ACTIVITY
4f

Activity Title:

Beach profiling – eroding and accreting dune comparison

Focusing questions

How are beach profiles and plant surveys conducted?

How does the form and profile differ for an eroded dune and an accreting dune?

What plants are found where and in what density on eroded and accreting dunes?

Resources required

- Two 1.5m lengths of 50 x 25mm timber, marked and numbered at 1cm intervals from 0cm at the top to 150cm at the bottom
- One measuring tape at least 3m long
- Field activity instruction sheet – Beach profile and plant survey – page 173
- Field activity worksheet – Beach profile and plant survey – page 175
- Pens
- Copies of the Coast Care Booklet No. 9: Backyard Buffers
- Copying: copy the field activity worksheet and instruction sheet

Prior learning

2a Native dune plants – what lives where and why?

2b Introduced dune plants and weeds

2e Plants of the local sand dune community

4a Importance of sand dunes

4b Dune formation

Method

1 The objective of this exercise is to explore how the form and profile of eroded and accreting dunes differs. In achieving this objective, students gain practical experience in the conduct of beach profiles and plant surveys enabling the investigation of dune plants distribution and density across different areas of the dune system.

2 Identify two locations for conducting the beach profile exercise. One should be a dune that is eroded (a heavy use area) and the other where dunes are building up (a low use area). Your local Coast Care coordinator will be able to help you to identify good sites for this exercise.

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Environmental Education Aspect:

About and In the environment

Environmental Education Concept:

- Interdependence
- Sustainability
- Biodiversity

Curriculum Links:

- Social Science
- Science

Suggested Curriculum Level:

Senior secondary

SUSTAINABILITY TIP!

Laminate and/or save copies of Backyard Buffers to re-use in future years.

Laminate and/or save copies of the instruction sheets for future re-use.

3 In the classroom hand out a field activity instruction sheet and worksheet to each student. Give each group two pieces of timber required for the profiling activity. Get students to do a pretend practice in the playground or field of how they will conduct the activity once at the beach.

4 In the field: in small groups, create a beach profile and plant survey at the first of the two sites. Instructions on how to do this are described on the field activity instruction sheet. NOTE: Each small group will require two pieces of timber to complete this activity. Repeat the activity at the second of the two sites.

5 Reflection and discussion:

- What happened to the profile of the beach at the two sites? How are the two profiles different and why? Is this what you expected?
- At each site – what happened to plant height along the beach profile? Why do you think this was the case? How did plant height compare at the two sites?
- How did plant density differ along the profile? Was there a difference in plant density between the two sites?
- What species were found common close to the sea? What species of plant were common further from the sea? Were the same plant species present at each site?

Possible next steps

- Once back at school use the data collected to computer generate graphs and profiles.
- Conduct a percentage cover exercise in the field. Use a square or circular quadrat and estimate the percentage cover of plants in that area for different plant species. Discuss how native foredune species like spinifex and pīngao only need 40-50% groundcover to be fully effective where marram is denser (NOTE: On some beaches it may be worthwhile retaining marram as it is the most common dune plant (sometimes only!!) in many South Island areas. And its excessive density is part of its poor function problem—a density of about 100 percent meaning sand blows right over the top of it, to accumulate only at the crest of the dunes. This creates all sorts of problems, as occurs on the Brighton dunes!!)

Field activity instruction sheet

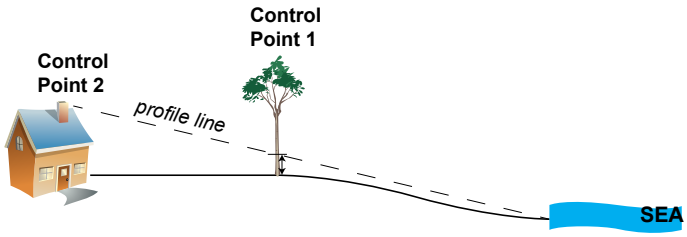
Beach profile and plant survey

Draw two beach profiles – one in an area where the dunes are being eroded (heavy use area) and one in an area where the dunes are building up (low use area). It is best to do this at low or up to half tide.

