ABOUT THESE RESOURCE BOOKS

This coastal resource is one of two books; the other is Canterbury's Marine and Coastal Animals. This book is divided into three broad regional sections: north, central and south Canterbury. Canterbury's Marine and Coastal Animals is not divided into regional sections, rather it identifies the different coastal environments and the animals that live in those areas.

These books have been written as a joint resource. They are designed to be used in combination with each other, but can be used individually. The visual links between the two resource books are a series of symbols. Wherever there is a symbol, there is corresponding information in the other resource book.

Below are the symbols you will see in these resource books.

CANterbury’s marine and coastal animals

1. You will find additional coastal information in the North Canterbury section of Canterbury's Spectacular Coast.
2. You will find additional coastal information in the Central Canterbury section of Canterbury's Spectacular Coast.
3. You will find additional coastal information in the South Canterbury section of Canterbury's Spectacular Coast.

Canterbury’s spectacular coast

- You will find additional marine and coastal animal information in the Canterbury’s Marine & Coastal Animals book.

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Up to 90% of New Zealanders live within 40 kilometres of the sea - an unusual statistic in world terms.

The coast provides a source of kai moana (sea food) and water provides spiritual fulfillment to all Tangata Whenua. They, like many other people in the region, see the coast as an integral part of the whole environment reaching from the mountains to the sea and do not look at coastal issues in isolation from other environmental issues. The coast for Tangata Whenua has always played a significant role in the lives of their ancestors, and the present generation, and will continue to be important for future generations. Their system of traditional rights to, and attitudes towards natural resource management has evolved over time. For Tangata Whenua, the natural resources of their aroha or rohe are a statement of identity and mana.
The Canterbury coastline is spectacular in its variety, from Kaikoura to Pegasus Bay and from Banks Peninsula/Horomaka to South Canterbury - rocky platforms, eroding sea cliffs, wide sweeping sandy beaches, sheltered bays of volcanic rock, coastal lagoons, estuaries, mud flats and the long, exposed, shingle beaches of the Canterbury Bight.

The most stable part of the Canterbury coast is Banks Peninsula. It blocks the northward drift of sediment, causing build-up at the northern end of the Canterbury Bight.

Banks Peninsula also shelters the southern part of Pegasus Bay from strong southerly storm swells, allowing the accumulation of relatively fine sediment in this area.

Along our coasts wetlands have formed in low-lying areas adjacent to river mouths. There are more than a dozen estuaries and lagoons, some of which are of international importance for their wildlife, especially birds.

A CHANGING COAST
The Canterbury coastline is constantly changing. Powerful waves remove sediment from the shore gradually eroding the coast, losing land to the sea. In other areas sediment builds up, and the coastline grows seawards.

Another phenomenon causing change to our coastline is global warming. Over the past century the average global temperature has increased by almost 0.6°C. Scientists expect the average temperature to increase an additional 1.4 over the next 100 years (Ministry for the Environment, Climate change impacts on NZ, 2001). Over the past 100 years the sea level has risen 2mm. It is predicted to rise up to half a metre over the next 100 years. Along Christchurch’s coastline, sea level rise could lead to the inundation of low lying areas around Brooklands Lagoon and the Avon-Heathcote Estuary/Hutia, and an increased incidence of tidal flooding in low lying riparian areas near the mouths of the Avon and Heathcote rivers. With higher water levels dune erosion may increase. However the overall result should be continued accretion (building) of the dune-backed beaches between the Estuary and Brooklands Lagoon (Tonkin and Taylor, CCC, 1999).

WHO DOES WHAT?
The sandy beaches along the Christchurch coastline are part of Pegasus Bay, an area that stretches from Banks Peninsula/Horomaka to the mouth of the Waipara River. Environment Canterbury, the City Council and the Department of Conservation all work together to protect the coastline. In this region Environment Canterbury has responsibility for the "Coastal Marine Area" which is the foreshore, seabed, coastal water and the air space above the water between the outer limits of the territorial sea (12 nautical miles) and generally the area of the average of the highest tides. The City Council administers the area from this point landwards but as the coast and land are so closely linked, the city and regional councils work together. The coastal environment as a whole is part of the Regional Coastal Plan. The Department of Conservation is responsible for native animals and plants at any location including coastal and marine areas.
North Canterbury Coast

THE KAIKOURA COAST

HUMAN HISTORY

Maori recognised the diverse resources that are a part of the Kaikoura Peninsula. Maori gave the area the name kai meaning food, and koura meaning crayfish. This represented the importance of the region as a food basket.

Early European settlement in the area focused on pastoral (sheep) farming, and the harvesting of marine resources, mainly seals and whales. Many whales and seals were hunted to the point of extinction.

In modern times, marine mammals such as whales, dolphins and seals are protected under national law. Now the Kaikoura Peninsula is home to a flotilla of sight-seeing vessels and tours that take in the diverse marine and bird populations, as well as the unique coastal landforms. Recreational and commercial fishing still plays an important role in the local economy.

Locally harvested crayfish are a favourite delicacy with tourists.

