EnviroTEACH

An environmental education resource for teachers

Term 2 – 2018

From the editor

This issue of Enviroteach focuses on the special qualities of Southland's coastal environment. It explores the concept of ki uta ki tai (mountains to sea) and the many ways in which the land, water and sea are interconnected. It looks at the big issues facing coastal ecosystems and some of the ways in which our coastal environment is changing. It highlights that the coastal values we enjoy and the ecosystem services the coast provides are only possible if our terrestrial, freshwater and marine ecosystems are also healthy and thriving, and draws attention to what we can do to help protect our treasured coast.

This publication has been written for teachers and contains information and suggestions for activities and investigations you can do with your students to explore this topic. This particular issue is built around the action learning cycle (with permission from the Toimata Foundation) which is the main tool used by Enviroschools to plan and carry out student-led projects. Look for the icons scattered throughout the publication which highlight opportunities for your students to:

(1) identify the current situation

(2) explore alternatives

(3) take action

(4) reflect on change.

Contact the education team at Environment Southland (education@es.govt.nz) if you'd like some assistance with planning units of work, lessons, or field trips focusing on coastal or other ecosystems. Visit our website – www.es.govt.nz > Services > Environmental education to find out what we can offer.

Pat Hoffmann
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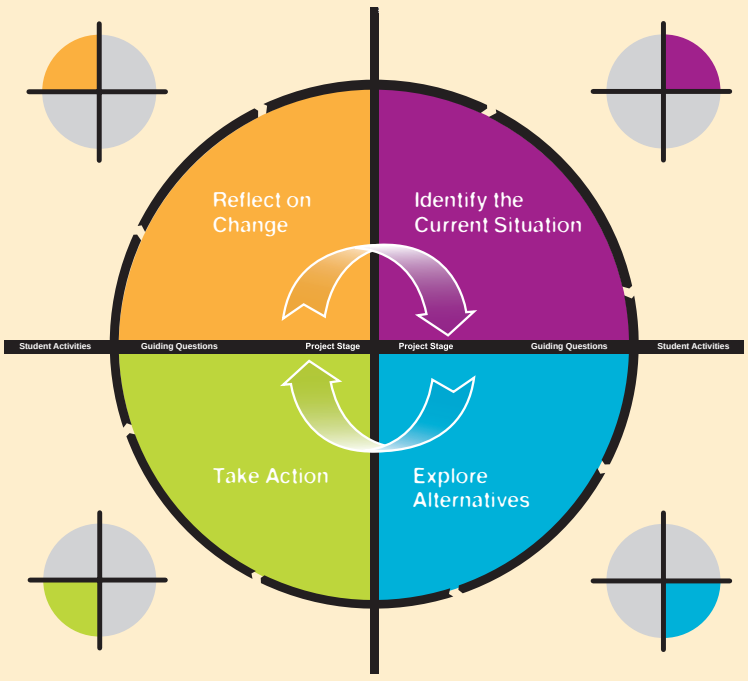
Action Learning Cycle



environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

Southland's treasured coast

Southland's coastline is over 3,000km long; the longest of any region in the country. Our coastal environment plays an important role in the social, economic and cultural wellbeing of all of our communities and we value it for lots of reasons. For example, many people choose to live or work near the coast for its climate and scenery or to make the most of its recreational opportunities. Visitors come to the coast to enjoy activities like swimming, fishing, boating, walking along the beach and taking photographs.

Southland's coast provides some of the finest seafood in the world, including mussels, kina, paua, toheroa, crayfish, blue cod, salmon, and our famous Bluff oysters. Many businesses and commercial activities (e.g. fishing, tourism and aquaculture) depend on these and other resources that the coast provides. The coast also provides us with valuable ecosystem services like water filtration and storm protection that benefit the entire region.

Southland's coast is ecologically diverse with a broad range of habitat types including rocky shores, beaches, dunes, estuaries, kelp forests and reefs. Diverse communities of plants, birds, fish, mammals, shellfish and other invertebrates, and the human communities that utilise these resources all rely on clean, clear coastal water, healthy shorelines and sea beds, and thriving intertidal and subtidal habitats.

