



# Super Site

Deep Cove, Doubtful Sound/Patea



**SUPER**  
site

Department of  
Conservation  
*Te Papa Atawhai*

This education resource was accurate at the date of publication.

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# section 1

An overview to using this Super Site© resource



## NEW ZEALAND environmental CARE CODE

- Protect plants and animals
- Remove rubbish
- Keep streams and lakes clean
- Keep to the tracks
- Take care with fires
- Respect our cultural heritage
- Enjoy your visit
- Toitu te whenua (leave the land undisturbed)

### Using this resource

SUPER SITE® resources are designed to help teachers to plan exciting and educational learning experiences outside the classroom. They are aimed at upper primary and lower secondary students and focus on a selection of parks and reserves administered by the Department of Conservation in your region. The sites chosen represent a range of possibilities and are reasonably accessible. The suggested activities encourage learning in the environment, enabling the development of skills, attitudes and values that students gain from experiences in the environment. Background notes and activities assist study about the environment, raising levels of knowledge, understanding, awareness and sensitivity to the environment and environmental issues. Activities foster the opportunity to participate, take action and do something for the environment, either as an individual or as a group.

### Cross-curricular, specialised or enquiry-based learning

Getting out of the classroom gives students an opportunity to study the whole environment, unrestricted by subject barriers. Sites can be used to meet goals from specific curriculum areas, or different curriculum areas, simultaneously. This is an approach that mirrors the inter-connectedness of the environment. For specific curriculum objectives used in this Super Site refer to the curriculum breakdown, page 5 (Section 1 introduction).

### Education for the environment

Take the opportunity to make students aware that the places they are about to visit are part of the heritage of all New Zealanders and therefore the responsibility of all. The Environmental Care Code in the margin is a good resource for reinforcing this point.

### Contact and feedback

For all enquiries and any feedback on this resource, please contact:

Department of Conservation  
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Te Anau 9600

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Telephone: 03 249 0200



## Introducing the area and activity locations

### The tracks

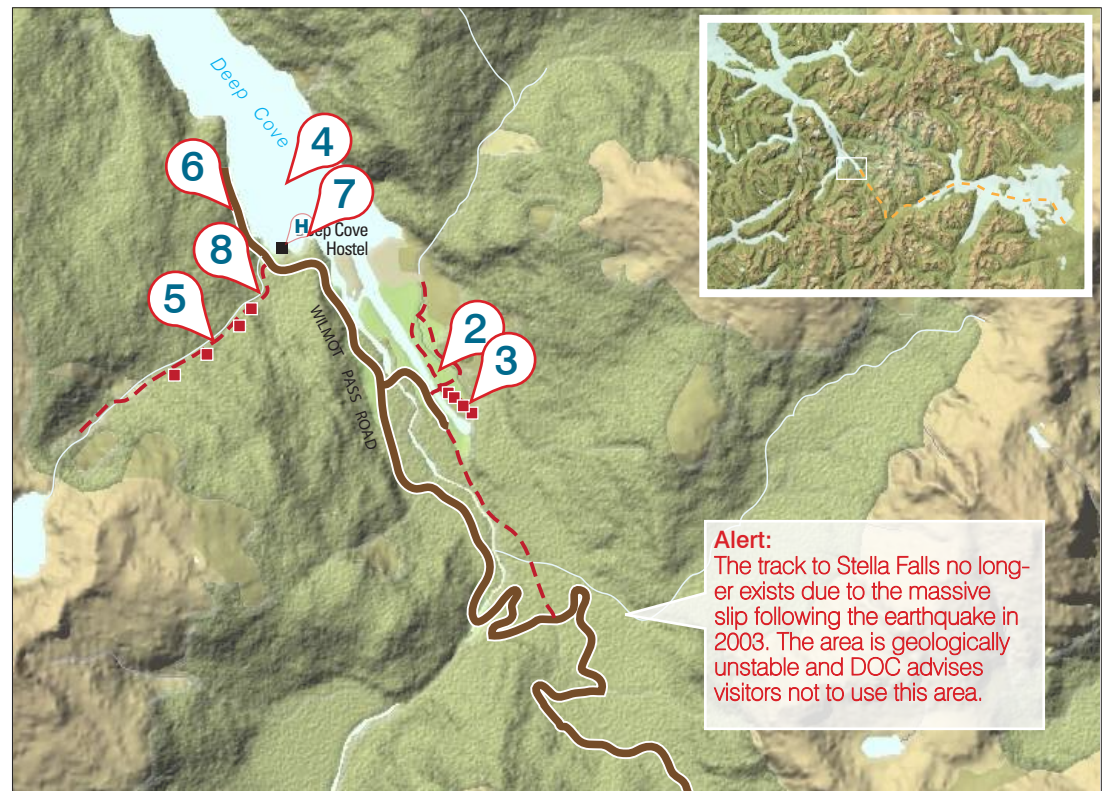
There are several excellent walking tracks at Deep Cove. They range in length from 45 minutes return to 5 hours return. All walks provide an opportunity to experience the forest, waterfalls and views of the fiord. Most of them will present students with some degree of physical challenge.

### The environment

Deep Cove hostel sits in a stunning location overlooking the water near the head of Doubtful Sound, around 40 kilometres from the open sea. The dramatic glacial landscape and lush temperate rainforest make Fiordland unlike any other environment in New Zealand.

#### Key

- Study site
- Deep Cove Hostel
- Road
- Walking tracks
- Activity site points
- Journey to Doubtful



### Outdoor activity site location overview

While the activities listed below are intended to be at specific sites around Deep Cove, others in each section can be done either at the hostel or elsewhere.

- Helena Falls and other areas - The geology of Deep Cove, Fiordland  
Activity 2a - What rock does what? (p11)
- Helena Falls - Forest regeneration in Fiordland  
Activity 3a - Watch this space (p14)
- The Fiord - The underwater world of Doubtful Sound/Patea  
Activity 4a - Marine Studies (p17)

- Hanging Valley - Soil erosion and water quality  
Activity 5a - Hanging valley hike (p21)
- Hostel to Wharf - Protecting native wildlife  
Activity 6a - Snap! Trap checks (p23)
- The hostel - The human history of Doubtful Sound/Patea  
Activity 7a - Human history (p25)
- Sandfly Central - Why the sandfly should be valued  
Activity 8a - Celebrating sandflies (p28)



Section 1 – Introduction

# Curriculum breakdown

How this Super Site relates to the national curriculum

## 1+2 Science

### PEB Planet Earth and beyond

**PEB ES** Earth Systems  
Explore and describe natural features and resources

### LW Living world

**LW LP** Life processes  
Recognise that all living things have certain requirements so they can stay alive

**EC** Ecology  
Recognise that living things are suited to their particular habitat

**EV** Evolution  
1. Recognise that there are lots of different living things in the world and that they can be grouped in different ways.  
2. Explain how we know that some living things from the past are now extinct

## 3+4 Science

### PEB Planet Earth and beyond

**PEB ES** Earth systems  
Appreciate that water, air, rocks and soil, and life forms make up our planet and recognise that these are also earth's resources

### LW Living world

**LW LP** Life processes  
Recognise that there are life processes common to all living things and that these occur in different ways

**EC** Ecology  
Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced.

**EV** Evolution  
1. Begin to group plants, animals, and other living things into science-based classifications.  
2. Explore how the groups of living things we have in the world have changed over long periods of time and appreciate that some living things in New Zealand are quite different from living things in other areas of the world.

## 2 Social science

### PPI People and place influence

Understand how places influence people and people influence places

### CP Cultural practices

Understand how cultural practices reflect and express people's customs, traditions and values

## 3 Social science

### PUP People using places

Understand how people view and use places differently

### RD Resource decisions

Understand how people make decisions about access to and use of resources

### RP Recording the past

Understand how people remember and record the past in different ways

## 4 Social studies

### CH Cultural heritage

Understand how people pass on and sustain culture and heritage

### CC Community challenges

Understand how people participate individually and collectively in response to community challenges

## Activities overview

1a Mega Map p9

**2 PPI**

**3 PUP RD**

1b Be prepared p9

**2 PPI**

2a What rock does what? p11

**3 4 PEB ES**

2b Rock eaters p12

**1 2 3 4 PEB ES**

3a Watch this space p14

**3 4 LW EC**

3b Regeneration cake p15

**3 4 LW EC**

4a Marine studies p17

**3 4 PEB ES**

**3 4 LW LP EC EV**

4b Deep down in Doubtful Sound p18

**3 4 LW EC**

4c Forty metre band jelly p19

**3 4 LW EC**

**3 4 PEB ES**

5a The Hanging Valley hike p21

**2 PPI 3 PUP RD 4 CH**

6a Snap! Trap checks p23

**3 4 LW EC**

**2 PPI 4 CC**

6b Don't pack a rat p23

**3 4 LW EC**

**2 PPI**

7a A Doubtful tale p25

**2 PPI CP 3 PUP 4 CH**

8a Celebrating Sandflies p28

**3 4 LW EC**





# section 2

## Teacher notes and activities

### Topic layout

This resource is organised by site, with each area focusing on a different topic. Each section includes supporting information (great background reading for teachers and parent helpers) and at least one activity to be carried out in the field, plus activities that can be done at the hostel or in the classroom.

### Curriculum level based

The activities in this resource are aimed primarily at meeting the objectives of the Science and Social Science curriculum levels 1-4. These curriculum areas are clearly laid out in Section 1, page 5.

### Using the activity sheets

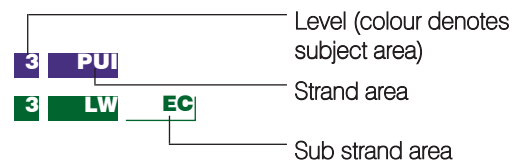
#### Planning outline

Each topic's activities have a brief overview box with a quick run-down of the curriculum objectives, materials needed, and additional health and safety issues you may need to be aware of as well as any other points of note.

#### Achievement levels and objectives

Achievement objectives are colour coded in line with subject areas in current curriculum documents. Numbers refer to levels while letters refer to strands and sub-strands. See page 5 for a breakdown of these.

Planning outline	
Achievement Objective: Science	Curriculum objectives covered
Strand: Living World	
Ecology	Materials required to complete activity
Levels: 3-4	
Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human-induced	Any ADDITIONAL health and safety issues involved with this activity
Materials required Weed watch sheet (page XX) String/ribbon	
Health and Safety Brambles have thorns! Have agreed or tagged boundaries to prevent students wandering too far.	
Additional Information Nothing to add here.	