MANAGEMENT ISSUES

The Kaikoura Peninsula is home to a fleet of sight-seeing vessels and tours that take in the diverse marine and bird populations, as well as the unique coastal landforms. The sustainable management of natural resources requires a fine balance between protecting the unique environment, and development for tourism. State Highway One and the main railway follow the Kaikoura coastline for most of its length, allowing access to an area of outstanding scenic beauty.

NATURAL HISTORY

The Kaikoura coastline stretches from the Conway River in the south to the Clarence River in the north, approximately 150km in length. The coast is dominated by rugged land formations, with the large Kaikoura ranges and the Pacific coast just a few kilometres apart.

A kilometre offshore from Kaikoura Peninsula the sea floor drops to 1750m creating the Kaikoura Canyon. This causes an upwelling of cold, nutrient-rich water. Because deep water is so close to the coast, it is an ideal habitat for a diverse range of birds, invertebrates, fish and marine animals, including shearwaters, penguins, dolphins and whales.

Kaikoura coastline, photo courtesy of ECaR
GORE BAY CATHEDRAL S

One of the most prominent features of the North Canterbury area are the Gore Bay Cathedrals. These rock formations were formed by erosion of soft rock (red conglomerate and sandstone), leaving behind hard rock shapes that look like cathedrals. They serve as a record of sedimentation history and are rare features of the Canterbury coast.

NAPE NAPE

Nape Nape Scenic Reserve is noted for its unique forest community and heavily eroded limestone coastline formations. This rather unique environment supports a growing colony of fur seals and a variety of bird species. In amongst the forest community and along this stretch of coast a rare grass species (Austrostipa littoralis) can be found. The surrounding sea is well known for fishing and surfing.

MOTUNAU ISLAND

Motunau Island is Canterbury’s largest offshore island. It has been the site of three distinct periods of Maori occupation. Evidence from middens sites reveals that the island was a bountiful source of food. In 1968 the island became a nature reserve and is now internationally recognised for its abundant wildlife such as white flippers penguins and sooty shearwaters.

PEGASUS BAY

Canterbury’s only vast stretch of sandy surf beaches with a dune system is found in Pegasus Bay - 55 kilometres of wide sweeping beaches from Banks Peninsula to the Waipara River mouth. It contrasts sharply to the rest of the Canterbury coast, which is made up of gravel and rock sediments.

Pegasus Bay is the most highly used coastline in the Canterbury region. Its popularity for recreation and development means high human impact and environmental effects.

HUMAN HISTORY

Pegasus was the name of the sailing ship that surveyed part of the South Island in 1859. The first mate of the brig Pegasus, William Stewart, gave Pegasus Bay its name. The captain of the ship, Captain S. Chase, lays claim to correcting James Cook’s charts by determining that ‘Banks Island’ was in fact a peninsula.

MANAGEMENT ISSUES

An increasing number of recreational vehicles (four wheel drive, four, three and two wheeler bikes) use the beaches of Pegasus Bay. It is accepted that a large number of these have low impact purposes such as getting to fishing and whitewater areas and for launching and recovery of boats. However, there are other groups and individuals that use the beach, and the dune areas, for recreational driving.

The principal issue of access and beach use contains a number of sub-issues:
- Conflicting uses
- Vehicles/pedestrian
- Boating/fishing
- Vehicles/natural values such as flora and fauna
- Human use/damage to dune systems
- Legal use/uncontrolled, potentially illegal use
- Concentration of vehicle impact in ‘favored’ areas such as Ashworths Spit

NATURAL HISTORY

20,000 years ago the sea level was 130 metres lower than it is today and the shoreline of Pegasus Bay was 50 kilometres further out to sea. As the climate warmed and sea level rose the continental shelf was continually flooded until 6000 years ago when the coast was 12 kilometres further inland than it is today - close to Deans Bush in Riccarton.

During the last 6000 years the coast has moved out reaching the position it is in today. This means that the coast as we know it - its landforms, estuaries and sediment, is relatively young. For example Christchurch’s South Brighton Spit is probably only about 1000 years old.
SAND DUNES

Pegasus Bay is an enormous sediment trap. Over many years sand has been deposited on the beaches from the sea floor and trapped in place by Banks Peninsula. The peninsula acts as a large shelter for the bay, protecting it from the southerly storms that would otherwise pull the sediment back out to sea again. Today, much of the sand comes from the Waimakariri and Ashley Rivers, which, unlike most other Canterbury rivers, do not discharge gravels, only sand. This build up of sand creates sand dunes. Sand dunes provide habitats for lizards and spiders such as katipo.

In calm periods, sand is brought onshore by waves taking it from bars where it has been deposited by longshore drift. This means that there is more sand on the beach leading up to the foredunes.

Calm weather profile

Frontal Dune

Dry beach at high tide

High tide

Low tide

During stormy weather high-energy waves travel up the beach, cut into the face of the dunes, take sand from the surface of the beach and transport it back out to form a bar offshore.

Storm Profile

Erosion Escarpment

Sand is transported offshore to form bar

Sand water level

Original beach level

Offshore bar

After a big storm, take a look at the shape of the foredunes. A steep face can be created on the seaward side when much of the sand is cut away by high-energy waves. In severe storms, plants growing on the dunes are removed, and other artificial structures damaged or moved.