How to draw a beach profile and do a plant survey

Equipment needed

- Two 1.5m rods of bamboo or timber, marked and numbered at 1cm intervals from 0cm at the top to 150cm at the bottom (Rod 1 and Rod 2)
- One measuring tape at least 3m long



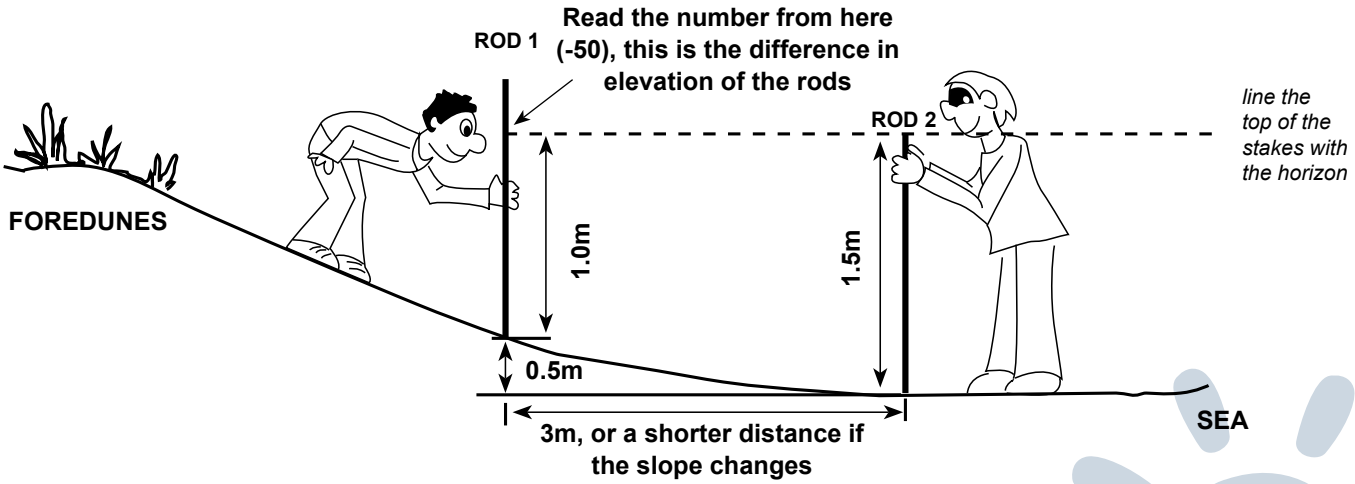
Method
Part one – beach profile

Before you start:

1. Find a fence post or tree on the landward side of the dune that you will be able to find again. This is the control point for the beach profile line. Mark the fencepost or tree at a given height that won't change. The same control point will be reused for all future profiling and is the starting point of all measurements.
2. Imagine a straight line from the water that passes through your control point. Find a second control point (such as a power pole, tree, chimney, etc.) that the line also passes through to define a line to follow to measure a beach profile. At the control points, it often helps to place a temporary marker that rises up from the dune or above a seawall to maintain a line-of-sight down on the beach, or note down the point, for example 'top of the chimney'.
3. Measure the height of the mark you made on the fencepost or tree in relation to the ground. For example if the marker is 65cm above the level of the sand, record -65cm and note 'marker height above ground'.

Start:

1. Fill in the top part of the log sheet. Include names of people in the team profiling, class, date, time, the high tide time and the beach location.
2. Assign one person to look after Rod 1, and a second person to look after Rod 2. Rod 1 will always be the landward rod, and Rod 2 will be the seaward rod.