# #1 Notes

Information notes 1

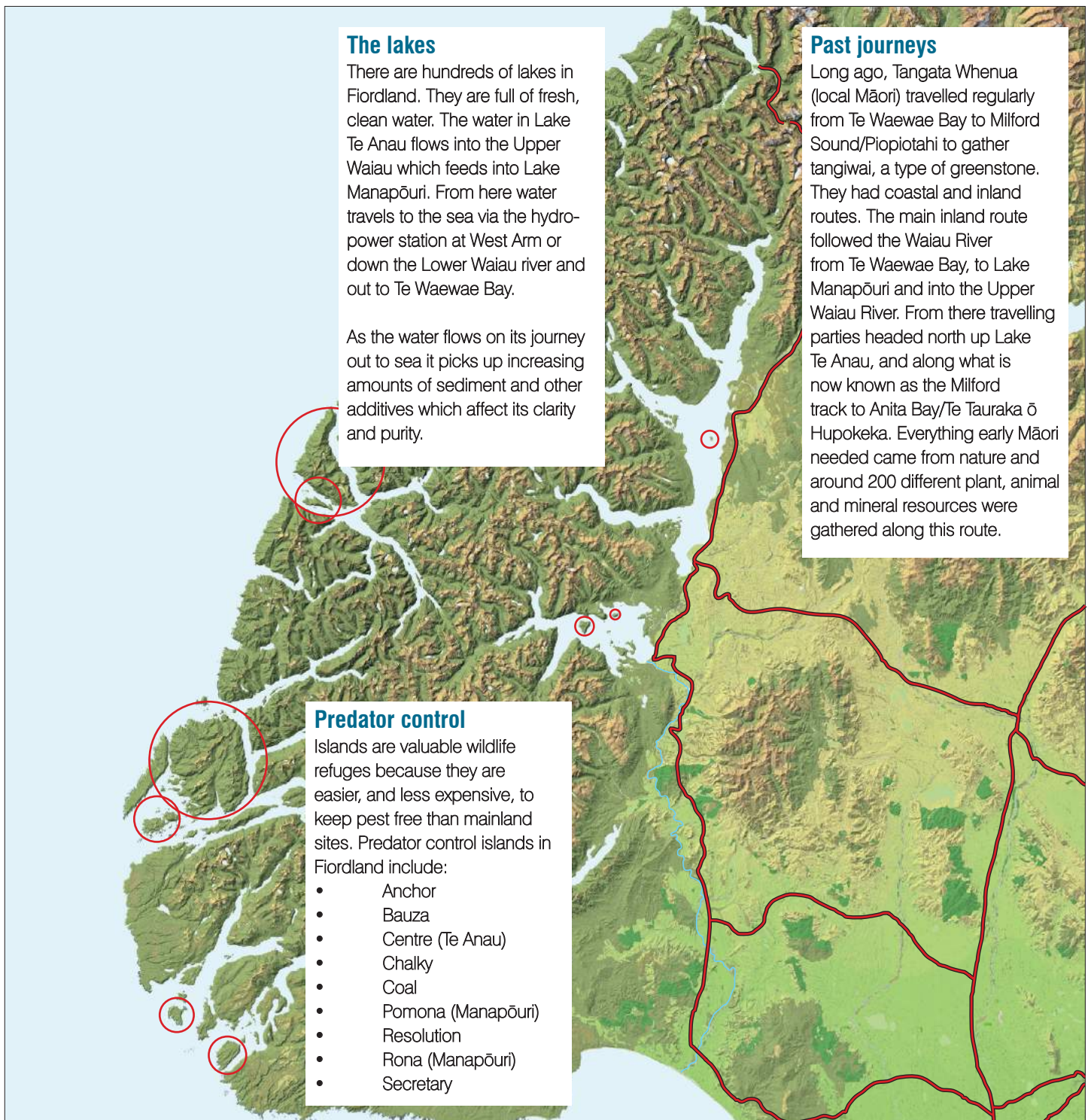
## Pre and post activities

Getting the most out of your trip

### Pre and post-visit activities

This resource includes suggestions for lead in and follow up activities.

If students have some formative ideas about what they might be about to find they will observe in a more focused way.



## #1 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Social Science  
Strand: N/A

Levels: **2 PPI**

Understand how places influence people, and people influence places.

Levels: **3 PUP**

Understand how people view and use places differently.

Levels: **3 RD**

Understand how people make decisions about access to and use of resources.

## Materials required

- Fiordland Map (available on disc)
- Writing/drawing materials

## Health and Safety

No additional issues.

## Additional planning notes

N/A

## Activity 1a – Knowledge Wall

## Activity description

Create a knowledge wall in your classroom. This activity establishes the setting for any field trip to Deep Cove.

## Supporting information

This activity consolidates all areas of supporting information #1. Knowledge Wall and outline for wall display (this is available on disc).

## Location

Pre-visit activity, classroom based

## Delivery

Create a knowledge wall, starting with an enlarged map of Fiordland. Hold a discussion to assess students' current knowledge of the area. Add information to the wall under headings such as: What does the area look like? What wildlife lives there? What do people do in the national park?

Locate and mark the route you will be travelling to Deep Cove. Colour Fiordland's freshwater one colour, and its coastal waters another.

Have a go at locating and marking the components of the Manapouri Power Station

- Te Anau Control Structure, the Mararoa Weir in the lower Waiau River, West Arm Power Station, route taken by pylons carrying power to Tiwai Point Aluminium Smelter, the two tail race tunnels' route from West Arm to Deep Cove in Doubtful Sound and the natural flow of water from Lake Te Anau to the sea at Te Waewae Bay.

Allocate students questions from section 7 (human history) and add their findings to the wall.

After the trip, revisit the headings on the wall and add the group's new knowledge to create a fuller picture of Fiordland.

## Planning outline

## Curriculum coverage

Achievement Objective: Social Science  
Strand: N/A

Levels: **2 PPI**

Understand how places influence people, and people influence places.

## Materials required

- Map of Fiordland
- Writing materials

## Health and Safety

No additional issues.

## Additional planning notes

N/A

## Activity 1b – Be prepared

## Activity description

One of the most important risk minimization strategies you can undertake is to involve students in planning the safety aspects of a trip.

## Supporting information

This activity consolidates all areas of supporting information #1.

## Location

Pre-visit activity, classroom based

## Delivery

Undertake this discussion as a whole class.

What kind of place or environment will you be visiting?

Has anyone been there before?

List what students already know about the site. In small groups ask students to look at the list and think of dangers to themselves. For every danger see if they can think of a way to make it safe. (Eg getting lost: stay with my group.)

In small groups ask students to think about how they can be a danger to the environment and what they can do about it. (Eg. Trampling plants: keep to the track.)

# #2 Notes

## Information notes 2

# Multiple site options

## The geology of Deep Cove, Fiordland.



### In a nutshell

After an earthquake in 2003 a massive rock fall left the Stella Falls area geologically unstable. The Helena Falls area is now the best place for students to see what Fiordland mountains are made of.

### Site overview

It takes 25 minutes to walk from the Hostel to the Helena Falls bridge. This activity can be carried out close to the track immediately after crossing the bridge.

## Fiordland Geology

### Rock on - older than the hills

The mountains of Fiordland are made from some of the hardest, oldest rocks in New Zealand. Radiometric age dating measures elements in rock that have known rates of decay and shows that the oldest rocks formed on an ancient seabed some four hundred million years ago, long before the islands of New Zealand existed.

### Rock on up - growing mountains

Beneath the land two pieces of the Earth's crust are in collision. The Indo-Australian plate is being driven alongside and under the Pacific plate, creating the Southern Alps and the Fiordland Massif (group of mountains). Ancient rock layers have been mangled and shattered, and rocks formed millions of years apart are now jumbled together.

### Chill out - the ice age

The landscape of Fiordland was created during the ice ages, a two million year period of world-wide cooling and warming that ended 15,000 years ago. During each of the ice ages in Fiordland, huge amounts of snow accumulated in the mountains. The snow was compressed under newer snow until it melted and refroze to form glacial ice. At the base of these glaciers, ice melted under pressure and the whole mass began to move. Ice itself cannot cut or erode rock - rock fragments imbedded in the glacier actually did the carving and caused the erosion, reshaping shallower V-shaped valleys worn by rivers into the dramatic U-shaped valleys we see today.

### Iced in - water and ice continue their work

Although the glaciers that carved Doubtful Sound have long gone, ice continues to shape the landscape.

Every winter, water soaks into rock then freezes and expands, cracking even the hardest granite. Water makes changes too, as sand and gravel wash across solid rock stream beds, slowly wearing channels in the surface.

### He iti, he pounamu - small but of great value

In the past travelling parties paddled waka along the treacherous Fiordland coast to collect tangiwai (bowenite, a type of pounamu) from a small bay near Milford Sound/Piopiotahi. This precious stone was traded with tribes from other areas.

Before metal working technology was brought to New Zealand by Europeans, Māori used different types of stone to make many different tools including chisels, adzes, knives, pounders, anchors and fishing weights.

### Bright, fine gold - European prospectors

Early European prospectors also made heroic journeys into Fiordland in search of minerals. Gold, marble, coal and mica have all been mined in Fiordland at some time. In 2010 a team of geologists from the Crown Research Institute GNS Science completed a decade-long project to update the geological map of Fiordland. They concluded that within the national park there were no deposits of minerals large enough to have economic value.

## #2 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science  
Strand: Planet earth and beyond  
Substrand: Earth systems

Levels: **3** **4** **PEB** **ES**

Appreciate that water, rocks and soil, and life forms make up our planet and recognise that these are also Earth's resources.

## Materials required

- What Rock Does What? and Rock ID sheet (page 31)

## Health and Safety

Ensure students gather rocks within agreed boundaries. Rocks should not be struck together close to anyone's face in case of chipping.

## Additional planning notes

Teachers may wish to take digital photos of the rock samples for later identification.

## Activity 2a - What rock does what?

## Activity description

Students explore the qualities of the rocks they have collected and are encouraged to think about how humans use rocks and the minerals they are made of.

## Location

Helena Falls area.

## Delivery

Explain to students that a rock may have been humankind's first tool. With it, a puny human could crack a nut or break a bone or open a shell. By experimenting with different types of rock, early people developed the skills to turn stone into many different types of tools, from blunt pounders to razor sharp skinning knives. We have never stopped experimenting with rocks and minerals and continue to find new ways of using them.

Have students working in small (4 - 6) groups. Ask each group of students to collect six rocks, each with different colours or textures. Either read out the 'What rock does what?' information, or give groups a copy of the sheet to work through.

When students have had time to try out their rocks, ask volunteers to talk about what they discovered. See if anyone can add to the group's knowledge of how we use rocks and minerals in our everyday lives.

At the end of the activity, see how many of the rocks the groups gathered are similar, and place them together in rock families. Use the rock ID sheet to see if you can identify any of them.

At the end of this activity please scatter the rocks back in the area they were found.



page 31

## #2 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science  
Strand: Planet earth and beyond  
Substrand: Earth systems

Levels: **1 2 3 4 PEB ES**

- Explore and describe natural features and resources.

## Materials required

- Activity sheet (page 32)
- One Mini Moro bar (or similar layered chocolate bar) at room temperature and one square of greaseproof paper
- One mini Moro bar that has been completely melted and set (Tip - pop on a piece of greaseproof paper and use a microwave for a few secs...watch closely!)
- One mini Moro bar for every student
- Plate
- Sugar
- Knife

## Health and Safety

Melting the chocolate bar could be done by an adult or with adult supervision.

## Activity 2b - Rock eaters

## Activity description

This activity demonstrates how sedimentary, metamorphic and igneous rocks are formed. This activity should be done after the visit to Helena Falls.

## Location

Hostel.

## Delivery

This activity can be delivered by a student or group of students reading the text and carrying out the actions on the recipe sheet. Depending on the group, students can either watch the Moro bar demonstration, or they can all take part.



page 32

## Rock Eater's demonstration (sheet on page 32)

Have the Moro bar (soft enough to pick up the sugar), the extra Moro bars, the paper and plate for sugar on a table where your audience can see them.

## Read the text and carry out the actions.

"All rocks are either igneous, metamorphic or sedimentary. This demonstration is going to show the difference between the three different types."

"All rocks, even the really hard ones, get worn down by frost and sun and rain until they are just tiny grains."

## Use a teaspoon to sprinkle sugar onto the plate to demonstrate grains of rock

"These tiny grains build up on the beds of seas, rivers and lakes until they become so deep that they get compressed and turn back into rock. Rocks that form like this are called sedimentary."

## Unwrap the Moro bar and press the top surface into the sugar so that it sticks to the softened chocolate.

"Sedimentary rocks often have different layers because the grains they are made of have come from the erosion of different rocks at different times."

## Cut the end off the Moro bar to show the layers including the grainy sugar layer on top.

"The sediments build up over millions of years and eventually the bottom layers get pushed down into the earth's crust."

Fold the greaseproof paper over the Moro bar and press down on it hard. Fold it over and squash again.

"The rock layers get heated and compressed which causes chemical changes. Rocks that have changed are called metamorphic."

## Cut the end off the Moro bar again to show how the layers have changed.

"In the end, the rock at the bottom of the layers gets pushed down to become part of the earth's molten core and it gets completely melted. This molten rock is called magma. When bits of molten rock cool, they form igneous rock."

## Hold up the melted mini Moro bar to demonstrate igneous rock.

"Rock keeps getting recycled from one type to another. This is called the rock cycle."

Now each student can have a mini Moro bar, but the first ones can go to the students who can answer these questions.

1. *What type of rocks do you think sandstone, siltstone and mudstone are?* Sedimentary
2. *What do you call rock that has been changed by being heated and compressed?* Metamorphic
3. *How does magma in the Earth's molten core become an igneous rock?* Volcanoes are one way that magma can reach the surface and become igneous rock.

## Forest regeneration in Fiordland



### In a nutshell

Rock falls and tree avalanches are common in Fiordland and all bare sites will eventually be covered in forest again. On the Helena Falls track, human activity removed the original vegetation, but the process of regeneration is similar to that on naturally occurring sites.