When the weather calms down, the sand is gradually washed back onto the beach from the bar.

Recovered profile

(Frontal Dune)

Sand is transported back onshore to re-establish beach.

Dune slowly rebuilds

Dunes have these things in common:

- They create a physical barrier between the sea and the land, protecting us from the worst extent of any storms including flood damage. Without healthy sand dunes, settlements along Pegasus Bay could be threatened.
- They are part of a mobile system, which changes with time. Weather, wind patterns and tides are important factors in shaping this environment. A sand “budget” balances the amounts of sand moving on and off the beach and this movement is continual. The natural movement of sand on and offshore plays a vital role in protecting the coastline.
- They form a unique habitat for specially adapted plants and animals.

In many areas along Pegasus Bay, this sand movement has been utilised by constructing fences on the seaward side of established dunes. The shade cloth stretched between wooden posts forms a durable barrier, which can be moved or recovered relatively easily should it be damaged by a storm. Sand covers these structures to form foredunes, making a barrier, which protects older dunes and the land behind the beach from the worst effects of any storm. The established dunes need to be eight metres high for them to be effective without becoming too tall and prone to wind erosion. Scientists regularly measure the height of the dunes.

VEGETATION

Without plants growing in the dunes, the sand would be carried away by the wind.

Dune plants are called “sandbinder”. Their long leaves and roots are shaped to trap the sand when the wind blows it around. The dunes build up and the plants grow higher. Their roots get longer to act like an anchor in the sand.

NATIVE SANDBINDERS

PINGAO

Pingao has coarse grass-like leaves. They vary in colour from green to orange. In spring, dark-brown flower heads appear, borne on stems up to 90cm tall. They produce seed in early summer. It is usually found where there is sand movement, typically on the side of the dune facing the sea. Wind blown sand is trapped around its stems and leaves. It forms lower more stable dunes, as it does not grow in such dense tussock. However, it cannot tolerate wave damage. Pingao used to be the dominant dune plant in the New Brighton area. However, it was burnt and grazed and as it disappeared from the dunes the sand was exposed to the wind and blown further inland.

SPINIFEX

Spinifex is a tough coastal plant that can cope with salt spray, drought, extreme temperatures, strong winds and shifting sand. It puts out strong, creeping runners or “stolons” across the dune. When the sand falls.

† Spinifex - spiky female seed heads

Photo courtesy of (CCC)
dunes to form a steep shape because of the way it grows; steep dunes with uneven plant cover are more vulnerable to wind erosion, leading to the possibility of blowouts. Due to its sand trapping abilities it deprives pingao of sand and its extensive root and rhizome systems out competes pingao for moisture. It is not a sandbinder that is used widely today and native plants are used to revegetate whenever possible.

ICE PLANT
A native of South Africa, the ice plant is a mat-forming succulent herb with softwoody stems reaching up to six metres in length. It has dull dark green leaves, which are thick and fleshy. The flowers are yellow, fading to a pinkish hue and the fruit is edible but rarely develops fully.

HOW DO PEOPLE AFFECT DUNES?
Dune systems change over time, but where the beach is close to settlements, interference in natural processes can take place - see chart below.

SANDY BEACHES ATTRACT PEOPLE

| RECREATION | Walking, playing on the beach, walking dogs, fishing, horse-riding, surfing, 4 wheel driving, jet skiing, boating. All these activities require people, animals or vehicles to move across or near the coast. They could disturb nesting birds or destroy plants that grow on sand dunes. |
| DEVELOPMENT | Building development for homes, businesses and structures built right on the coast such as jetties or sea walls. Structures built on the coast can interfere with natural coastal processes. Fire-vegetation clearing for farming or other purposes. Grazing, particularly by sheep and rabbits. Introducing exotic plant and animals. |
| SERVICES | Port operations, sewage outlets. Ships and other sea vessels may contribute to marine pollution. Population growth near the coast means an increase in sewage discharge. This could lead to contamination if not treated correctly. |
HUMAN HISTORY
The coastline has been a major source of food and resources since the first Maori settled in the 1500s. Ngati Mamoe migrated south from the North Island and assimilated the Waitaha people, first by intermarriage, then by warfare and finally by negotiated peace. In the mid-1700s Ngati Tuhu migrated south from the North Island and, in a similar process to the Waitaha, assimilated Ngati Mamoe. As fires destroyed the forests inland, approximately 500 years ago, Maori became dependent on the coast. Several thousand campsites have been found along the coastline, between the estuary and the Waiari River mouth. The coastline provided a source of fish, shellfish and seabirds for Maori, particularly in the Avon-Heathcote Estuary/Hutai and the wetlands of Brooklands Lagoon.

COASTAL MANAGEMENT ISSUES
The sandy coastline is a great place for all types of recreation, however, the impact of activities on the sand dunes can cause major erosion and destabilisation of the sand dunes. People visiting the beach are encouraged to keep to boardwalks and designated tracks, instead of walking over the sand dunes, and damaging plantings placed there to stabilise the sand dunes.

