ACTIVITY

1d

Activity Title:

Formation and characteristics of different types of beaches

Focusing questions

What different types of beaches are there in New Zealand?

How are estuaries different to open coastal sandy beaches?

How are sandy beaches formed?

Resources required

- Fact sheet – "Beach formation and different types of beaches" on page 35
- Map of New Zealand – page 37
- Beach type statement labels – page 38
- Map of Bay of Plenty – page 39
- Estuary and open coast beach statement labels – page 40
- Copying: photocopy enough copies of the fact sheet for one per student or a projected image. Create one copy of the two maps and statement labels for each small group of students. Cut the sheets of statements to create single labels.

Prior learning

1b Beach brainstorm

1c Beach diagram

Method

1 The objective of this activity is to explore the formation of our moana or beaches and the different types of beaches that exist in New Zealand.

2 Explain to students that the objective of the exercise is to look at some of the different types of beaches there are and how these beaches are formed.

3 Read the fact sheet **Beach formation and different types of beaches**. Highlight key points or make notes in exercise books. (Or if you prefer, go through this information using class discussion and the white board while students take notes in their exercise books.)

4 Break into small groups. Give each small group a copy of the map of New Zealand and the beach formation and type statement labels. Students place labels on the east coast or the west coast depending on the statement.

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Formation and characteristics of different types of beaches

Environmental Education Aspect:

About the environment

Environmental Education Concept:

- Interdependence
- Biodiversity

Curriculum Links:

- Social Science
- Science

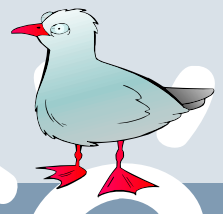
Suggested Curriculum Level:

Any

SUSTAINABILITY TIPS!

Laminate labels and A3 maps for re-use in future years OR put the names of the labels on a projected image for students to use and save paper and laminating.

Save paper by projecting an electronic copy of the fact sheet for students to read from.



5 Go through the answers with students. Discuss:

- What did they already know about the different types of beaches in New Zealand?
- What beaches have they visited and what did they notice about the physical characteristics of these beaches?
- What new information did they learn from this activity?

6 Give each small group a copy of the map of the Bay of Plenty and the estuary and open coast beach statement labels. Identify with students where the estuaries and open coastal beaches are on the map. Students place labels either on the estuary or the ocean side of the coast depending on the statement.

7 Go through the answers with students. Discuss and reflect on:

- What did they already know about the difference between estuaries and open ocean beaches?
- What estuary and open ocean beaches have they visited and what did they notice about these beaches?
- What new information did they learn from this activity?

Possible next steps

- 3c How we feel about and value the beach – a visualisation activity where students are encouraged to think of different describing words to explain how they feel about the beach.
- 1e Beach sketch – a field activity requiring students to observe and record their local beach.

Beach formation and different types of beaches

Different types of open ocean beaches – east versus west coast

Open ocean beaches vary in colour according to the mineral content of the sand. This is due to the origin of the eroded sediments that make up the sand that supplies that beach. On the west coast of New Zealand there are many 'black sand' beaches which are rich in dense, dark minerals such as titanomagnetite. On the east coast of New Zealand white and golden sandy beaches are more common and made of white quartzo-feldspathic sands.

Some coastlines are made up of beaches that are separate from one another. Other beaches are more connected. The east coast beaches of the northern North Island of New Zealand are made up of lots of small bays. Each beach is separate to the next. Where a series of beaches are separated into bays, this is known as an embayed system. In embayed systems the beach sand is largely trapped between the headlands.

On the open and connected west coast beaches, sand moves between beaches, jumping small headlands as it moves along the shore. The black sand west coast beaches of the northern North Island are much more open and connected. These beaches act like a river of sand flowing north.

The amount of development along the coast also makes west coast beaches in New Zealand different to those of the east coast. There is less development along the west coast beaches than the east coast.

Weather influences the two coasts of New Zealand and makes the beaches of the west and east coasts quite different. West coast beaches are commonly subjected to huge ocean swells from the Tasman Sea and Southern Ocean. It is uncommon for west coast beaches to be calm. While you might think that big surf pounding west coast beaches might mean there is a lot of erosion, the big swells also cause substantial accretion. In contrast, many beaches on the east coast are often calm. In the Bay of Plenty for example, there are many days each year where there are few or no waves pounding the beach.