### Site overview

The Helena Falls track is an easy 45 minute loop walk from the Helena Falls bridge. It may be muddy in places. It takes 25 minutes to walk from the Hostel to the Helena Falls bridge. The site for the 'Watch this Space' activity is reached five minutes after crossing the bridge (walking the loop anti clockwise). This activity can be done before or after visiting the falls.



**First on the scene**  
Moss, lichen and algae.

### Forest Regeneration

#### Slip sliding away - the forest falls off

Tree avalanches and rock falls can leave strips of mountainside as clear of forest and soil as they were after the last ice age. Trees cannot easily grow on bare rock. Without soil, there are no nutrients, there's nothing to hold on to moisture and there's nowhere for roots to grow. Yet the forest will return, and the process, called regeneration, begins immediately.

#### First on the scene - plants for a new habitat

The first living things to appear are often simple plants called algae. The easiest algae to spot are bright orange and usually grow on rocks. Lichen is another of the first arrivals. Lichens are easy to recognise by their grey green colour. Mosses are green and grow in damper spots. These are the first soil builders. As they grow, they make soil by catching wind blown dust and by shedding dead parts that eventually make a fine layer of humus.



**Soil makers**  
A shrub seedling emerges from a carpet of creeping plants and grasses.

#### Soil makers - a carpet of growth

Moss and lichens make the environment a little less harsh. There's a bit of soil, it doesn't dry out as quickly and the moss keeps the ground a bit warmer when it is cold and cooler when it is hot. The wind-blown seeds of small creeping plants and the spores of ferns have enough soil, moisture and warmth to

germinate. These plants have roots that spread into cracks in the rock and through the soil. They grow fast and shed more leaves, which are broken down by fungi, invertebrates and bacteria to make more humus.

#### Forest again - the trees return

The roots of the creeping plants and ferns help to hold the soil in place during heavy rain or high wind. Small shrubs and grasses are able to grow, and the insects and birds they attract speed up the soil making process. Finally, in the shelter of the shrubs, tree seedlings get their start in life.

It takes around 300 years for mature forest to return to a damaged area. This process can be disrupted by browsing animals like deer and goats, and if introduced plant species take over before native plants can become established.

Bare rock

Forest

## #3 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science  
Strand: Living World  
Substrand: Ecology

Levels: **3 4 LW EC**

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

## Materials required

- Watch this Space
- Plot sheets – one per group (plot shape marked, tape measure on one side, space for birds seen or heard, plot number, date)
- Watch this Space sheets (page 33-38)
- Pencils/pens
- String and scissors
- Camera, if you would like to record photopoint photographs

## Health and Safety

Students to work within agreed boundaries and stay away from the river and stream.

## Tree avalanches

Tree avalanches, slips and rock falls are common in Fiordland. Keep a look out for slip areas on the roadside and try counting tree avalanche paths if doing the Real Journeys cruise. A blank 'Watch this Space' plot sheet is included in the Resources and Worksheets section for schools wanting to choose their own regenerating site to study.

## Activity 3a – Watch this Space

## Activity description

Schools build up their own record of how a forest regenerates by monitoring vegetation plots.

## Location

Helena Falls area. The site is less than ten minutes walk from the bridge. Six 2 metre square vegetation plots are marked with pegs. Plots are numbered.

## Delivery

Explain to students that in 2003 this site was bare of plant life. Shattered rock from the Manapōuri Power Scheme's second tail race tunnel covered the area. The power company responsible for the power station, Meridian Energy, provided thousands of tree and shrub seedlings to speed up the process of regeneration, but countless other plants have moved in without human help. Eventually, this area will be forest again.

Using the background notes as a guide, help students to identify different types of plant (algae, lichen, moss, creeping plants, seedlings etc.) on regenerating sites.

If students have done the 'Worth Knowing' plant ID activity they will recognize some of the plants at this site. Encourage students to look at the detail and complexity of the ground cover and make predictions about what will happen to their plot over time.

A 2011 map of each plot is provided as a guide for students. The map identifies just some of the plants within the plot. Students can add as much extra detail to their plot drawing as they wish. It will be easier for students to map their plots if a string is run through the holes in the four corner pegs of the plots. Using string to divide the plot into quarters will also help.

Within a couple of years changes will be measurable, and students will be able to compare their plot diagrams and photopoint<sup>(1)</sup> pictures with those done in past years. Schools will need to archive plot maps so that students can see the recorded changes.

<sup>(1)</sup>A series of photographs taken from the same point over a period of time to record change. Photos should be taken from the track side of the plot, standing back just far enough to include the whole plot in the picture.

NB Plants likely to appear as plots regenerate include kāmahi, silver beech, mountain beech, rata, mountain holly and dracophyllum. Keen students may want to make a 'Worth Knowing' plant guide for groups visiting the plots in future years. Leaf rubbings, sketches and photographs could all be used. Plant ID books are available at the hostel.



page 33



## #3 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science

Strand: Living World

Substrand: Ecology

Levels: **3 4 LW EC**

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

## Materials required

- Student Recipe Sheet (page 39)
- At least one packet of sponge fingers
- One plain sponge
- Grated chocolate/chocolate hail
- Pebbles/smarties
- Kiwi fruit. Some mashed, some sliced into rounds or ovals
- Banana. Mashed
- Chocolate finger biscuits
- Large marshmallows
- Green food colouring to colour the marshmallows

## Health and Safety

No additional health and safety issues with this activity.

## Activity 3b – Regeneration Cake

## Activity description

Students use a dessert to demonstrate the regeneration of a tree avalanche site.

This activity is best done after the Watch this Space activity.

## Location

Hostel.

## Delivery

One group of students demonstrates the process of regeneration by following the recipe card and reading the text aloud.

Everyone gets to eat it!



page 39

## Regeneration Cake demonstration (Sheet on p39)

Make trees by poking holes in large marshmallows and colouring them with green food colouring. Put the marshmallows on chocolate finger biscuits to make trees. Have your other ingredients assembled on a table where your audience can see them. Make a minimum of five trees.

Explain that you are going to make Regeneration Cake and that the sponge represents the bare rock. Explain what is happening at each stage.

Roughly break up the sponge fingers and spread them thickly over the ready made sponge.

"After a rock fall or tree avalanche the rock is left bare. The first things to grow on the site don't need soil. They grow on the bare rock. They include lichen (pronounced liken), algae and some types of moss."

Dollop some mashed kiwifruit into crevices between the broken rocks.

"These first plants trap wind blown dust and help to make the first pockets of soil."

Sprinkle some grated chocolate onto the plants.

"Small creeping plants begin to grow. Some of them arrive as windblown seeds."

Pop Smarties down where there are pockets of soil.

"The creeping plants grow and die and make more soil."

Sprinkle a little more grated chocolate around the creeping plants.

"Now, when bird droppings land here, any shrub seeds in the droppings have a chance to grow."

Splat a few spoonfuls of mashed banana (bird droppings) onto the landscape.

Plant kiwifruit slices in the banana.

"The shrubs make more soil and provide shelter so that, eventually, trees can grow on the site again."

Plant chocolate finger biscuits in amongst the shrubs, to represent the trees.

Your Regeneration Cake is now ready to serve.

Give the first helpings to the students who can answer these questions.

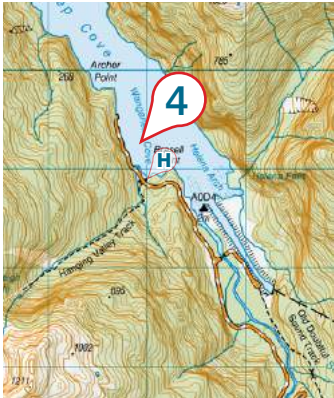
1. *Name one of the first things to grow on a bare site.*  
Lichen, algae or moss.
2. *What are two ways in which seeds arrive on a bare site?*  
Blown on the wind, or carried by birds.
3. *Why aren't trees the first plants to grow?*  
Because there is not enough soil or shelter for them.

# #4 Notes

## Information notes 4

# The fiord

## The underwater world of Doubtful Sound/Patea



### In a nutshell

Deep Cove is the most intensively fished area of the Fiordland coast. The activities in this section give students the opportunity to have fun out on the water, without taking fish.

### Site overview

Directly in front of the hostel is a relatively sheltered area of water where groups can carry out marine experiments. Plankton fishing needs to be carried out in deeper water, mid fiord, while the fish cam can be used along the rock walls of Brassel Point, well away from fallen trees.

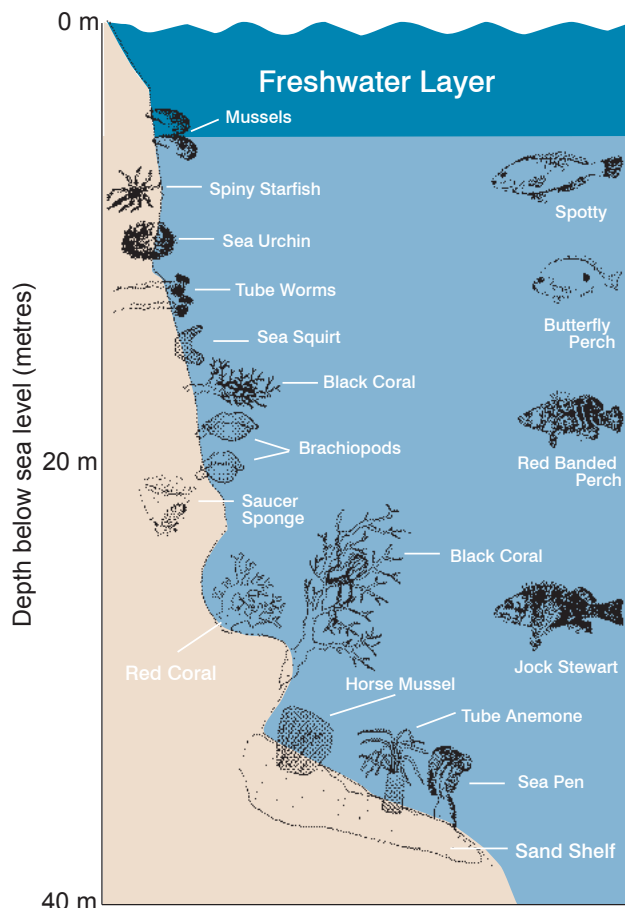
### Beneath the reflections

New Zealand's fiords are like no other marine environment in the world. Fiordland's extraordinarily high rainfall results in a layer of fresh water sitting on top of the denser salt water. This freshwater is stained by harmless plant chemicals called tannins, which reduce the amount of sunlight that penetrates the water. In this artificially darkened environment,

normally deepwater species can be found as little as 5 metres below the surface. The reduced light means that seaweeds, which need sunlight for photosynthesis, are far less common than would be usual.

### ...and above

Because there are fewer plants growing in the fiord, marine life here relies on additional plant material entering the food chain through tree avalanches and leaf fall from the forest.



Without the forest, there would be less food to support marine plant eaters. The fresh water layer would not be coloured by tannins which would mean more sunlight penetrating through the water. Soil erosion would smother the corals and other filter feeders. If possum and deer numbers became high enough to reduce the forest cover of the mountains, Fiordland's unique marine world would be destroyed.

### ...and looking closer still

Plankton are tiny living things that drift on ocean currents. Some live their whole lives as plankton while others develop into marine life such as fish, shellfish and seaweeds. Ninety percent of plankton comes from the plant kingdom and is called phytoplankton. Phytoplankton turn sunlight and carbon dioxide (a gas we breathe out) into carbon and oxygen (a gas we breathe in) by photosynthesis, just like plants on land. Two thirds of all global oxygen comes from plant plankton and seaweed, which is why healthy oceans are vital to life on Earth. Because they need sunlight to make food, phytoplankton drift near the surface of the ocean. Because most of the plankton in the fiord has been drawn up from deep water, students tend to see mainly plankton from the animal kingdom (zooplankton).

## #4 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science  
Strand: Planet Earth and Beyond/Living World  
Substrand: Earth Systems/Life Processes,  
Ecology, Evolution

Levels: **3 4 PEB ES**

Appreciate that water, rocks and soil, and life forms make up our planet and recognise that these are also Earth's resources.