Nylon fences have been used to trap and stabilise sand. Planting the sand dunes with plants is an important process in the stabilisation of the dunes. In many areas pingao has been used to replace marram grass. Pingao grows alongside other plants without smothering them and allows sand dunes to form into more stable mounds, unlike marram grass.

NATURAL HISTORY
The New Brighton coastline as we know it today is a fairly recent occurrence. Six to seven thousand years ago the coastline was at Kapaori, Fendalton and Riccarton. Sea levels were 130 metres lower than they are now. 14,000 years ago a warmer climate had melted the icecaps and glaciers raising the sea level.

Two thousand years ago the coastline was approximately 3 - 4 km inland of the present shoreline. Sediment eroded from mountains has been washed down the rivers, building up the shoreline and slowly shifting it eastwards.

FLORA
In the 19th Century, European settlers destroyed many of the coastal plants, through burning and over-grazing. On the coastal sand dunes restoration programmes are underway to replant areas, previously open sand, with African Ice plant initially, then replacing these plants with native sand-binding plants such as pingao, cottonwood, blue milkweed and sand corposme.

FAUNA
The rocky headlands and boulder beaches conceal a life of different sea forms just under the pounding waves and surging surf. Barnacles, seaweeds, lichens, snails and crabs thrive in the upper tidal zones. In mid to low tide, sea anemones, weels, molluscs, starfish and sea urchins can be found. Just below low tide are the swaying kelps and red seaweeds.

On the surf beach along the New Brighton Spit, black-backed gulls/karoro regularly patrol the beach at low tide in search of shellfish. While small sandhoppers feed on freshly deposited seaweed and surf clams, tuatua, and swimming crabs hide within the sand at low tide.
WHAT IS A LAGOON?
A lagoon is an expanse of fresh or salt water, which is usually shallow. Some lagoons are spring fed and therefore, are predominantly fresh water, others are linked to the sea and the water is a mixture of both fresh and salt (brackish) water. Coastal lagoons are a feature of the Canterbury coastline. They occur in a number of places from the most northern to the most southern.

HUMAN HISTORY
Brooklands Lagoon and the Waimakariri River mouth were important Maori food-gathering sites until the mid-1880s when game fishing legislation was introduced. The legislation banned everyone, including Maori, from taking fish from the river. In the 1850s early European settlers divided the land surrounding the lower Waimakariri into large pastoral runs. George Leach, a Scottish ex-bank manager, owned the area now known as Brooklands Lagoon. The vegetation was soon stripped away by over-grazing and the light sandy soils were blown inland. Farming was later abandoned in the lagoon area.

MANAGEMENT ISSUES
A large number of recreational activities take place at Brooklands including bird watching, walking, fishing, horse-riding, mountain biking, picnicking and boating. Such a mixture of users requires careful management to balance these activities with the needs of the wildlife. Fishing and four wheel drive vehicles can interfere with nesting birds, while bow waves from surf skis effect the roosts of the wading birds at the north of the lagoon. The lagoon is gradually silting up as the Waimakariri River floods and sand is blown off the dunes. The habitat that forms from this natural reclamation can be affected by the nutrients and effluent that enter the lagoon from rural run-off. This run-off contains bacteria from animal faeces and nutrients like nitrates and phosphates, leading to excessive plant growth.

NATURAL HISTORY
Brooklands Lagoon is an important wildlife area with over 74 species of birds, countless insects, invertebrates, and fish and native plants. It is one of the few remaining natural wetlands in New Zealand, now that more than 90% of natural wetlands have been drained or destroyed.

Brooklands Lagoon is an important link in a chain of wetlands along the central Canterbury coast for migrating birds. The lagoon provides a breeding habitat, wintering site and a feeding stop for birds migrating between the North and South Islands. At the height of the summer season 3000 birds visit the lagoon.

The lagoon covers 270 hectares and is 4.5 kilometres long and 0.8 kilometres at its widest point. It is comprised of three areas: the southern lagoon, the middle lagoon and the northern lagoon.

FLORA
The southern lagoon is a wildlife refuge where the high tide only covers the mudflats between two and four hours a day. Wide areas of saltmarsh, consisting of rushes/wiwi, sedges and salt tolerant grasses, surround shallow ponds. The rushes/wiwi provide protection for insects and coastal skinks. The dune vegetation on Brooklands Spit is one of the last remaining areas of natural dune-land plant communities in Christchurch. Cottonwood, flax/tauatake and sand convolvulus, including a couple of huge kaeke and ngaio trees with canopies nearly 10 metres across, can be found at Brooklands. A wide range of native plants, including ferns, grasses, rushes/wiwi, sedges/mania, saltmarsh herbs, trees and shrubs grow along the margins and on the mudflats of the lagoon.

FAUNA
The salt concentration in the water is usually very low, offering ideal conditions for invertebrates, such as tunneling mud crabs, mudflat snails and rag worms. The mid-lagoon area is a mixture of reed beds and open mudflats, which at low tide form the main feeding ground for wading birds, such as godwits, South Island pied oyster catcher/torea, caspian tern/tara and the banded dotterel.