In addition to the different types of open coast beaches in New Zealand, there are also other types of sandy beaches that aren't located on the open coast. Estuaries (which include harbours) also have sandy beaches. Estuary sandy beaches are very different to open coastal sandy beaches.

Another type of sandy beaches - estuaries

An estuary is a partially enclosed body of water. Estuaries are places where fresh water from land meets and mixes with salt water from the ocean. Estuaries come in all shapes and sizes. Sometimes they are called bays, lagoons, harbours, inlets, sounds, wetlands and swamps.

Unlike open coastal sandy beaches, estuary beaches are protected from ocean forces by land. Estuaries can be protected from ocean waves by sand bars, reefs, barrier islands, headlands and deltas. See the next page for a description of how these are formed.

How different beaches are formed

Open coastal beaches

Open coastal beaches are dynamic landforms formed over millions of years that are altered by waves and wind and the continual process of erosion and accretion. Beach formation begins with the erosion of shell, sand, rock, gravel and pebbles from the shoreline. This material is crushed and rolled by the waves causing it to break and fracture into smaller and smaller pieces. Open coastal beaches are also made up of some eroded material that is washed to sea by streams and rivers.

Eroded material that becomes sand and sediment is deposited on the shore to form beaches. Most sediment is suspended in sea water and transported along the open coast by long shore currents. Long shore currents are a stream of water that flows along the coast, parallel to the beach. These currents are created by the action of waves breaking on the shore. Cross shore currents are also important in the movement of sand.

Once deposited by long shore currents, sand is continually deposited onto the beach by (long-period) breaking waves and eroded from the beach by (short-period) breaking waves. This means that sand is continually moving on and off the beach and along the shoreline. The continual long shore transport of sediment along the coast and the movement of sand by waves along the foreshore are part of a process called littoral drift.

Estuaries

Estuary beaches are formed mainly by eroded material that is washed to sea by streams and rivers. Estuaries have been formed over thousands of years. Many are old river valleys that have filled with water. Once formed, estuaries make good sediment traps. Estuaries are filled with sediment from both the land and the sea. Sediment from the land includes mud and clay that comes from the land via rivers. Sediments from the sea are usually clean sands that have eroded from rocks, sand, shells and pebbles on the open coast. These sea sands and sediments are pushed into the estuary by waves and tidal currents.

How else are estuary and open coastal beaches different?

The sand in estuaries is often finer than the coarse sand found on open coastal beaches.

The communities of animals and plants that live on the edges of these two types of beaches are also different. Different types of shellfish can be found in the sand of these beaches. Pipis, tuangi or cockles and tītiko or mudsnails are common on estuary beaches, while tuatua are found buried in the sand on open coastal beaches.

Mānawa or mangroves grow in estuaries but not on the open coast. On the open coast, above the high tide line there are sand dunes and dune plants such as pīngao, kōwhangatara or spinifex. These plants sometimes grow on dry-sandy estuary beaches, where fresh water influence does not favour ‘traditional’ estuary plants.

Pipis collected at Ōhiwa Harbour

Find out more

If you want more information on Coast Care groups and programmes contact:

Coast Care Coordinator, Bay of Plenty Regional Council
Telephone: 0800 884 880
Facsimile: 0800 884 882
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Website: www.boprc.govt.nz
Address: 5 Quay Street, PO Box 364, Whakatāne 3158