Levels: **3 4 LW LP+EC+EV**

Recognise that there are life processes common to all living things.

Explain how living things are suited to their particular habitat.

Begin to group plants, animals, and other living things into science-based classifications.

## Materials required

- The equipment and instructions on how to use it will be issued by the hostel manager.
- Take pen and paper to record results.

## Health and Safety

Ensure each boat has a radio and a survival bucket. Ensure all life jackets fit well.

Other safety issues will be covered by hostel manager.

## Before you start...

Take the boat to a sheltered spot out on the water and look at the landscape around you. Doubtful Sound was carved by glaciers so huge that at one time only the tops of the mountains would have been visible above the ice. Look for the hanging valley on the Hanging Valley track. This was made by a smaller glacier which was carving its own path until it was cut off by the main glacier. Where the mountains meet the water, the fiord walls continue down steeply, in some places for more than 400 metres (but only around 100 metres in Deep Cove).

## Activities in the Fiord section

These activities will be supported by a short film showing Deep Cove underwater.

## Activity 4a – Marine Studies

## Activity description

Groups get out on the water in stabi craft and explore the marine environment

## Location

Deep Cove

## Delivery

The Hostel manager will give instructions on the safe use of stabi craft and will issue the equipment and instruction sheets. The hostel has a copy of the DVD Mirror World (60 mins). This is a fascinating documentary about the marine environment of fiords.

Activities (equipment and instructions available from the hostel manager).

## Freshwater layer

The freshwater layer at Deep Cove varies in depth from two to ten metres depending on rainfall. Students work out how deep the freshwater layer is by lowering a corked bottle and pulling the cork at different depths. They taste test for saltiness and use a thermometer to measure water temperature.

## Light penetration

Students lower a disc over the side of the boat and watch as it is let down into the tea coloured freshwater layer. When the disc vanishes, the depth to which light can no longer penetrate has been reached. Most life in the fiord is found in the top forty metres of water as light can rarely penetrate deeper than this. To give students a comparison, it is a forty metre drop in altitude from the blindfold rope walk on the Hanging Valley track to the hostel.

## Fish cam

By carefully lowering the fish cam near to the rock walls of Brassel point, students can get a peek at the underwater world of Deep Cove. Look out for spotted wrasse or spotties. These amazing little fish have good memories and recognise each other by the patterns of blotches and spots on their sides.

## Plankton fishing

All life in the seas would collapse without plankton so they are well worth learning more about. Plankton fishing takes around ten minutes and gives time for students to share anything they know about plankton, and come up with some questions. Back at the hostel, watching plankton with the USB microscope will help students to learn more, and come up with new questions! NB: Wait until after dark then pour the plankton back into the fiord (from the beach below the hostel) and you may see some of them glow with phosphorescence.

## #4 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science  
Strand: Living World  
Substrand: Ecology

## Levels:

3 4 PEB ES

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

## Materials required

- Interactive whiteboard
- Supersite Software

## Health and Safety

No additional issues related to this activity.

## Activity 4b – Deep down in Doubtful Sound

## Activity description

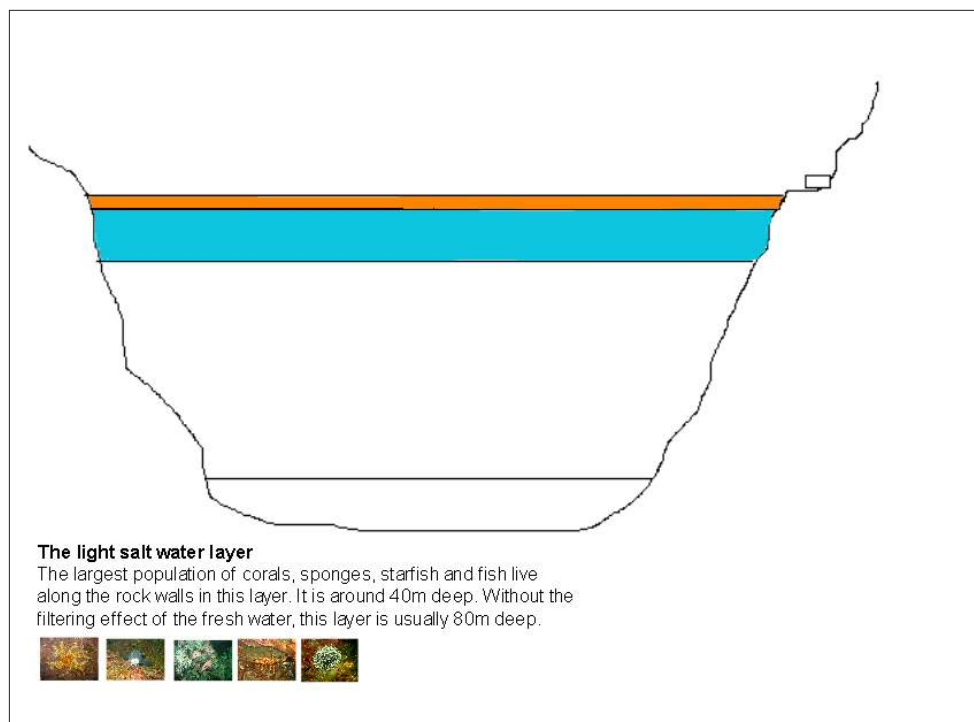
A follow-up marine studies activity. Students use the interactive whiteboard at Deep Cove to build up a picture of the fiord in cross section by using the whiteboard's software and the file located on the disc.

## Location

Hostel

## Delivery

The majority of students are likely to have the skills to run this activity with minimal assistance. As many students as possible should be actively involved. Encourage discussion around the topics raised.



## Cross section

Screen grab from the interactive whiteboard application document available on the disc and at the hostel.

## #4 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science  
Strand: Planet Earth and Beyond/Living World  
Substrand: Earth Systems/Ecology

Levels: **3 4 PEB ES**

Appreciate that water, air, rocks and soil, and life forms make up our planet and recognise that these are also earth's resources

Levels: **3 4 LW EC**

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

## Materials required

- Two packets of purple jelly, one packet of blue, and one packet of orange or cola jelly all made to set firm (make with 1 3/4 cups of water per packet rather than two).
- One lolly worm and a handful of mini chocolate fish
- Butter knives
- A slice of cake, preferably chocolate
- Six cup capacity glass bowl with steep sides
- Activity sheet (page 40)

## Health and Safety

An adult can make the jelly mix using 1 3/4 cups of boiling water per packet of jelly.

## Activity 4c - Forty Metre Band Jelly

## Activity description

A follow-up marine studies activity.

This activity demonstrates the layers of a fiord using coloured jelly.

This activity should be done after other fiord activities.

## Location

Hostel

## Delivery

One group of students demonstrates the layers of a fiord by following the recipe card and reading the text aloud.

Everyone gets to eat it!

This activity can be delivered by one group of students or adapted for several groups.



page 40

## Forty Metre Band Jelly demonstration (Sheet on p40)

Before the demonstration, use butter knives to roughly cut up the jellies in the bowls until they are diced into very small pieces.

Put the mixing bowl, slice of cake, prepared jellies and sweets on a table where your audience can see them.

Explain that you are going to make an edible model of the sea in Doubtful Sound.

"Doubtful Sound is more than 400 metres deep at its deepest point. Scavengers like marine worms live in the sludge on the fiord floor."

Squash the cake into the bottom of the bowl. Put the lolly worm on top.

"The water is really dark so dolphins need to use sonar to swim and predators like the snot eel find their prey by smell."

Spoon in the purple jelly and flatten the surface with a spoon.

"The largest populations of seaweeds, corals, sponges, shell fish, star fish, sharks, eels and fish live in the top forty metres of salt water. This is called the forty metre band."

Carefully spoon the blue jelly on top of the purple jelly. Pop in mini chocolate fish.

"Divers come to Fiordland because they can see deep water species close to the surface. This is because the brown coloured fresh water layer is like tinted glass and blocks out sunlight. Black coral usually grows 100 metres below the surface, but here divers can see it at 5 metres."

Very carefully spoon orange or cola jelly on top as your final, but most important, layer. Hold up the jelly so that everyone can see the layers.

Now you can serve up the edible sea but give the first helping to the students who can answer these questions

1. *How deep are the deepest parts of the fiord?* Over 400 metres (434m).
2. *How does a snot eel find its prey?* By sense of smell.
3. *How many metres deep is the band of water in which most fiord life exists?* 40 metres.
4. *Which layer of the fiord is like a pair of sunglasses?* The top, brown stained layer.

Think up a bonus question for whoever wants the marine worm at the bottom of the bowl.

# #5 Notes

## Information notes 5 The Hanging Valley Track

### Soil erosion and water quality



#### In a nutshell

This track follows the course of the stream that supplies water to the hostel. Most of the activities for this site raise student awareness of how what happens on land affects what happens to water in the environment.

#### Site overview

The Hanging Valley Track is very steep and will be slippery after rain. It takes around fifty minutes of walking to reach the kea cairn.

#### Walking where glaciers flowed

From behind the hostel the track climbs the steep southern wall of the main fiord until it meets a valley carved by a much smaller tributary glacier. During the ice ages the main Doubtful Sound glacier shaved off the smaller one, leaving a clear U shaped valley high on the mountainside. Standing at the kea cairn you are at the mouth of this hanging valley.

#### The Rainforest

The forest you'll be walking through is dense and lush due to a rainfall of around 8 metres per year, but it survives on a very thin layer of soil. You'll notice how tree roots spread over the surface of the rock, and where a tree has been uprooted you'll see the thin, yellowish mountain soil. The food plants need from the soil is all in the thin chocolate brown humus layer made up of dead leaves and rotted wood. Touch rotting logs and you may find some have a squelchy, jelly like texture that students will find entertaining. The wet wood is being broken down by decomposers like algae, fungi and bacteria.

The wet climate makes it possible for many plants to grow away from soil, clinging to tree trunks or perched high in branches. Native orchids grow like this, but they have special spongy roots to store water during dry spells. Delicate plants like filmy ferns curl up and look dead in dry weather but quickly recover after rain.

Common trees in this part of the forest include rata, beech, kāmahi, totara and rimu. These species provide food for birds in the form of nectar, fruit, seeds and the insects they attract and you are quite likely to see weka, tomtits, and fantails and may hear kereru and kaka feeding in the canopy.

#### Protecting the green mantle

Human activity means that deer avoid the Deep Cove area but possums are present so you may spot droppings and see browsed plants and gnaw marks on tree trunks. Deer and possum control is vital to protect the forest. Without healthy vegetation the high rainfall would wash soil into the fiords, smothering the filter feeding corals and anemones that grow on the rock walls.



#### Hanging valley

This is a tributary valley that enters a main valley at a much higher level.

## #5 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Social Science  
Strand: People and Place Influence/People  
Using Places, Resource Descisions/Cultural  
Heritage

Levels:

2	PPI	3	PUP+RD
4	CH		

Understand how places influence people, and people influence places.  
Understand how people view and use places differently.  
Understand how people make decisions about access to and use of resources.  
Understand how people pass on and sustain culture and heritage

## Materials required

- A small piece of polystyrene and a small glass jar (rub the polystyrene on the jar to make a bird caller)
- A secret stash of snack bar wrappers and other rubbish for the activity at the third stop
- Rubbish bag
- Crayons and paper to make a rubbing of the kea memorial at the fourth stop
- Teacher's activity sheet (page 41-42)

## Health and Safety

Students should keep to tracks and stay away from steep drops near the river. Groups should make enquiries with the hostel manager regarding water quality.

## Activity 5a - The Hanging Valley Hike

## Activity description

At rest points on this walk students investigate how what happens on land affects what happens to water in the environment.

## Location

Hanging Valley Track

## Delivery

Most groups walk to the kea cairn, which takes around 50 minutes without stops.

Students will enjoy the climb more if they have breaks so the activities below are spaced at intervals on the climb. Stops are marked by large orange triangles with Environmental Care Code messages on them. If students have done the pre trip activity 'Be Prepared' they will probably have come up with some of these points themselves.

At each stop, carry out the activity suggested and encourage discussion. Possible answers to questions are suggested.

As well as doing the activities listed, try stopping if you hear birdsong. Can any one in the group identify the birds heard? Rubbing a piece of polystyrene on glass makes a squeaking sound that attracts small birds.