The main channel forms the northern lagoon. Shellfish, such as pipi and cockles, can be found in sandy patches close to the lagoon mouth. Eels, brown trout and yellow-eyed mullet feed around the mouth of the Styx River. Occasionally fish like kahawai and stargazer will enter the lagoon to feed.

+ Brooklands lagoon, photo courtesy of ECAn
WHAT IS AN ESTUARY?
When freshwater mixes with salt water in a semi-enclosed area, an estuary forms. Estuaries are often enclosed by a sandbar or gravel and act as a sediment trap for silt from rivers and tides. The sandbar protects the estuary from breaking waves and strong sea currents.

HUMAN HISTORY
The estuary has been a major source of food for Māori. Several thousand campsites have been found along the sand dunes between the estuary and the Waitakari River mouth. Ngāi Tahu harvested shellfish, eels and waterfowl on the tidal flats. The mouth of the estuary was an important trade route for flax/harakeke and potatoes in exchange for steel adzes, axes, muskets and other goods.

It was the main access route to Christchurch prior to the opening of the Lyttelton rail tunnel in 1867. The estuary was relied on for trade, food and social contact. Up until the early 1900s the estuary was an important port, linking Kaikoura, Sumner, and the bays of Banks Peninsula, carrying passengers, firewood, farm products, machinery, stock and general goods.

MANAGEMENT ISSUES
An estuary is particularly vulnerable to two forms of pollution: heavy metal and sewage.

One way pollution reaches the estuary is via stormwater drains. The drains are designed to channel water from houses and sealed surfaces such as roads and footpaths and to get water off the streets as quickly as possible to prevent flooding. They are a series of connected pipes under the ground that eventually end at the sea or empty into a river, stream or any natural waterway. Because the water runs off the sealed surfaces into the drains it often collects toxins and rubbish along the way, for example litter, dog faeces, oil and petrol from cars, dirt and dust from the road, water from people washing cars, zinc from galvanized roofs and house paint. Any number of these can end up in the estuary itself.

Another form of pollution that may affect an estuary is effluent from oxidation ponds which can contain copper, lead and nickel. The effluent from Christchurch’s Bromley treatment plant has been treated to remove 99.9% of harmful micro-organisms. The run-off from the city and land around the estuary contains bacteria and viruses from rubbish, offal and faeces from birds, dogs, rats and other animals, which run into the rivers and drains. The majority of bacteria decline after a day or so, however, bacteria can survive in the sediment of the mudflats. When disturbed by boats and storms, the bacteria from the mudflats mixes with the water.

The management of the oxidation ponds and stormwater drains, surrounding land and our lifestyles affect the water quality of the estuary, and therefore the plants and animals that survive in the estuary.

NATURAL HISTORY
Two thousand years ago there was no estuary. The shoreline was 3-4 km further inland. The glaciers ground down the greywacke rock into gravel, which was carried down the Ashley and Waimakariri Rivers to the coastal shoreline where it was dumped as sand. As the sand built up to create the Brighton Spit, water pooled behind it to create the Avon-Heathcote Estuary (ihutai), 450 years ago. Today the estuary covers 880 hectares and is 12 km from the city centre.

FLORA
Saltwater marsh wetlands occur around the mouth of the Avon River. Raupo, surrounded by reed-like plants such as lake club rush and sea rush (cicci), grows at the head of the estuary, in Raupo Bay. Raupo, a freshwater plant, indicates hidden sources of freshwater. Close to the shore, mist or turf forming plants cover small meadow-like areas. Mat plants such as grasswort, wild celery, native musk and shore pimpernel provide a colourful display of flowers during the spring and summer months.

FAUNA
Estuaries are a diverse ecosystem home to many animals including crabs, invertebrates, fish and wading birds.
LYTTELTON HARBOUR - WHAKARAUPU

HUMAN HISTORY
Lyttelton Harbour is one of New Zealand's biggest ports and has been an essential part of the transport of people and goods for over 150 years. It was originally called Port Cooper, but later renamed after Lord Lyttelton. He was a key member of the Canterbury Association, which organised the migration of people from England to Canterbury, 1850-1855.

Before the arrival of these English settlers, Port Cooper was known and used by sealers and whalers in the 1790s and early 1800s.

The changes Lyttelton has seen:
- Wool and wheat were the main exports from Lyttelton in the early years of European settlement. The 1820s and 1830s saw new jetties being built and parts of the harbour were filled and reclaimed, making it safer for anchorage.
- Electric lights were installed on the wharves in 1862.
- Antarctic exploration between 1901 and 1913 turned the world's eyes to Lyttelton where the Antarctic exploration ships were anchored. Ponies from Manchuria and huskies from Siberia were quarantined and trained nearby on Quail Island/Otamahua.
- The advent of faster steam powered vessels was another huge change. Migrants could now arrive in reasonable health, having a much shorter and less sickly voyage.
- Demand for farming machinery and wheat threshing mills in the early 1900s boosted Lyttelton traffic.
- World War I provided Lyttelton with a huge boost in exported meat, wool and other products as the Government commandeered farm produce and increased exports to England.

Over 800 cars are lifted off car-ships and onto truck decks each week although coal continues to be one of the port's busiest cargoes, arriving via rail from the West Coast.