coastcare
Tiaki takutai

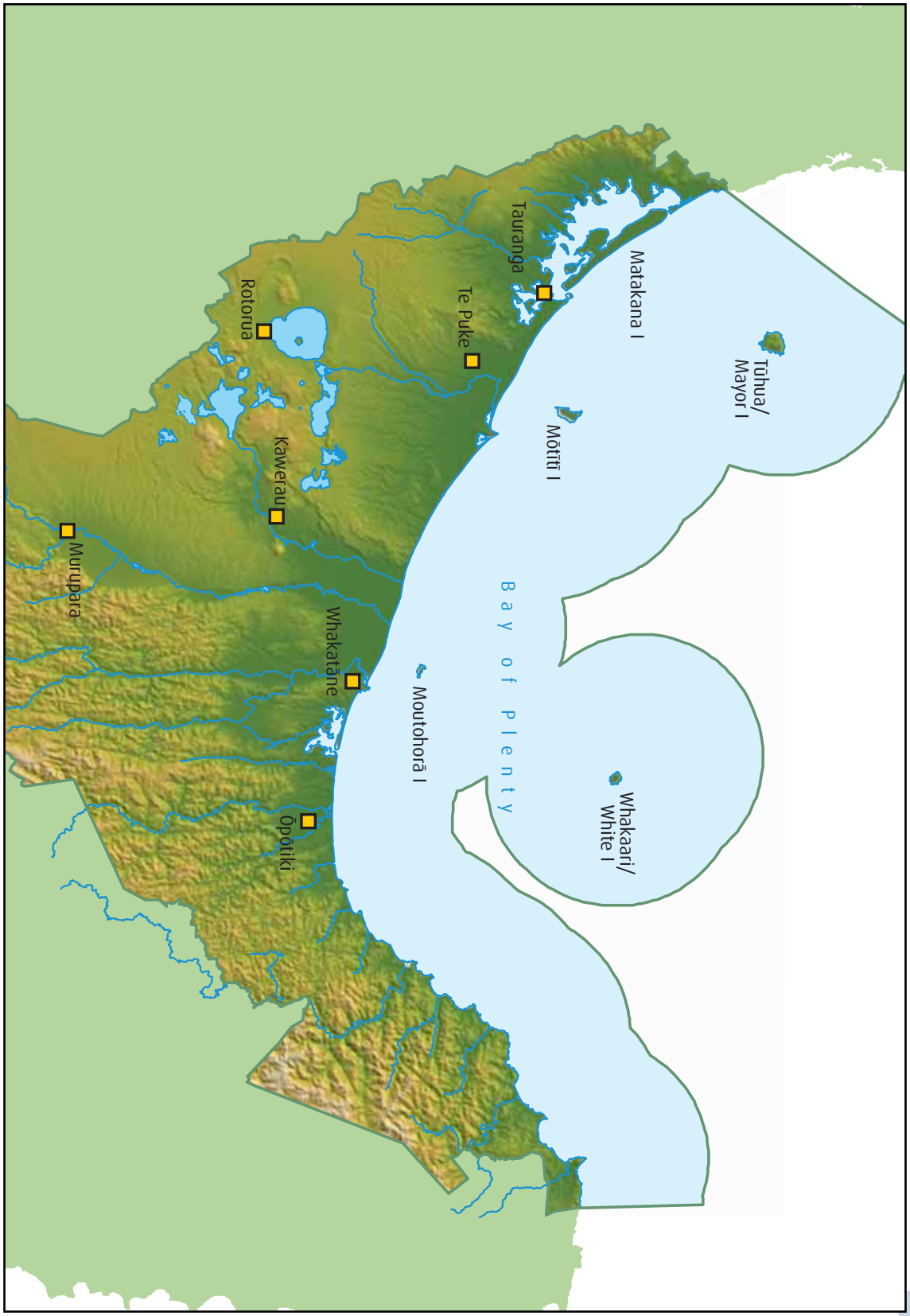
Bay of Plenty Regional Council in partnership with Tauranga City Council; Whakatāne, Western Bay of Plenty, and Ōpōtiki District Councils; and the Department of Conservation.

Map of Aotearoa – New Zealand

Beach type statement labels

Many black sand beaches	**Many white sand beaches**
Coastline has lots of development	**Coastline has little development**
Beaches made of dark minerals such as titanomagnetite	**Beaches made of white quartzo-feldspathic sands**
Beaches are separate, often in small bays	**Beaches are long, open and connected**
Exposed to Tasman Sea and Southern Ocean swell	**Sea is often calm**
Sand remains in a single bay	**Sand migrates along the coast**

Map of the Bay of Plenty



Estuary and open coast beach statement labels

Beaches are on the edge of a partially enclosed body of water	Beaches are on the edge of the open ocean
Also known as harbours, lagoons, inlets, sounds, wetlands and swamps	Often fine sand (sometimes muddy or silty)
Often coarse sand	Home to pipi, tuangi/cockles and tītiko/mudsnails
Home to tuatua	Pīngao and kōwhangatara/ spinifex are most common here
Dynamic landforms subject to continual creation and erosion by wind and waves	Mangroves live here
Formed principally by erosion of shell, sand, rock, gravel, pebbles from the shore line	Formed by sediment suspended in seawater and transported along the coast by longshore currents
Subject to continual longshore movement of sand by waves known as littoral drift	Formed principally by eroded material washed to sea by streams and rivers