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## Walking track notes (full notes on p41-42)

## First stop.

*Water + Soil = Mud: Keeping the hostel's drinking water clean.*

Environmental care code - Keep to the track (discuss after activity one).

The hostel's drinking water comes from the river you can hear nearby. It is clean and safe to drink, but it would not be safe if it was muddy.

What happens when heavy rain falls on the track?  
What happens when heavy rain falls onto moss on the forest floor?  
How is the moss keeping the water at the hostel from being muddy?

Environmental Care Code - Keep to the track.

## Second stop.

*The number one rule for safe drinking water.*

Environmental care code - Bury toilet waste away from streams and rivers (discuss after activity).

What would happen if someone went to the toilet behind a tree?  
If it rained, where would the poo 'flush' to?  
Ask the group (including your parent helpers) if anyone has heard of giardia.  
If anyone needs to poo in the bush, they need to go at least 50 metres away from the water.

Environmental Care Code - Bury toilet waste away from streams and rivers.

## Third stop.

*Don't rubbish the environment.*

Environmental care code - Remove rubbish (discuss after activity).

While students are at the stream, take the bag of rubbish up to the track and scatter it around the area.  
When you return to the track to continue your climb, ask students about their reactions to seeing the rubbish.

Environmental Care Code - Remove rubbish.

## Fourth Stop

*The kea cairn. A fed kea is a dead kea.*

Environmental care code - Protect plants and wildlife (discuss after activity).

This memorial is part of the human history of the area. The plaque remembers Neddy the kea who crash landed and drowned in Deep Cove in 1965.

Why not feed kea?

Use a crayon and paper to take a rubbing of the kea cairn

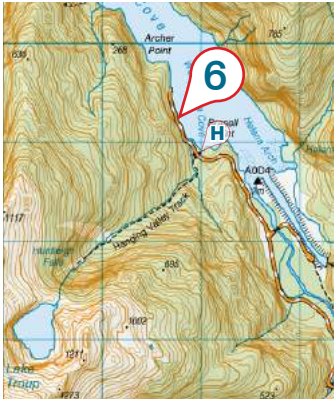
Environmental Care Code - Protect plants and wildlife.

# #6 Notes

## Information notes 6

# Hostel to wharf

## Protecting native wildlife



### In a nutshell

At this site students can be involved in conservation action by checking the rat/stoat traps that help to protect pest free islands in Doubtful Sound and beyond. Deep Cove is effectively a line of first defence for these Islands.

### Site overview

It is a one kilometre walk from the hostel to the main wharf. Note that there can be traffic on this road at any time of the day. Students can use plant ID sheets to identify native plants (theme - 'Worth knowing').



## Protecting Our Treasure Islands

### When the mammals arrived - big changes for New Zealand's birds

New Zealand has just two native land mammals, a long tailed bat and a short tailed bat. All of the animals (and many of the birds) we see in our day-to-day lives have been brought to New Zealand. Animals were introduced for a variety of reasons: rabbits as food, horses for transport, cattle and sheep to farm, deer to hunt, possums for a fur trade.

Introduced animals quickly began to prey on or compete with the birds, lizards and insects that filled the forests, wetlands and other habitats of New Zealand. Some native species coped with the changes but others quickly became extinct or survived only on islands the invaders could not reach.

### Pest Patrol - stoat and rat trapping brings back the birds

Deep Cove's most troublesome introduced pests are rats, stoats and possums. Trapping these pests is helping to protect native wildlife. Traps used to kill rats and stoats are placed in boxes to protect inquisitive birds like kea and weka. Leg hold traps for possums are set in trees to avoid catching kiwi and weka.

### Bird banks - Doubtful Sound's sanctuary Islands

In Doubtful Sound, the Department of Conservation has largely cleared Secretary and Bauza Islands of

deer and stoats. The forest is now recovering and bird and insect populations have exploded, making it possible for endangered birds to be introduced to the islands. Kiwi, takahē, North Island kokako, and rock wren are among the birds that now make Secretary and Bauza true 'treasure islands'.

### Working together

In the 1970s and 80s birdsong, especially the dawn chorus, was a memorable feature of students' experience of Deep Cove. By the late 1990s however, the forest was falling silent as stoats, rats and possums took an increasing toll on bird populations. In 2006, local business Fiordland Explorer Charters established a stoat and rat trap line from West Arm at Manapōuri to Deep Cove hostel in Doubtful Sound in an attempt to bring back the dawn chorus. So far results are promising and there has been a measurable increase in birdlife with more schools are hearing and even seeing kiwi, many more weka present, and tui spotted for the first time in twenty years. Fiordland Explorer Charters are just one of a large number of businesses, both local and national, organisations, trusts and individuals contributing to the protection of the Fiordland environment.



## #6 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Science/Social Science

Strand: Living World/People and Place influence, Community Challenges

Substrand: Ecology

Levels:

3 4 LW EC

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

Levels:

2 PPI 4 CC

Understand how places influence people and people influence places.

Understand how people participate individually and collectively in response to community challenges

## Materials required

- Spanner for opening trap boxes and gloves (available from hostel manager)
- Fresh bait (half a teaspoonful of peanut butter on a small piece of cardboard works well)
- Hand sanitizer
- Spotters Guide, Pest Files and Worth Knowing cards

## Health and Safety

There can be traffic on the road at any time. Adult to remove dead animals from traps (students can rebait). Use hand sanitizer after handling traps, dead animals or bait.

## Activity 6a – Snap! Trap checks

## Activity description

Schools check and rebait the rat and stoat traps.

## Location

Hostel to main wharf

## Delivery

This is hands on conservation. Dead animals will need to be removed from traps and the traps reset and baited.

The DVD 'How to set a stoat trap' includes a demonstration of how this is done.

Explain that these traps catch rats before they can stow away on boats that may be visiting bird sanctuary islands. The Department of Conservation is responsible for replacing the eggs in the traps, but if schools keep refreshing other bait it will increase the number of rats caught.

Take the Pest Files, Spotter's Guides and Worth Knowing cards with you on this walk. At each trap, take the time to look for plants 'Worth Knowing'. Challenge students to learn to recognize the plants and remember why they are worth knowing. Discuss the species on the Pest Files and Spotter's Guides.



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## Planning outline

## Curriculum coverage

Achievement Objective: Science/Social Science

Strand: Living World/People and Place Influence

Substrand: Ecology

Levels:

3 4 LW EC

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

Levels:

2 PPI

Understand how places influence people and people influence places.

## Materials required

- Rodents (small stones, mini snack bars, joke shop rubber mice/rats will all do)
- Rodent droppings (rice grains)
- A box of food from the kitchen and a filled pack
- Pest cards
- Paper and pens/pencils

## Health and Safety

No additional issues related to this activity.

## Activity 6b – Don't Pack a Rat

## Activity description

Students hunt for hidden rodents and make a poster to raise the awareness of how pests can hitch a ride to island sanctuaries.

## Location

Hostel or classroom

## Delivery

Assemble a kit for someone going to visit a pest free island. Include a box of food and a filled pack.

Hide something that will represent rodents (Small stones, mini snack bars, joke shop rubber mice/rats will all do. Use rice to represent mouse droppings.) Hide them well, inside food cartons or tucked into pockets.

Have a group of students do a rodent check on the gear and see if they can find all the pests.

Explain that this is how rats and mice get to islands and discuss what damage they can do there (refer to pest cards). Ask students to design posters to raise the awareness of people planning to visit islands (especially boat owners).

Send posters to the Department of Conservation and they may be used at the Deep Cove slipway and in DOC publications.

## The human history of Doubtful Sound/Patea



### In a nutshell

How has the human use of the Doubtful Sound area changed over time?

### Site overview

More detailed information on the history of Doubtful Sound can be found in a resource available from the hostel manager.

### Deep Cove through the ages

Deep Cove's first human visitors would have been the early Māori explorers. Following their discoveries the area became part of a mahinga kai or food and resource gathering route. European explorers came looking for resources too, firstly fresh water and food for ships' crews and later seals and minerals for trade. When tracks were cut, the first intrepid tourists came, and once the road over the Wilmot pass was made (as part of the construction of the Manapōuri Power Station) commercial and recreational hunters and fishers became regular users.

Today, hundreds of thousands of visitors pass through Deep Cove every year as part of their Doubtful Sound experience. Some are here to kayak, tramp, hunt or fish, others to dive and experience the extraordinary underwater world of the fiords, many are sightseers on the large boats and an important percentage are school and university students experiencing and learning about this unique New Zealand environment.



*The Deep Cove hostel as it was*

Photos © Paul Gaye



Photos © Paul Gaye

## #7 Activities

## Planning outline

## Curriculum coverage

Achievement Objective: Social Science  
Strand: People and Place Influence, Cultural Practices/People Using Places/Cultural Heritage

Levels:

2	PPI+CP	3	PUP
4	CH		

Understand how places influence people, and people influence places.

Understand how cultural practices reflect and express people's customs, traditions and values.

Understand how people view and use places differently.

Understand how people pass on and sustain culture and heritage

## Materials required

- Script sheets
- Prop box from store room

## Health and Safety

No additional issues related to this activity.

## Activity 7a - A Doubtful tale

## Activity description

Students use a series of short skits to get a glimpse of the human history of Doubtful Sound.

## Location

Hostel

## Delivery

Students can read straight from cards or be given time to prepare their skits. Props are kept in the store room.

Each of these short scenes is accompanied by questions that can be researched and added to the knowledge map.

There are twelve scenes and 24 characters plus one narrator. Extra characters/scenes could be added.

This activity is also an opportunity to talk about the way people have viewed Doubtful Sound in the past and how we might view it in the future.



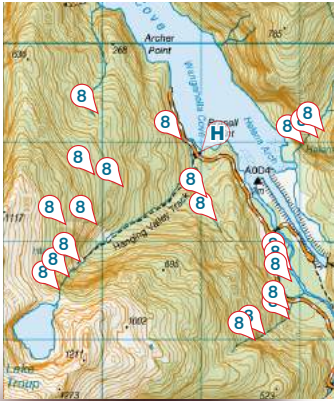
page 50

# #8 Notes

Information notes 8

## Sandfly central

### Why the sandfly should be valued



#### In a nutshell

Sandflies are a fact of life at Deep Cove, so why not take a little time to get to know the enemy?

#### Site overview

Sandflies can be found anywhere near running water. In Fiordland this means pretty much anywhere! Although their bites cannot transmit disease, scratching can put germs into the wound and this can lead to problems if not monitored. Best advice? Don't scratch!



© GeorgeNovakPhoto

#### Sandflies, what's the story?

Despite several hundred years of seasonal resource gathering in Fiordland, Māori did not establish large permanent settlements within the fiords, and while European settlers did attempt mining and farming these enterprises were abandoned long ago. This lack of human interference in the landscape is one of the reasons that Fiordland is one of the world's great wilderness areas.

Today, Fiordland is a national park, so it is protected from timber milling and land development. However, the fact that it survived undamaged long enough to gain protection, may be down to a very small champion. Who is the guardian and defender of the glorious Fiordland wilderness? Te Namu. The sandfly.

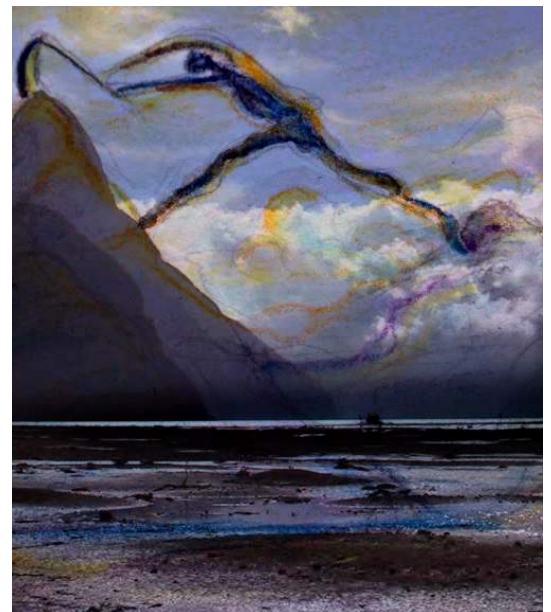
Sandflies are found (or find us) in many parts of New Zealand, but their creation is linked to the creation of the fiords.