MANAGEMENT ISSUES

Environmental effects of Lyttelton Port

- **On the seabed**
  Dredging of a channel is necessary to ensure large vessels can travel freely into Lyttelton. This causes disturbance to the seabed and pollution within the sediment.
- **In the air**
  In the days of wind-travel and sails, air pollution was not a major problem in the port. For the best part of the twentieth century however, the air was heavily polluted in Lyttelton/Whakaraupu from steam and coal powered vessels, as well as trains. This is now under control.

- **Effect on the harbour water**
  One of the main concerns today is the potential for an oil or fuel spill. Small spills happen several times a year and need to be contained or dispersed using chemicals. Oil kills marine mammals as well as birds and interferes completely with the food web.
  Another concern is the ballast water that ships carry to stabilise the load. Water from foreign shores can bring weeds that have the potential to cause harm in our waters. A recent example is the plant pest, Undaria, which has come from Asia.

- **Effect on the sea around Banks Peninsula/Horomaka**
  About 25% of all marine pollution comes directly from shipping activities. Plastic fishing gear, bits of fish nets (which do not break down or decompose easily) and rubbish from fishing vessels and other ships can be fatal for marine mammals.

  Management of the environment often conflicts with human activities. Therefore, it is about creating a balance between the requirements of people and the requirements of the environment.

  Lyttelton Port plays an important role in the economy of both Canterbury and New Zealand. It is the South Island's major commercial deepwater port. It is the hub port for the South Island for the container trade and is ideally located for the distribution of cargoes nationally and internationally. Its strength lies as much in its location as its even mix of import and export cargoes. The port is serviced by many international shipping lines, several of whom only call at Lyttelton in the South Island.

UNWANTED VISITORS

Ever since people have been able to travel between islands and continents, marine creatures have been hitching a ride on their vessels. Some creatures have been successful in settling into new areas, sometimes entire coastlines. In New Zealand it is sometimes impossible to draw a line between life forms that occur naturally in our waters and those which have been introduced. Increased trade, faster ships and more visitors to every part of the world have considerably increased opportunities for marine creatures to hitch a ride.

New Zealand is one of the last countries to receive unwanted introductions. However they have been recorded over the past few decades. An example of a marine hitchhiker is Undaria. It was accidentally introduced in the early 1980s and was probably transported in the ballast water of foreign ships and discharged into New Zealand harbours on arrival. It is spreading throughout New Zealand, including Canterbury waters. It is in Lyttelton, Akaroa and Timaru Harbours and may well be elsewhere.

**Why is it a weed?**

Undaria is the ideal space invader. It is an annual plant, first appearing in early spring and growing quickly over the summer. Undaria can grow up to one centimetre a day, much faster than most of our native seaweeds.
QUAIL ISLAND - OTAMAHUA

Quail Island is Canterbury's largest island. The island was a useful food-gathering site for Maori and was later used by European settlers for farming. Other uses for the island included quarrying for ballast rock, a laver colony and a quarantine station for animals used in Antarctic explorations. People were also quarantined on the island during the 1917 'flu epidemic. The Quail Island Trust has begun a major native planting programme on the island.

BANKS PENINSULA - HOROMAKA

HUMAN HISTORY
CANTERBURY'S FIERY DRAGONS OF THE SEA

As Captain James Cook travelled down the coast of the South Island in 1770, drawing an outline of New Zealand, he noted that Banks Peninsula was "seemingly detached from the coast". Explorers later realised the sea did not connect around the island but formed a peninsula with Lyttelton/Whekaarupu and Akaroa Harbours.

On the first maps of New Zealand, Banks Peninsula is drawn and named Banks Island. Cook named it after Joseph Banks, the botanist who accompanied him on his voyage to New Zealand.

NATURAL HISTORY

TIMELINE

1 11-10 million years ago
Large scale eruptions and construction of the main cone of the Lyttelton Volcano. The centre of the volcano was at Charteris Bay.

2 10-9 million years ago
Erosion of Lyttelton Volcano and small-scale eruption of lava from vents near Mount Herbert/Te Ahu Patiki.

3 9-8 million years ago
Continued eruption of Mount Herbert/Te Ahu Patiki lavas, followed by construction of main cone of the Akaroa Volcano. The centre of this volcano was near Cnave Peninsula.

4 8-6 million years ago
Final phases of volcanic activity marked by outpourings of lava from numerous small cones on the flanks of both the Lyttelton and Akaroa volcanoes. Of note are the lavas from vents at Diamond Harbour, which produced Quail Island/Otahuhua, and at Halswell, which produced the fine building stone that has been quarried there.

5 6 million years ago to present
Volcanic pile eroded to form the environment that we find today on Banks Peninsula. The sea breached the crater of the two main volcanoes to form Lyttelton and Akaroa harbours. At the peak of its activity, the Lyttelton Volcano reached about twice as high as the present highest point on the peninsula.

The salt-laden coastal winds that occur around Banks Peninsula can destroy many plants, particularly trees and shrubs. Cliff faces from Summer to Godley Head support a hardy collection of native grasses, herbs and small shrubs. In the 19th Century, European settlers destroyed many of the coastal plants, through burning and over-grazing.