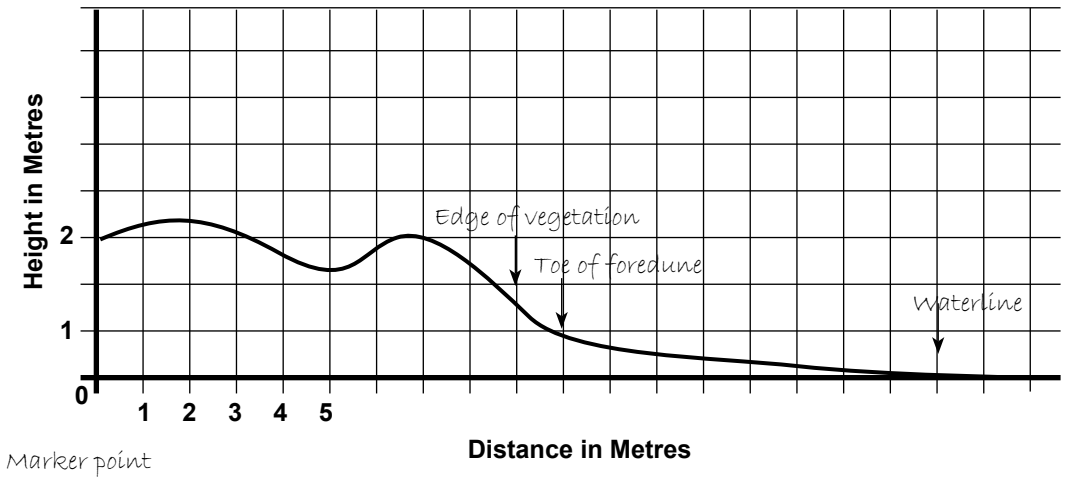


3. The first person stands the end of rod 1 on the ground next to control point one.
4. The second person uses the control points as a guide to measure three metres (or less if the slope changes) in a straight line towards the ocean.The second person places Rod 2 at this point.
5. From the landward rod (Rod 1), the first person sights the horizon and the top of the lower of the two rods, in this case Rod 2. This line-of-sight will intersect part way up the other rod. The second person will read the elevation number marked on rod 1 that is in line with the top of rod 2 and the horizon. Keep both poles vertical when reading!

   All measurements are read by the first person (the most landward one), either off Rod 1 in the event of a downward slope or Rod 2 if a rising slope. When there is a downward slope the measurement will be negative. When there is an upward slope the measurement will be positive. It takes careful attention to get this right on each measurement. A single error will make the rest of the data plot incorrectly on a graph. Record the elevation change and horizontal distance between poles on the log sheet.
6. Note any features at Rod 2, (such as edge of vegetation, toe of dune, water line, etc.) in the Notes column on the log sheet. Once the notes are taken, move Rod 1 to where Rod 2 is. Then move Rod 2 to a point 3m seaward of Rod 1 and repeat the measuring process, use a shorter distance if there is a change in slope before 3m is reached. The job of the second person is to be sure each forward move stays in line with the two control points.
7. Repeat steps 5 and 6. Measure, Record, and Move Ahead. Continue to move ahead, repeating these steps all the way to the water. As you go, everyone on the team should look ahead for features to stop on and measure. If some feature, perhaps the edge of the dune, does not occur at a horizontal interval of 3 metres, then make the horizontal distance smaller. For example, if the dune edge is only 0.6m from the last measurement, move the forward pole ahead only that far.
8. Stop at the water.

Adapted from www.seagrant.umaine.edu/files/pdf-global/.../emerymethod.doc
http://www.whoi.edu/page/live.do?pid=52235&tid=282&cid=88638
The original reference on Emery beach profiling is: Emery, K.O., 1961, A simple method of measuring beach profiles: Limnology and Oceanography, v. 6, p. 90-93.

Source: Maine Geological Survey, Department of Conservation, 22 State House Station, Augusta, ME 04333-0022