#### And this is the story of how it happened...

Once, if you had been out at sea here, looking back towards the land, you would have seen nothing but an unbroken cliff.

Imagine, a tall, forbidding wall of rock stretching along the coast as far as the eye could see. Okay for seabirds, but no place for people. People need landing places for their waka. Campsites. Places to gather food.

Back in the early days of this country, atua (spiritual beings or demigods) had a lot to do with shaping the land. The task of making this Southwest corner of the South Island more suitable for humans went to one called Tū te Raki Whanoa.



© Corrie Francis Parks

Tū's job was to make openings in the rock wall so that waka could find shelter from the ferocious sea. It was a big job, even for an atua with a magic adze, but Tū was up for it. He planted his feet widely and set to work.

Did you ever watch a log chopping competition? He must have worked like those guys, sweat flying, chips flying. But Tū was chopping rock, not wood, and he didn't stop. Tū was like a super hero. He recited special charms, sparks flew, rock shattered, he kept working. He didn't even take toilet breaks. The coastal waters of Fiordland are called Te Mimi o Tū te Raki Whanoa. Yep, the wee of Tū.

Mostly though, it was sea that flooded the inlets he carved. Tangaroa, god of the sea filled them with fish. Tāne, god of the forest clothed the bare rock walls with trees and filled the trees with birds.

By the time Tū had finished working his way up the coast from south to north, he had carved the 14 fiords we know today. Now, instead of being a sheer rock wall the coast was broken at handy intervals by steep sheltered inlets stocked with delicious fish and birds. He had a bit of help here and there but it was mostly his own work and it was tino pai rawa atu (absolutely awesome). He really was an expert.

Tū had accomplished his mission to make the coast a place that humans could live.

Time passed and people came.

Now, you wouldn't think it was possible to do too good a job of a thing, would you? How likely is it that you muck out your bedroom and your mother says its too tidy? Or that your maths teacher complains about your 100% correct test result? Well, it seems you can. Tū's landscaping job was just too good, all people wanted to do was gaze at it. They didn't mend fishing nets, or work flax or dry fish for their winter stores. They just sat and looked at the view.

And this is just what they were doing when Hine nui te Pō, goddess of the Underworld, came to visit Tū. She was not pleased. Hine nui te Pō liked people busy or dead. She couldn't undo Tū's work, so she devised a plan so fiendish that no one would stand still in Fiordland ever again. She created a gigantic six legged, winged blood sucker called Te Namu.

Te Namu was as big as a bear and always hungry, but it couldn't be everywhere at once and the poor thing wore itself out racing around the fiords terrorising people. Hine nui te Pō decided it would be more efficient to make lots of little namu, and that is how we come to have sandflies, and why we seldom stand still to admire the views in Fiordland, however amazing they are.

## #8 Activities

## Planning outline

**Curriculum coverage**

Achievement Objective: Science

Strand: Living World

Substrand: Ecology

Levels: **3** **4** **LW** **EC**

Explain how living things are suited to their particular habitat and how they respond to environmental changes, both natural and human induced.

Achievement Objective: Social Science

Strand: Cultural Heritage

Levels: **4** **CH**

Understand how people pass on and sustain culture and heritage

**Materials required**

- Pens and paper
- A magnifying glass may be helpful
- Light and dark clothing (and some brave volunteers)

**Health and Safety**

Sandfly bites that have been scratched should be treated with antiseptic to prevent infection.

## Activity 8a – Celebrating Sandflies

**Activity description**

Students learn more about sandflies through discussion, experimentation and observation and use the knowledge they acquire to design a sandfly superhero logo or poster.

**Location**

Hostel

**Delivery**

Sandflies drive us crazy... but

Let students relax and read them the story of how sandflies were created. Afterwards try having a discussion about te namu's good points. You could have a sandflies v humans debate. Try to observe something about their behaviour. Is it true they are attracted to dark colours and repelled by light colours? When are they most active? Will rancid bacon fat really keep them off? Early settlers thought so (any volunteers?).

Compare the effectiveness of various brands of repellent, and any homemade concoctions you can think of. Once you have spent some time learning about sandflies, try to create a Super Sandfly logo or poster to celebrate this little defender of the wilderness.

# Section 3

## Resources and work sheets

### Native Wildlife

The Department of Conservation Community Relations Team may be able to help you with additional resources. Factsheets on native birds are available on request from the Fiordland National Park Visitor Centre or by visiting the DOC website.

Department of Conservation

Lakefront Drive

PO Box 29 Te Anau

Ph 03 249 0200

Fax 03 249 0237

[www.doc.govt.nz](http://www.doc.govt.nz).

You can also research pests on this site by going to [conservation>threats and impacts>deer](#) (or rats or possums etc).

Annual Garden Bird Survey – Join this exciting project and your data will be recorded on a bird distribution map, helping to create a snapshot of garden bird populations throughout New Zealand. Go to this site to download a form and instructions [www.landcareresearch.co.nz/research/biocons/gardenbird](http://www.landcareresearch.co.nz/research/biocons/gardenbird)

For activities and information on native birds (and pests) visit the Kiwi Conservation Club (New Zealand Forest and Bird) website [www.kcc.org.nz](http://www.kcc.org.nz). This site is aimed at primary school aged students.

For photos, descriptions and birdcalls of native and introduced birds in New Zealand, go to [www.whatbird.co.nz](http://www.whatbird.co.nz)

### Plant Life

"Which Native Forest Plant" by Andrew Crowe is an easy to use plant guide.

Weedbusters is a weeds awareness and education programme. Explore Weedbusters in schools on their website, [www.weedbusters.org.nz](http://www.weedbusters.org.nz)

"Plant Me Instead" is a handy book that gives alternatives to garden plants that can become weeds. It is available, free, from Environment Southland and Department of Conservation.

To find out about ecological restoration projects in New Zealand (including what's happening in your region), visit the website [www.bush.org.nz](http://www.bush.org.nz)

### Water Quality

Go to [www.upthecreek.org.nz](http://www.upthecreek.org.nz) to visit an interactive site about water quality.

### Possums

Environment Southland have a Possum Busters education programme available online. They also have an Environmental Education Officer available to visit schools within Southland.

Environment Southland

Private Bag 90116

Ph 03 211 5115

Fax 03 211 5252

Website [www.es.govt.nz](http://www.es.govt.nz)

### Marine Environment

The Guardians of Fiordland - In 1995 a group made up of commercial and recreational fishers, charter boat and tourism operators, environmentalists, marine scientists, community representatives and tangata whenua (local Māori, Ngai Tahu) adopted the vision 'That the quality of Fiordland's marine environment and fisheries, including the wider fishery experience, be maintained or improved for future generations to use and enjoy'. To find out just how successful this collaborative approach has proved to be, visit the website <http://www.fmg.org.nz>

Sea Week - Held in late February and early March each year, Sea Week is a national celebration of the culture, history and traditions of the sea. Visit the Seaweek website for great resources and information on activities, conservation opportunities and field trips in your area. <http://www.seaweek.org.nz/>

## Glossary of terms

There are many terms used in the conservation world that may be new to you. Refer to this page if you are not sure what a term means.

### Glossary

*Beech mast* - In 'mast years' beech forests produce a very large amount of seed. Mast seeding is triggered by warm temperatures in late summer and early autumn.

*Biological Control* – term given to the use of natural predators, parasites or pathogens to control pests.

*Canopy* - In a Beech forest, canopy refers to the upper layer formed by mature trees.

*Ecology* – study of living things in relation to each other and to where they live.

*Ecologist* – the name given to those who study ecology

*Endemic* – found only in one country (kiwi are found only in New Zealand)

*Extinction* – not existing anymore, ie the Moa is an extinct bird

*Flora* - plants of a particular area

*Fauna* - animals of a particular area

*Igneous* – born of fire – rocks formed by the action of volcanoes

*Introduced* – have been brought to a country by humans (the Canada goose was introduced to New Zealand from North America for sport)

*Mammalian predators* - New Zealand's native species have been decimated by the introduction of a variety of predatory mammals including rats, cats, possums and stoats.

*Metamorphic* – Rocks formed or changed by heat and/or pressure.

*Mustelid family* - Stoats, ferrets and weasels. Released in New Zealand to reduce rabbit numbers but they also prey heavily on many native species.

*Native* – found naturally in one country but may also be found naturally in other countries (fantails are found in New Zealand but also in Australia)

*Sedimentary* – rocks formed from particles that have settled on the earth's surface.



# What rock does what?

## Are there fossils in these rocks?

Probably not. :( Fossils are found in sedimentary rock like sandstone, mudstone and limestone.

Sedimentary rocks are soft (by rock standards) and very few are found at this site because the glaciers wore them away.

## Rock types

**Igneous** – rock formed from molten material from within the earth's crust.

**Metamorphic** – rock changed by heat and/or pressure.

**Sedimentary** – rock formed from particles that have settled on the earth's surface.

## Will we find gold?

Probably not! :( You may find pyrite, or fools' gold though.

If you find a little chunk of something that looks like gold, look again. If it is really yellow, you might have found gold (yay!). If not, you may have found pyrite. Pyrite is used to make cheap jewellery.

Rocks are made up of different minerals. Some are hard and some are soft. Some crumble, others flake. Look at the rocks you collected. What rock does what?

**Scratchy** - Some rocks are harder than others. Try scratching one rock with another. Which is the hardest rock in your collection? Hard rocks that don't chip, scratch or crumble can be used as pounders. Māori used shaped stone pounders to separate out the strong plant fibres in flax leaves. Many people today have a stone pestle and mortar (pounder and bowl) in their kitchen for grinding spices.

**Sparkly** - Look for rocks with tiny little sparkly grains in them. Sparkly minerals are used to make some cosmetics. Try rubbing a sparkly rock on your skin for free shimmering makeup.

**Sparky** - Strike two rocks together. If you can smell gun powder, the rocks contain the mineral quartz. If the rock contains a lot of quartz it will make sparks. If rubbed together, quartz rocks will glow. Long before there were glowsticks, one tribe of North American Indians had figured out how to make a light show by shaking quartz crystals inside a leather maraca until they glowed.

**Sandy** - Rub rocks together. Can you grind a fine sand or dust from any of your rocks? Sandy rocks were used by Māori to wear grooves in pounamu so that it could be shaped. Sandy minerals are still used to make sandpaper.

**Shiny** - If you find black, shiny, flaky chunks in a rock, you have found the mineral mica. Try peeling off thin sheets of mica. Large sheets were once used to make windows in woodstoves because mica is very heat resistant. Today it is used as an insulator in high voltage electrical equipment.



### Quartz rocks

Quartz is one of the most common minerals in the earth's crust.



### Diorite

An igneous rock.



### Hornblende gneiss (pronounced 'nice')

A metamorphic rock (formed when diorite is put under intense pressure).



### Hornblende biotite gneiss

A metamorphic rock.



### Pegmatite with black mica

The quartz in this rock forms crystals with flat shiny surfaces.



### Rust stained meta-sedimentary gneiss

The rust comes from the weathering of iron bearing minerals. This is a metamorphic rock formed from sedimentary material (e.g. sandstone, mudstone).

# Rock eaters recipe sheet

## Instructions

1 Have the (soft) Moro bar, the extra Moro bars, the paper and plate for sugar on a table where your audience can see them.

2 Read the text and carry out the actions.

"All rocks are either igneous, metamorphic or sedimentary. This demonstration is going to show the difference between the three different types."

"All rocks, even the really hard ones, get worn down by frost and sun and rain until they are just tiny grains."

2 Use a teaspoon to sprinkle sugar onto the plate to demonstrate grains

"These tiny grains build up on the beds of seas, rivers and lakes until they become so deep that they get compressed and turn back into rock. Rocks that form like this are called sedimentary."

3 Unwrap the Moro bar and press the top surface into the sugar so that it sticks to the softened chocolate.

"Sedimentary rocks often have different layers because the grains they are made of have come from the erosion of different rocks at different times."

4 Cut the end off the Moro bar to show the layers including the grainy sugar layer on top.

"The sediments build up over millions of years and eventually the bottom layers get pushed down into the earth's crust."

5 Fold the greaseproof paper over the Moro bar and press down on it hard. Fold it over and squash again.

"The rock layers get heated and compressed which causes chemical changes. Rocks that have changed are called metamorphic."