MARINE PROTECTED AREA

To protect marine life, parts of Banks Peninsula's waters have been given special protected status. This includes a marine mammal sanctuary and a marine reserve. These areas are shown on the map inside the back cover of the Marine and Coastal Animals book. Although there are special restrictions, you can enjoy watching the marine life.

HOME TO THE WORLD'S RAREST MARINE MAMMAL - HECTOR'S DOLPHIN - TUTUMAI'REKURAI

Hector's dolphin, as well as being the smallest dolphin in the world (maximum length 145cm long), is also the world's rarest marine mammal. Banks Peninsula is a particularly important habitat for them.
TE WAIHORA - LAKE ELLESMERE

Te Waihora simply means 'water spread out' - aptly chosen for Lake Ellesmere, the fourth largest lake (in surface area) in New Zealand. It is really a lagoon. It is usually closed to the sea by a 26 kilometre long barrier, Kaitorete Spit.

The lake itself looked, to the early settlers, as if the gods had created a big basket of food.

The other Maori name for the lake, Te Kete ika, is translated as 'the food basket of the great ancestor, Rakaia'.

Te Waihora/Lake Ellesmere is one of New Zealand's most important wetland systems. In 1990 it was given a National Water Conservation Order in recognition of the importance of its wildlife.

KAITORETE SPIT

Kaitorete has considerable cultural value to Ngai Tahu because of the ancestral associations with the area. Its ancestral name is Ka Poupou a Te Raikouia (The great Eel Weir of Te Raikouia). This name denotes the function of the spit, which is similar to that of an eel weir, which guides eels into the mouth of a hinaki (eel trap).

Kaitorete Spit separates Te Waihora from the South Pacific Ocean. It is a regionally significant natural landscape, containing the largest unmodified dune system in Canterbury.

Although referred to as a spit it isn't a true spit. It's attached at both ends whereas a spit should have a free end at the downward drift end. It is fact a "barrier", and is 57,000 years old.

The spit is a major habitat for the koripo spider.
South Canterbury Coast

THE CANTERBURY BIGHT

HUMAN HISTORY
MANAGEMENT ISSUES
About 75% of the Canterbury coast is eroding. The Canterbury Bight is particularly prone to erosion because it is exposed to strong ocean swells coming from the Southern Ocean. During storms, waves three to six metres high pound the beach. It has been estimated that up to five kilometres of land has been lost to the sea in the last 5000 years.

As a result of the erosion, any development along this part of the Canterbury coast needs to be carefully considered. Erosion is a natural process and very difficult to mitigate. Erosion-prone areas can be avoided with careful planning and investigation. Erosion rates vary from place to place and from time to time. Measurements allow predictions to be made and erosion prone areas identified.

NATURAL HISTORY
The area of coast that extends from Banks Peninsula/Horomai and 170km kilometres south to Timaru is known as the Canterbury Bight. It is one long open coast of mixed sand and gravel beaches. Bight = bay or inlet.

The beaches of the Canterbury Bight are unusual in world terms, being made of a mixture of sand and gravel which comes from the large braided rivers and erosion of the cliffs that back the short steep beaches for 60 kilometres of the bight. Powerful currents driven by the waves along the shore move the sediment northwards up the coast.

THE WAIHAO BOX

The Waihao Box on the coast at the mouth of the Waihao River was built to assist the drainage of the Waihao catchment where there is no natural drainage outlet. As early as 1896, plans were being put in place to drain the fertile coastal lands.

The box is considered the most successful of its kind in New Zealand despite it being closed off by shingle 75% of the time. Although it usually opens naturally it sometimes requires a bulldozer to remove shingle for it to open. It is now the only remaining outlet box in New Zealand.

The 60 metre long structure causes sand and gravel to slip down the banks next to the box. The beach material is very mobile and is often saturated with water. There is a real danger here of becoming trapped in the gravels as they act like quicksand when saturated.

Steep gravel beaches and cliffs are a common sight along the stretch of coastline from Tuahauaki Point, just south of Timaru, to the Waitaki River. Some of these cliffs are eroding at an alarming rate. The coast in this area is retreating, on average 0.5 metres per year.

An unusual feature of the South Canterbury coast is the plate-like shape of the large stones found on the beaches of the Waitaki Fan and the Wainono lowland. Over many years the waves separate the flat stones from the more spherical stones. The flat stones end up quite high on the beach and can sometimes be seen stacked neatly like tiles on a roof.

* Tuahauaki (Bloody Jack), a great southern Ngai Taii chief and warrior drowned at this part of the coast. It was known as Jack's Point but has since been changed back to Tuahauaki Point.
WAINONO LAGOON

HUMAN HISTORY
The Waikao River mouth and its northern channel draining the lagoon are of great importance to Ngai Tahu, for its history as well as being an important mahinga kai site. Wai means water and Hao is the name of the type of eel taken from this awa (river). The Waikao River in earlier times and during whakareke (migration) time would be filled with eels heading out to sea.

MANAGEMENT ISSUES
Issues affecting the lagoon are increased stock in the area, causing erosion and contamination of waterways, increased use of fertilisers and the encroachment of the sea on the lagoon.