Field activity worksheet

Beach profile and plant survey

Beach profile

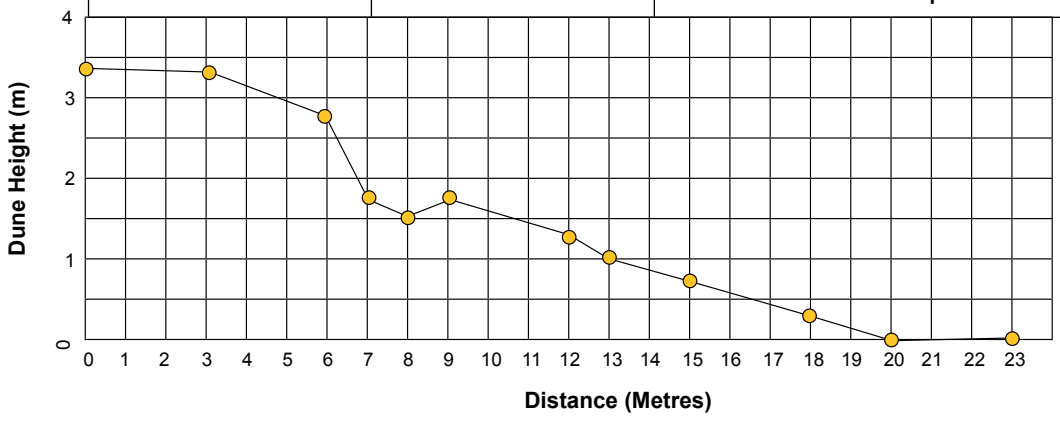
Name: _____ Class: _____

Beach: _____ Date: _____

Time: _____ High Tide Time: _____

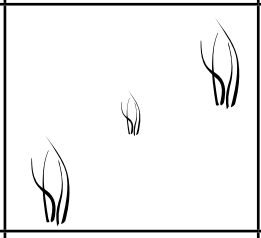
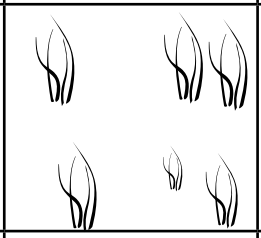
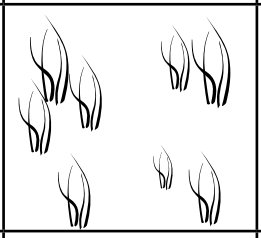
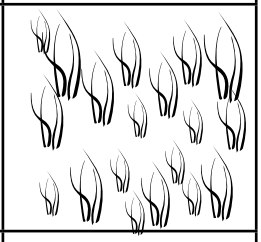
Distance travelled (m)	Height change (cm)	NOTES:
0		

Sample Data and Chart



Distance travelled (m)	Height change (cm)
0	
3	-50
6	-100
7	-25
8	+25
9	-50
12	-25
13	-25
15	-50
18	-25
20	0
23	0

Plant Density

0% Cover	25% Cover	50% Cover	75% Cover	100% Cover
				
0	1	2	3	4

Plant Species

Spinifex = Sp – Native

Leaves are grey/green and hairy. Seed heads look like tumble weeds.

Pīngao = Pg – Native

Leaves are green/bronze and shiny. Black seeds are attached to vertical 30-40 cm stalks.

Sea rocket = Sr – Introduced

Sprawling plant, light green irregular shaped leaves. Lilac flowers.

Shore spurge = Ss – Native

Grey/green leaves, brittle stems, white sap. Very rare.

Pōhuehue = Ph – Native

A scrambling vine with almost round mid green leaves about 5-10 mm across. The hairy stems are dark brown/black. Mid and back dune plant, leaves burnt off by salt spray.

Sand tussock = St – Native

Grows in tussocks (no runners) on front mild dune zone. The bright green to light brown thin leaves are 40-60 cm tall and end with a characteristically sharp point. The light brown seedheed is small, upright and like ryegrass.

Kikuyu grass = Ki – Introduced

Grassy, green with thick runners capable of climbing over fences and other plants.

Wīwī = Ww – Native

Upright bushy plant. Dark brown seeds clumped tightly 50-80 cm from sharp tip.