6 Cut the end off the Moro bar again to show how the layers have changed.

"In the end, the rock at the bottom of the layers gets pushed down to become part of the earth's molten core and it gets completely melted. This molten rock is called magma. When bits of molten rock cool, they form igneous rock."

6 Hold up the melted mini Moro bar to demonstrate igneous rock.

"Rock keeps getting recycled from one type to another. This is called the rock cycle."



# Watch this Space 1

Plant spy fact file:

School		
Group		Date / /

This plot map uses symbols to represent some of the plants present. Draw over the map to show changes (seedlings may disappear; shrubs may grow taller etc.). Fill in measurements and note observations.

**Seedlings** ∞ coprosma

**Shrubs** ① coprosma

**Trees** ④ broadleaf

**KH** knee high **CH** chest high **WH** waist high **HH** head high

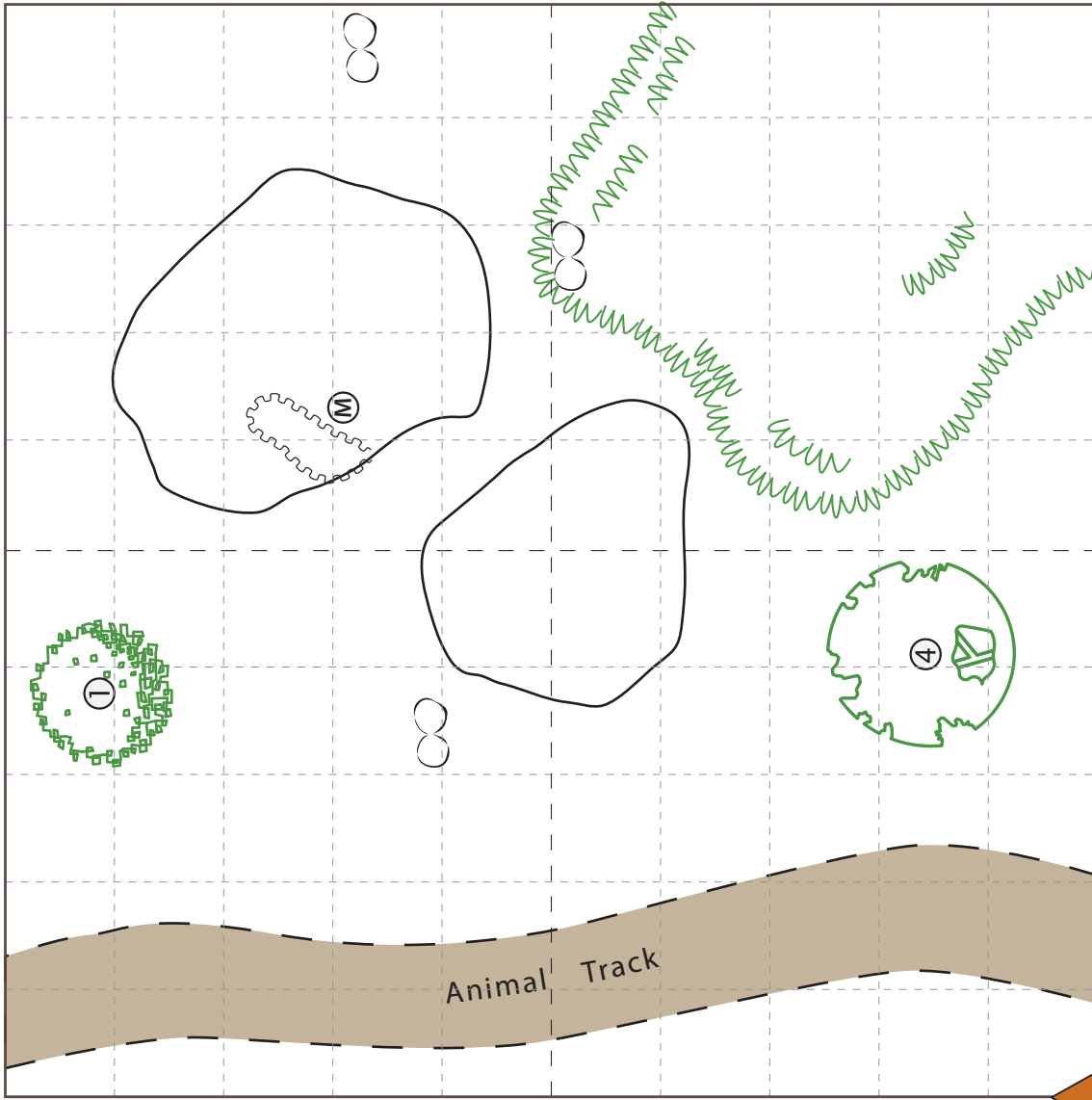
**Grasses** ⑤ non-native grass

**Measurement** ⑩ In June 2011 this clump of moss measured 210mm by 120mm.

Today it measures ..... mm by ..... mm.

Percentage of the plot covered in moss .....

Percentage of the plot covered in ground hugging plants .....



## Activity 3a

**Observations** (include berries, flowers and fungi seen. Note animal sign such as droppings and mammal or insect browse on leaves)

.....

.....

.....



# Watch this Space 2

Plant spy fact file:

School		
Group		Date / /

This plot map uses symbols to represent some of the plants present. Draw over the map to show changes (seedlings may disappear; shrubs may grow taller etc.). Fill in measurements and note observations.

**Seedlings**  hebe  broadleaf

**Shrubs**  coprosma

**Trees**  broadleaf

**KH** knee high **CH** chest high **WH** waist high **HH** head high

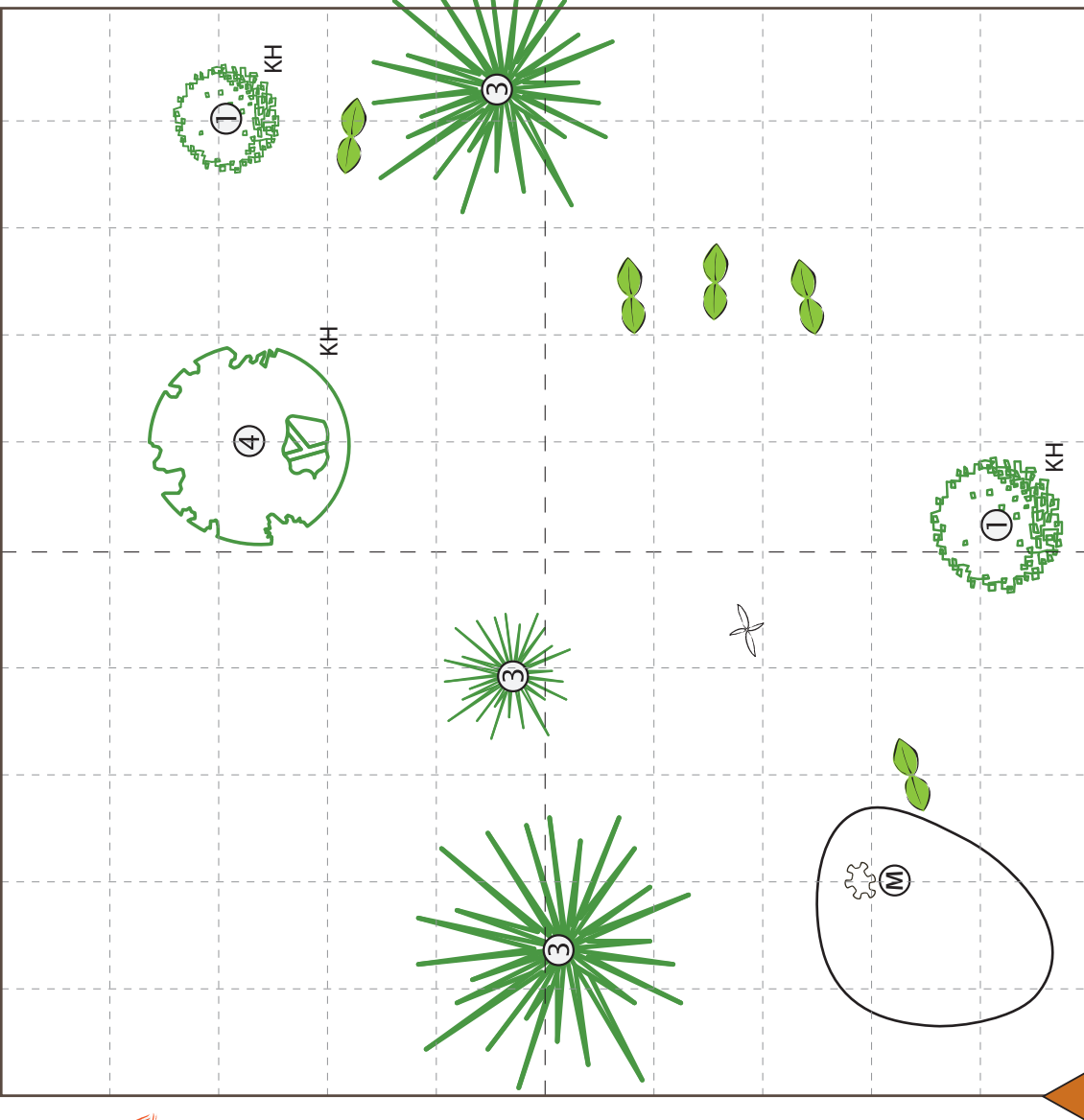
**Grasses**  tussock

**Measurement**  In June 2011 this clump of moss measured 13mm by 12mm.

Today it measures ..... mm by ..... mm.

Percentage of the plot covered in moss .....

Percentage of the plot covered in ground hugging plants .....



**Observations** (include berries, flowers and fungi seen. Note animal sign such as droppings and mammal or insect browse on leaves)

.....

.....

.....



# Watch this Space 3

Plant spy fact file:

School		
Group		Date / /

This plot map uses symbols to represent some of the plants present. Draw over the map to show changes (seedlings may disappear; shrubs may grow taller etc). Fill in measurements and note observations.

**Seedlings** ∞ coprosma  hebe

**Shrubs** ① coprosma ② hebe  
KH knee high CH chest high WH waist high HH head high

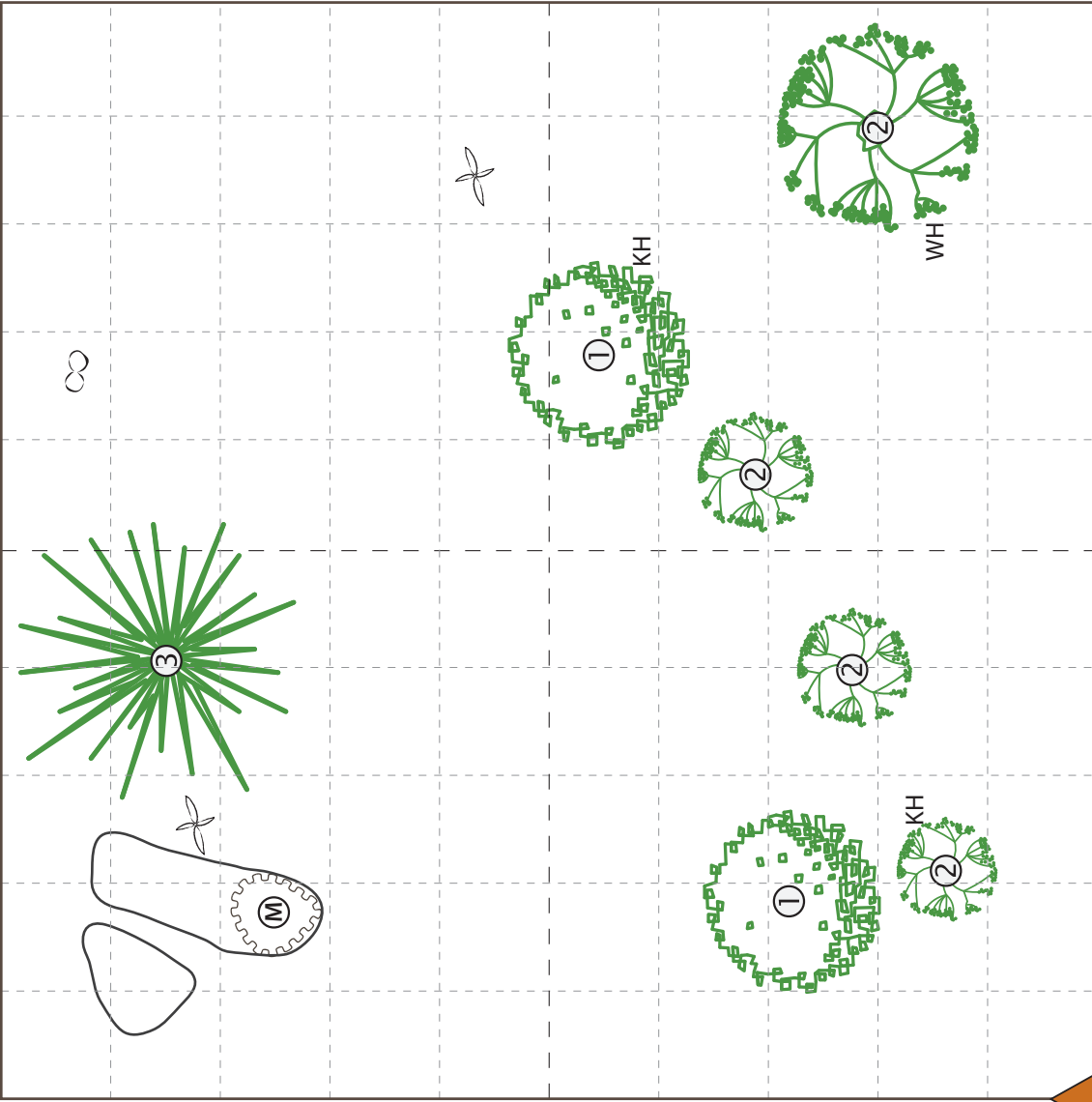
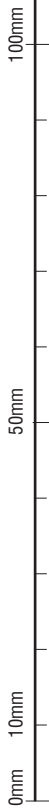
**Grasses** ③ tussock