NATURAL HISTORY
Waikao Lagoon is 35 kilometres south of Timaru and nine kilometres northeast of Waimate. The lagoon covers an area of 325 hectares. Separated from the sea by a 100 metre shingle bar, Waikao Lagoon is

South Canterbury's largest coastal wetland. Its outlet to the sea is via the Waikao River's north branch. The lagoon is a wetland of national importance, particularly for its bird life, supporting migratory and threatened bird species. Its fish habitat is also important, being a spawning ground for inanga - whitebait.

FLORA
Tall rushes originally dominated the edge of the swamp. This rush now only occurs on the western side of the lagoon. On the northwest side thickets of willows, flax/harakeke and tall grass can be seen.

On the low lying flats, north of the lagoon, are small rushes. Several species of introduced grass are grazed further back from the mudflats. Species found on the shingle beach are ribbonwood, gorge and lupins. The main aquatic plants found in the lagoon are Myriophyllum, Liliaoas novae-zealandae, Ruppias megacarpa, and Ranunuculus (water buttercup).

FAUNA
Around 30 species of wetland birds can be commonly found at the lagoon including shags, herons, swans, ducks, stilts and terns. Fish that commonly occur throughout the year are the longfin eel/tuna, shortfin eel/tuna, brown trout and flounder.

* Mahinga Kai refers to natural resources and the area in which they are found. It includes resources as diverse as tuna (eel) and harakeke (flax) and paru (soles), used for dyes.
THE PORT OF TIMARU

HUMAN HISTORY
Established in 1873 and with many additions since, the harbour breakwater has been the backbone of Timaru's growth from an isolated whaling station into a small city. Before the construction of the breakwater, cargo had to be unloaded from ships moored out to sea in deep water and transported to the shore by smaller boats through the dangerous surf that still pounds the Timaru coastline today. This was a time-consuming and risky business.

MANAGEMENT ISSUES
Issues affecting the Port of Timaru are similar to those which Lyttelton Port experience. Refer to page 11.

NATURAL HISTORY
120 years ago the Timaru coast from Puti Point to Dashing Rocks was a line of cliffs cut out by gullies to form a shoreline of small headlands and bays. All of the beaches were steep and shingled.

Today a new coastal landscape has been created by the Timaru Harbour breakwater, which protrudes nearly 1.5 kilometres from the original shoreline. Before the construction of the breakwater, beach gravels from the rivers and cliffs of South Canterbury were transported northwards along the shore by wave currents. These gravels travelled uninterrupted around Timaru's irregular shaped coastline and up to Washdyke and the coast of the Canterbury Bight.

It is thought that the beaches and lagoons of Washdyke and the Canterbury Bight were eroding naturally at a very slow rate but the construction of the breakwater increased the erosion rate to staggering proportions. The harbour breakwater trapped most of the gravel that would normally have travelled north along the coast. This caused the beaches there to erode at a very rapid rate. By 1933 (only 55 years after construction of the breakwater) Tawmatawhai Lagoon was completely destroyed.

Accelerated erosion has also affected beaches along the Washdyke and Seadown coast. In the past 120 years the shoreline at Washdyke Lagoon has retreated over 400 metres (that is over three metres per year) and the area of the lagoon and wetland has decreased by over 150 hectares.

CAROLINE BAY

Caroline Bay is unique to the South Canterbury coastline. It is the only sandy beach between Banks Peninsula/Horomaka and the Waiaki River. Overlooked by the city, the bay is one of Timaru’s biggest attractions. It provides the focal point for a carnival that for three weeks each Christmas fills Timaru to capacity. A large number of recreational activities are enjoyed at the bay including swimming, walking, mini golf and walks in the gardens.

NATURAL HISTORY
In 1878 Caroline Bay was a narrow shingle beach in front of the high coastal cliffs that the main town centre is built on today. The shoreline has changed from gravel to sand and has grown over 700 metres from the coastal cliffs that the sea used to lap against.

The build up of sand was caused by the development of the Port of Timaru when a leeward breakwater (now known as the North Mole) was built in 1887.

- Both gravel and sand move northwards along the coast of Canterbury. Currents along the beach move the coarser gravels toward land but after the development of the North Mole the path of the gravel became blocked.
- Finer sands however, are transported by wave currents seaward of the breakers. Because of this some of the sand leaks past the sediment trap created by the North Mole. It continues its journey past the harbour mouth, where it washes into Caroline Bay. There it builds up against the North Mole.

It has been estimated that around 30,000 cubic metres of sand (about six Olympic swimming pools full) was building up in Caroline Bay every year. Because it had nowhere to go from there, the shoreline built out (accretion) at a rate of over five metres per year. The Timaru District Council has extended the grass area at the bay to keep pace with the accretion. Over the past few years, however, the build up of sand has slowed. There has been a balance between the forces of the sea (high waves and currents) and the amount of increasing sediment.

Also, companies with permission from the council, extract sand and gravel for their own use, which controls the build up.
“New Zealand begins with the sea and ends with the sea. Understand this and you begin to comprehend New Zealand and the New Zealander.”

MAURICE SHADBOLT
NEW ZEALAND AUTHOR