, and location of transect lines. Students can also describe the pattern of landforms and land uses they observe in the surrounding area.

Guided walk and recording of observations

Walk along the beach to examine erosion, human impacts, and look for any control measures and hard engineering structures.



▲ Howells Point, Riverton.

Transect lines

A transect is a straight line across a habitat. It can be as simple as a rope or tape measure placed in a line on the ground. The observer walks along the line and stops at intervals to observe, measure, and record data.

1. Decide what information you want to record along the transect.
2. Decide on the starting point, direction, length and end point. For example, you may choose to start at the foredunes (closest to the sea) and work your way inland.
3. Decide on the distance between samples, e.g. 5m intervals.

4. Lay out a rope or tape measure to mark the transect route.
5. Walk along the transect, stopping at intervals to observe, measure and record data.

Tips

Dune profile: Get students to place a pole or electric fencing standard wherever they notice an obvious change in the angle of the slope, and then measure and record the angle of the slope at that point.

Soil: Students can make a visual comparison of changes in the organic content of the soil by

attaching a strip of double-sided tape to a diagram of the dune profile and sprinkling a small sample of soil onto the tape at each sample point.

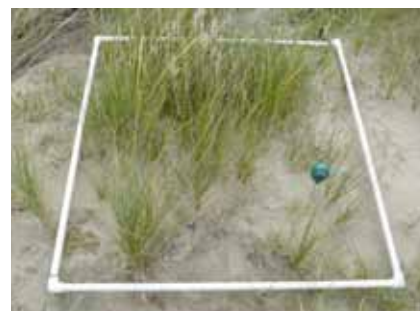
Vegetation: Students can use 1m² quadrats to estimate the percentage vegetation cover and the frequency of each plant species at each sample point. A species identification chart or key would be helpful.



▲ The angle of the slope can be measured using a cell phone. (Download one of the free clinometer apps.)



▲ Drawing of the dune profile with soil samples.



▲ Vegetation can be assessed within a 1m² quadrat. Soil characteristics can be measured using a thermometer and pH meter.

After the field trip

Guest speaker

Invite someone from the city, district or regional council to talk to your class about natural hazards associated with the coastline, human impacts, management of erosion and the views of different stakeholders.

Discussions

- Discuss coastal processes and the dynamic nature of coastlines.
- Discuss the effects of erosion on people, infrastructure, and the environment. Consider a range of stakeholder viewpoints and possible actions.
- Discuss cultural values of the beach and sand dunes.
- Discuss management strategies that are already in place and the effectiveness of these strategies. Offer management suggestions.

Suggestions for writing

- Write to persuade others to protect Southland's beaches and sand dunes.
- Describe how a dune species is suited to its environment.
- Compare the ways in which two or more dune plants have adapted to their habitat.

Visit the Southland Museum and Art Gallery

- View artefacts and learn about the taonga of Murihiku at the Māori Tangata Whenua Gallery .
- Learn about the historic waka – Te Waka o Mokomoko – that was found and recovered from the sands of the estuary near Invercargill. The exhibition showcases the waka being treated and includes other important wooden taonga of Southland.



TE WAKA O MOKOMOKO – In mid December 2011 a team led by the Southland Museum excavated part of a historic Māori waka (canoe) near Omaui, Southland. The waka was transported to the Southland Museum & Art Gallery to begin a six year conservation treatment to preserve the wood. In a first for New Zealand museums, te waka has been put on display in the museum to illustrate the conservation process for the public.

This project is being undertaken with the support and advice of Heritage New Zealand, Te Ao Marama, local Iwi, Ministry for Culture and Heritage and the National Conservation Laboratory (Auckland University).

Te Waka o Mokomoko is an ongoing display, showing the conservation treatment while it is being completed. A video screening in the exhibition shows what the conservation process has been like, right from the location it was found on the beach.

Resources

Check out these resources to learn more about Southland's beaches and sand dunes.