Did you know that nearly all of Southland's freshwater fish spend part of their lives in estuaries? Similarly, many marine fish and mammals that usually live far out to sea visit our coastlines during part of their lifecycle, e.g. to find food and habitats for breeding. Southland's coast also provides critical habitats for migratory birds such as bar-tailed godwits that fly to New Zealand from across the globe to rest and feed in our estuaries.

▲ Visitors enjoying Omaui Beach on a sunny day

ACTIVITIES

Find out what your students already know and value about the coast

Ask your students to talk, write or make a display about their personal experiences of visiting the coast. You can use this activity to practise a range of literacy skills e.g. expressive writing or poetry. Prompts could include: Describe your favourite spot. When and how often do you go there? Who do you go with? What do you like to do when you visit? What is the best thing about that place? If you could choose one thing that would never change, what would it be?

Learn more about your local coastal environment

- Investigate the economic contribution of the coast to our economy. Find some statistics on fishing, tourism or commercial activities and get the students to present them as tables, graphs and charts.
- How healthy are the beaches, estuaries and rocky shores in your area? Students can investigate ecosystem health using hands-on methods like marine metre squared (www.mm2.net.nz). Contact the education team (education@es.govt.nz) if you'd like some assistance.

Ki uta ki tai

The coastal environment has intrinsic spiritual and cultural value for Ngāi Tahu ki Murihiku. It's a taonga (treasure) and a provider of kaimoana (seafood), and has many sites of cultural significance and strong ancestral connections for tangata whenua. Water (o te wai) is considered a taonga because it gives life; the welfare of the environment and the people depend on it. O te wai extends to the sea (o te moana) and Ngāi Tahu recognise the inherent connection between freshwater and the sea.

The concept of ki uta ki tai is based on the knowledge that resources are connected from the mountains to the sea and must be managed in that way for the people today and for the generations to follow. If the realms of Tāwhirimatea (atua of the winds), Tāne Mahuta (god of all living things), Papatūānuku (mother earth) and Tangaroa (god of the sea) are sustained, then the people will be sustained. This kaupapa reflects the belief that we all belong to the environment and are only borrowing these resources from the generations that are yet to come. It is our duty to leave the environment in as good or even better condition than it was when we received it from our tūpuna (ancestors).

▲ The Waituna Lagoon and its catchment is an area of cultural significance for Ngāi Tahu.

Interactions between land, rivers and coast

Southland's ecosystems are connected to each other in many ways. The coastal values we enjoy and the ecosystem services the coast provides are only possible if our marine, freshwater, and terrestrial ecosystems are healthy and thriving too. Unfortunately, coastal water quality and ecosystems can also be affected by contaminants (like nitrogen, phosphorus and bacteria) and sediment originating from land-based activities that make their way into freshwater streams and groundwater and eventually drain into our coastal lagoons, lakes and estuaries.

ACTIVITIES

Enviroscape model

Invite our education team to visit your class with our Enviroscape model to demonstrate in a visual, fun and interactive way how contaminants from the land make their way into rivers and oceans, and what we can do to avoid or minimize these impacts.

Explore cultural perspectives and traditional knowledge

- Explore Māori cultural perspectives by learning waiata (songs), listening to, reading or acting out pūrākau (legends), or finding out about tikanga (traditional rules or practices) relating to the coast.
- If you have students from several different nationalities in your class, you can explore and celebrate a range of cultural perspectives.

Issues facing our coastal ecosystems

In many cases the health of Southland's coastal ecosystems is still good. However, some parts of our coast are under pressure and are showing signs of decline. In Southland's estuaries, the main drivers of declining ecosystem health are eutrophication, accelerated sedimentation, bacterial contamination, habitat loss, invasion of pest plants and climate change.