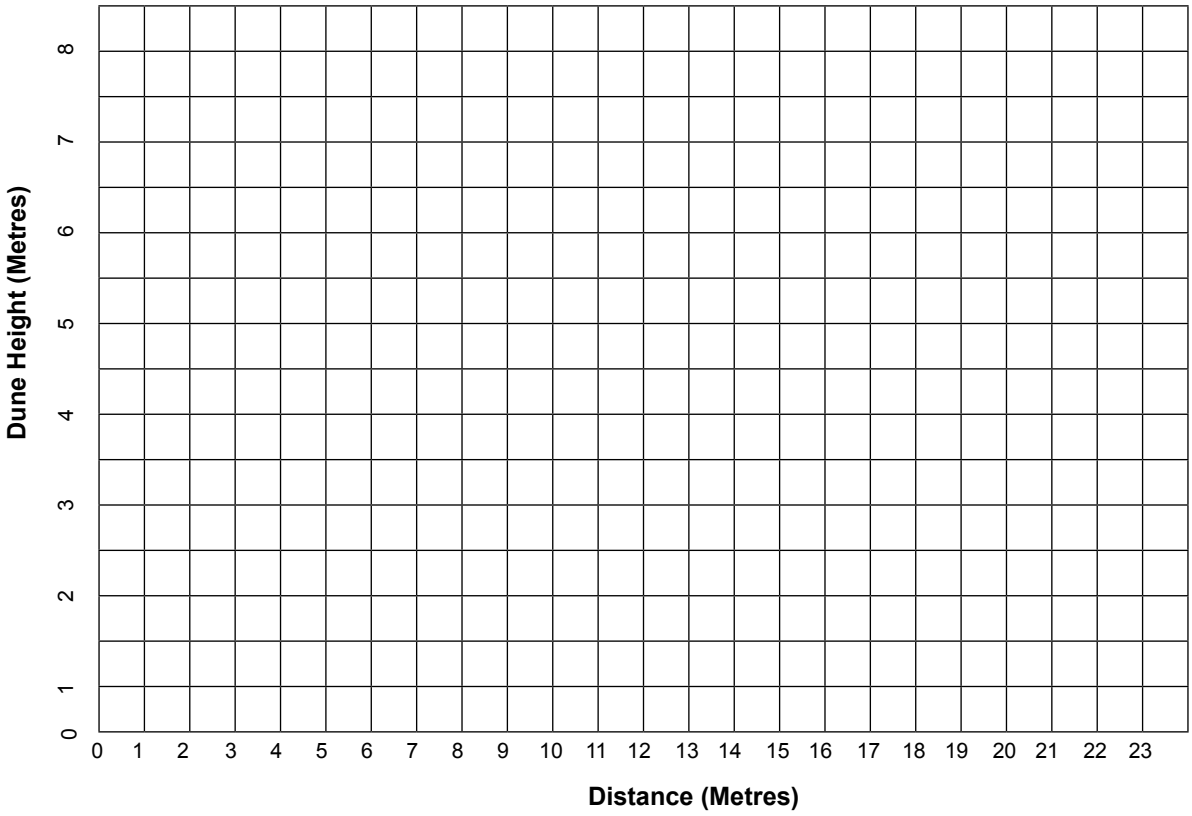
Lupin = Lu – Introduced

Bright green leaves on bushy wood stems. Yellow sweet scented flowers.

Iceplant = Ic – Introduced

Large succulent green leaves with pale yellow/orange flowers.

Record your beach profile here:



Part two – plant survey

Record the plants you find each time you gain 0.5 metres in height. Record the density using the scale on the back of the field sheet. Record the species using diagrams on the back of the field sheet and the Backyard Buffers booklet.

Distance travelled (m)	Height (m)	Plant Density Scale 0-4	Plant Species
	4.0		
	3.5		
	3.0		
	2.5		
	2.0		
	1.5		
	1.0		
	0.5		
	0		

- see reverse for sample results

You should end up with a table of results something like this:

Distance travelled (m)	Height (m)	Plant Density Scale 0-4	Plant Species
20	4.0	4	Sp, Pg, Lu, Ph
16	3.5	3	Sp, Pg, Lu
14	3.0	2	Sp, Pg
13	2.5	1	Sp, Pg
12	2.0	1	Sp, Pg
10	1.5	0	-
8	1.0	0	-
5	0.5	0	-
Water Edge	0	0	-