Department of Conservation

- *Our own gold coast.* www.doc.govt.nz/get-involved/conservation-education/resources/our-own-gold-coast/
- *Stewart Island/Rakiura Conservation Management Strategy and Rakiura National Park Management Plan.* 2012. www.doc.govt.nz/Documents/about-doc/role/policies-and-plans/cms/stewart-island-rakiura-cms-and-rakiura-np-mp-2012.pdf
- *The Catlins Coast* - an environmental education resource kit for use on three sites in the Catlins. www.doc.govt.nz/Documents/getting-involved/students-and-teachers/field-trips-by-region/001-the-catlins-coast.pdf

Forest and Bird

- www.forestandbird.org.nz/what-we-do/publications/media-releases/summer-care-leave-only-your-footprints-the-beach-summer

Lloyd Esler

- *Southland's Sandy Shores - a resource for teachers.* Department of Conservation.

School Journal

- *Save Our Sand Dunes* by Philippa Werry, Part 2 Number 3, 2010. <http://literacyonline.tki.org.nz/content/download/28367/297547/file/Part+2+Number+3+2010+Save+Our+Sand+Dunes.pdf>

Science and Biotech Learning Hubs Professional Development Session for Seaweek 2016

- <http://sciencelearn.org.nz/Teacher-Ideas/Professional-Development/Seaweek-2016>

Seaweek

- <http://seaweek.org.nz/resources-downloads/>

Southland Community Nursery

- www.southlandcommunitynursery.org.nz/restoring-your-patch/know-your-patch/dunes/

Southland Museum and Art Gallery

- www.southlandmuseum.co.nz/assets/long-term-exhibitions-and-programmes-2016.pdf

What does Environment Southland do to protect our coast?

Southland has a diverse and special coastline which boasts some of New Zealand's finest examples of dunes and other coastal habitats. Environment Southland is required, under New Zealand's Coastal Policy Statement, to protect ecosystems which are unique to the coastal environment and vulnerable to modification.

How can you help protect our sand dunes?

- Always use formed access ways such as boardwalks, steps and marked tracks, where provided.
- Encourage friends and children to respect the dunes and not play on them – especially on the critically important seaward face of the dune.
- Do not allow livestock onto dunes.
- Do not light fires on dunes.
- Do not dump personal household and garden refuse as it can spread weeds.
- Keep dogs under control in order to protect nesting birds and other animals.
- Do not drive motorcycles or 4WDs on dunes.
- If you come across archaeological artefacts or sites, leave your discoveries where you find them and report the sighting to Heritage New Zealand.

Fleur Matthews is Environment Southland's team leader for air and coast. She looks after a small team of planners who are part of the wider team working on Southland's land and water, air and coastal plans. Fleur says that Environment Southland manages adverse effects on the environment by deciding which activities (e.g. cruise ships, jetties, moorings and aquaculture) can occur within the Coastal Marine Area.

Her team is currently looking at Environment Southland's Coastal Plan, which requires updating. She says it's time to think about what has changed since the plan was developed and how it might need to be updated in response to those changes. For example, the current coastal plan prohibits aquaculture in most of Southland, but allows aquaculture development in certain parts of the region to be considered through the resource consent process on a "first come first served" basis. If Southland is to achieve the goal in the Southland Regional Development Strategy to diversify the Southland economy into aquaculture, a more strategic approach is needed.

Fleur is also working on the Proposed Fiordland Marine Regional Pathway Plan. This plan aims to reduce the risk of marine pests being carried in on local and visiting vessels. Vessels can provide a pathway for marine pests, which attach to boats and gear, and in pockets of seawater and bilge water. Keeping these areas clean means that the pests are unable to attach and Fiordland is protected. This proposal is the first of its kind in New Zealand and is a huge step towards protecting and securing the future of this precious area.



▲ Fleur Matthews, team leader – air and coast, policy and planning.

Although her background isn't in planning, Fleur is able to bring a fresh perspective to leading a group of planners. She has a double degree from University of Otago (Bachelor of Commerce (Economics) and Bachelor of Science (Chemistry)), and spent nearly ten years in a policy analyst role in biosecurity for the Ministry for Primary Industries. The main skills needed for policy and planning are critical thinking and an ability to structure an argument.