Eutrophication

Eutrophication (from the Greek word for well-fed) is the process in which a waterbody becomes overly enriched with minerals and nutrients (e.g. nitrogen and phosphorus). This can lead to:

- Excessive growth and decay of plants and algae, especially invasive weed species, which can smother habitats and contribute to even higher nutrient levels;
- Decreased levels of oxygen in the water, which can make it difficult for fish to obtain sufficient oxygen;
- Increased turbidity and decreased water clarity, which can affect fish and plant life

Currently, the two most-affected estuaries in Southland are Jacobs River and New River. However, Toetoes (Fortrose) Estuary is also showing signs of degradation due to eutrophication.

Sedimentation

Sedimentation is the process in which sediment (e.g. topsoil, sand and silt) is eroded from the land, transported by rivers and deposited on a river bed or seabed. Although sedimentation is a natural process, sedimentation rates are now much higher than they were before human activities changed the natural landscape (such as deforestation, agriculture and urban development). The impacts of accelerated sedimentation on coastal ecosystems include:

- A shift from a sandy to a muddy seabed which affects fish and shellfish
- Loss of habitat
- A decrease in the diversity of plant and animal communities

The Waikawa, Toetoes, Jacobs River and New River estuaries are all experiencing adverse effects as a result of sedimentation. There has been a significant increase in the muddiness of the New River Estuary where the percentage of the estuary classified as soft mud increased from 17% in 2001 to 27% in 2016.

Bacterial contamination

Faecal bacteria can enter coastal water through faeces from mammals and birds, stormwater, agricultural runoff and human sewage. This can cause diseases in humans such as dysentery, gastroenteritis and hepatitis A.

Southland's marine bathing sites are prone to bacterial contamination after sustained rainfall when bacteria are carried by rivers down to the coast. Water samples taken from shellfish gathering sites consistently breach national guidelines for *E.coli* levels. These sites include the cockle beds in Toetoes Harbour, Jacobs River Estuary, Colac Bay, and New River Estuary.

Every summer, Environment Southland monitors the water at 13 marine bathing sites and eight shellfish-gathering sites so we can inform the public about levels of *E.coli* bacteria. Throughout summer you can access this information from our website to help you understand the health risks and make informed choices.

Excessive growth of algae in Toetoes Estuary

Scientists sampling mud in the Jacobs River Estuary

Habitat loss and invasion of pest plants

Drainage and reclamation have destroyed large parts of Southland's estuaries. New River Estuary has lost 26% of its area since 1910.

Coastal shoreline habitats function best with a natural vegetated margin which acts as a buffer. This buffer protects against introduced weeds and grasses, naturally filters sediment and nutrients, and provides valuable habitat. Much of the coastal margin in Southland has been modified through grazing by cattle and sheep.

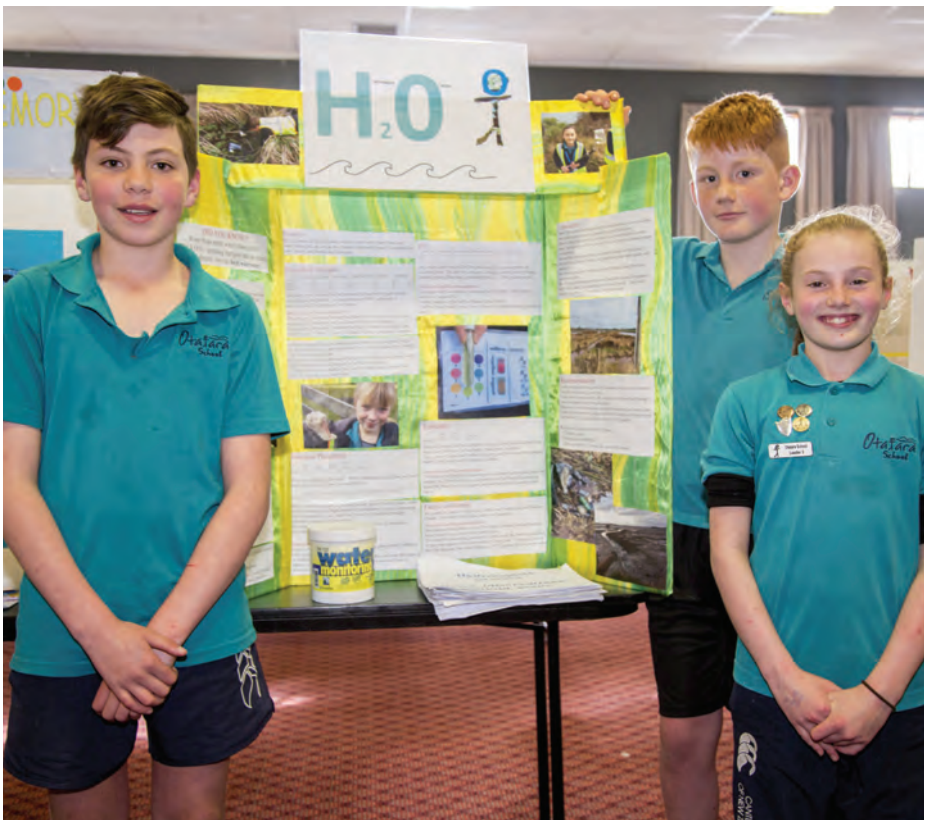
Most of our dune systems are vegetated by marram grass, an introduced species which outcompetes native species such as pīngao. This replacement has caused dune instability problems and loss of biodiversity and natural character.

Climate change and sea level rise

Our coastal environments are constantly subjected to natural processes that lead to changes in our coastlines. These include storm surges, flooding by high tides, strong winds, erosion and shifting of beach sand.

Experts predict that as our climate changes and sea level rises, we will experience more frequent coastal flooding and more severe erosion of our coastlines. Environment Southland has infrastructure in place such as tide gates and pumping stations to help protect us against coastal hazards. We also have a monitoring network and a flood-warning system so the public can access up-to-date data via the internet or telephone.

You can find out more about coastal hazards and what we are doing to minimise our risk by reading *Our Threats: Southland Water 2010: Part 4* which you can download from the Document Library on our website – www.es.govt.nz.



▲ In 2017, Year 6 students at Otatara School carried out a wide range of tests to investigate the quality of water being carried by Otatara's stormwater drains into the New River Estuary. They visited Environment Southland to present their findings to the science team, and won a silver award at the NZAS Southland Science and Technology Fair for their efforts. (PHOTO: David Russell, Southern Exposures)

ACTIVITIES

Explore alternatives

- Help students become better-informed about the big issues and what is going on around them.
- Find out what other people think and explore a range of perspectives.
- Support students as they begin to decide what they think and where they stand.

You can do this through activities such as reading, inviting guest speakers to talk to your class, or by setting up practical investigations in your local environment.

How has our coastal environment changed?

Some of Southland's most critical infrastructure has been built within the coastal environment. Bluff port, for example, straddles the coastal marine area and the landward edges of the coastal environment - as do many roads and railways around the region.

We can't do without this infrastructure, and it is very likely that in the future more infrastructure will need to be developed in coastal areas in response to the growth of economic activities in the region.

Over time, subdivision of properties, changes in land use and development within Southland's coastal environment have changed the natural character, features and landscapes of the coast. This has resulted in the loss of some of its indigenous biodiversity as well as some of its intrinsic, ecological, amenity, social, cultural and heritage values.

Bluff Harbour

Riverton

ACTIVITIES

Find out what your students would change if they could

- Ask your students to think about a specific place on the coast they know well.
- Find out how the area has changed over time, by collecting stories or historical photos, or visiting the museum. The Retrolens website (http://retrolens.nz/) offers a treasure trove of aerial photos taken between 1936 and 2005.
- Ask your students to imagine what changes might occur in the same area in the future. What changes would they like to see? What changes would they not like to see?
- Get your student to identify one change or improvement they would make if they could, and describe it or draw it.

What is Environment Southland's role?

Because the coast is so important to us, there is often debate around how coastal areas should be used and managed. Local government has the challenge of meeting the needs of the range of people that use the coastal environment while making provision for new activities or developments. Aspects that need to be balanced include maintaining and enhancing public access to the coastal environment, and preserving the natural character of the area.

EXAMPLE

Two years ago, a film company applied to Environment Southland for consent to carry out some activities in Milford Sound/Piopiotahi as part of the making of the feature film, Alien: Covenant. *Environment Southland assessed their application and granted them a permit to temporarily exclude the public from the filming site for the three months of filming, build temporary sets and other structures on the foreshore, and generate noise from pyrotechnic explosions within the coastal marine area. The film company had to follow strict guidelines from Environment Southland and once filming was finished, they had to remove everything and restore the foreshore to its original condition.*

In this example, Environment Southland's decisions and the conditions that were imposed on the film company were guided by our Regional Coastal Plan. This document describes the values associated with Southland's coast and identifies the issues requiring management. It has separate sections explaining how we manage coastal issues relating to estuaries, coastal water, the seabed and foreshore, structures in the coast, coastal processes and protection works, ships, recreational activities, marine farming etc. You can find the plan on our website: www.es.govt.nz/document-library/plans-policies-and-strategies/regional-plans/Pages/Coastal-plan).

▲ Milford Sound/Piopiotahi

ACTIVITIES

Roleplay the decision-making process

Get your students to imagine that someone has proposed a new development or activity somewhere along Southland's coastline, e.g. they want to dredge for gold in Te Waewae Bay, build a jetty on Stewart Island, construct a marine farm at Bluff, or do some filming for a blockbuster movie at Oreti Beach. Provide a detailed description of the proposal. Tell the students that they have been appointed as consultants to help decide whether the development or activity should go ahead and give advice on how it should be done.

- Brainstorm the potential impacts on the land, freshwater and coastal ecosystems, air, plants, animals, other structures and people.
- Describe how the development or activity might limit public access to the area, or increase the impacts from natural hazards (such as storms or tides) and sea level rise.
- Recommend whether or not the development should go ahead, giving reasons.
- Propose solutions or alternatives that would allow the development to go ahead while maintaining public access and protecting the natural character of the area.
- Suggest how any impacts that cannot be avoided could be minimised to a more appropriate level.

What can schools and young people do?

ACTIVITIES

Find out what others have done

Find out what people are doing locally, elsewhere in New Zealand or in other parts of the world to help the coastal environment. Think about the actions they have taken and identify the changes and benefits that came about because of their actions.

Identify all the actions you could take

- Make others aware of the issues and share what you've learned.
- Find out what others are doing by inviting in speakers from landcare or catchment groups in your area, local councillors or other environmentally-minded organisations.
- Let the public, community leaders and policy-makers know what you think.
- Make submissions on council plans, proposals or resource consent applications.
- Get involved in community environmental projects, or groups such as the youth council or the Kiwi Conservation Club.
- Become an Enviroschool. Contact to our education team if you'd like to know more about this.

Plan for action

- Identify your priorities for change. Which of these actions will bring about the changes you want?
- Identify what you will need to take action.
- Who else do you need to involve?
- Decide who will do what and when.
- Implement your plan!

Reflect on change

- Think about how your action project went.
- Identify the changes and benefits that came about because of your actions
- Celebrate your achievements!
- Identify some next steps.

Right – In 2016, St Joseph's School in Invercargill helped Environment Southland to establish a riparian strip along the Kingswell Creek at the New River Estuary. Actions like this can help to reduce sedimentation of our estuaries because the plants stabilise stream banks and trap sediment on the land.

Need some help?

Here is a selection of the range of educational resources, activities and field trips Environment Southland can help you with. Contact us at education@es.govt.nz or call 0800 76 88 45.

- **Marine Metre Squared: www.mm2.net.nz**
- **Estuaries study**
- **Rocky shores study**
- **Sandy beach study Enviroteach: www.es.govt.nz/document-library/newsletters/pages/Enviroteach**
- **NZ Marine Studies Centre: www.otago.ac.nz/marine-studies/resources**
- **EnviroScape lesson: www.enviroscapes.com**