**Measurement** ④ In June 2011 this clump of moss measured 130mm by 100mm.

Today it measures ..... mm by ..... mm.

Percentage of the plot covered in moss .....

Percentage of the plot covered in ground hugging plants .....

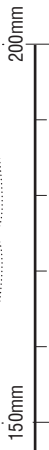


**Observations** (include berries, flowers and fungi seen. Note animal sign such as droppings and mammal or insect browse on leaves)

.....

.....

.....



# Watch this Space 4

Plant spy fact file:

School		
Group		Date / /

This plot map uses symbols to represent some of the plants present.

Draw over the map to show changes (seedlings may disappear; shrubs may grow taller etc.). Fill in measurements and note observations.

**Seedlings** ∞ coprosma ○ mountain holly

**Shrubs** ① coprosma  
KH knee high CH chest high WH waist high HH head high

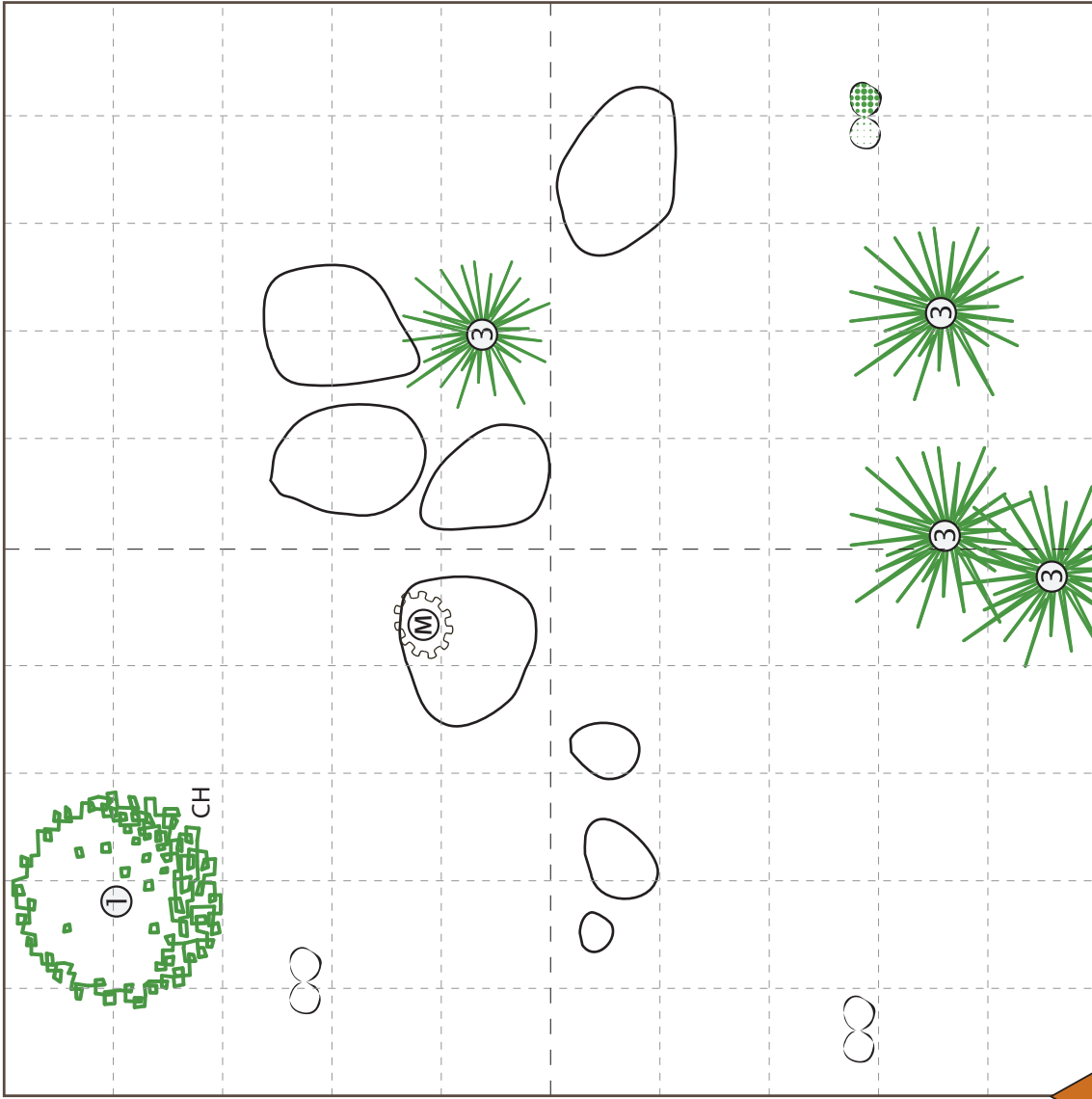
**Grasses** ③ tussock

**Measurement** ④ In June 2011 this clump of moss measured 130mm by 110mm.

Today it measures ..... mm by ..... mm.

Percentage of the plot covered in moss .....

Percentage of the plot covered in ground hugging plants .....



## Activity 3a

**Observations** (include berries, flowers and fungi seen. Note animal sign such as droppings and mammal or insect browse on leaves)

.....

.....

.....

.....

150mm

100mm

50mm

10mm

# Watch this Space 5

Plant spy fact file:

School

Group

Date


This plot map uses symbols to represent some of the plants present. Draw over the map to show changes (seedlings may disappear; shrubs may grow taller etc). Fill in measurements and note observations.

**Seedlings** ∞ coprosma  tutu

**Shrubs** ① coprosma ② hebe

KH knee high CH chest high WH waist high HH head high

**Grasses**  tussock

**Measurement**  In June 2011 this clump of moss measured 8mm by 7mm.

Today it measures ..... mm by ..... mm.

Percentage of the plot covered in moss .....

Percentage of the plot covered in ground hugging plants .....

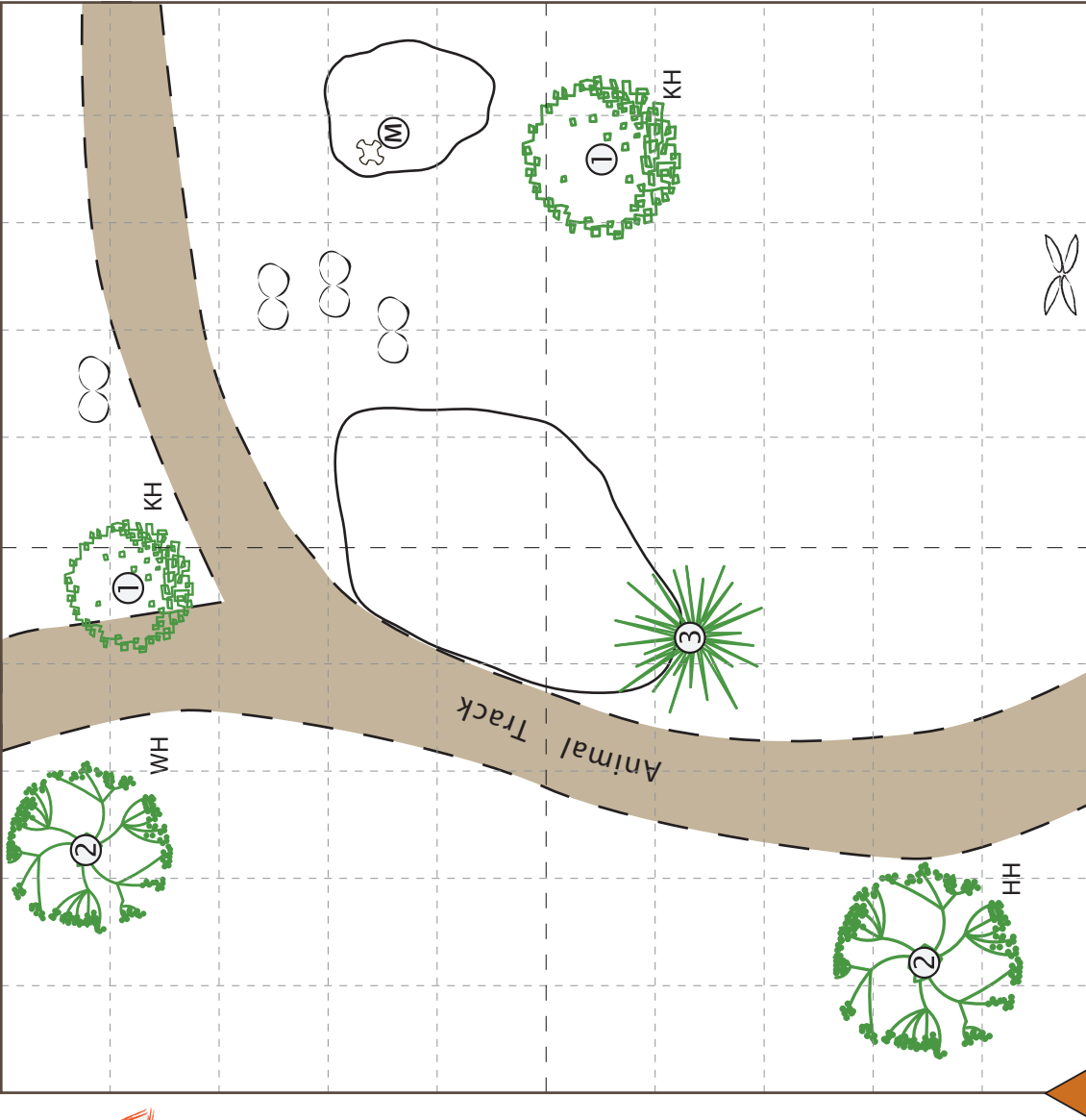


0mm

10mm

50mm

100mm



## Activity 3a

**Observations** (include berries, flowers and fungi seen. Note animal sign such as droppings and mammal or insect browse on leaves)

.....

.....

.....

.....

200mm

150mm

# Watch this Space?

Plant spy fact file:

School	
Group	
Date	/ /

Site location

Use symbols to represent some of the plants present.  
 Draw over the grid to show any changes (seedlings may disappear; shrubs may grow taller etc). Fill in measurements and note observations.

**Seedlings** .....

**Shrubs** .....

KH knee high CH chest high WH waist high HH head high

**Grasses** .....

**Measurement** .....

Percentage of the plot covered in moss .....

Percentage of the plot covered in ground hugging plants .....

**Observations** (include berries, flowers and fungi seen. Note animal sign such as droppings and mammal or insect browse on leaves)

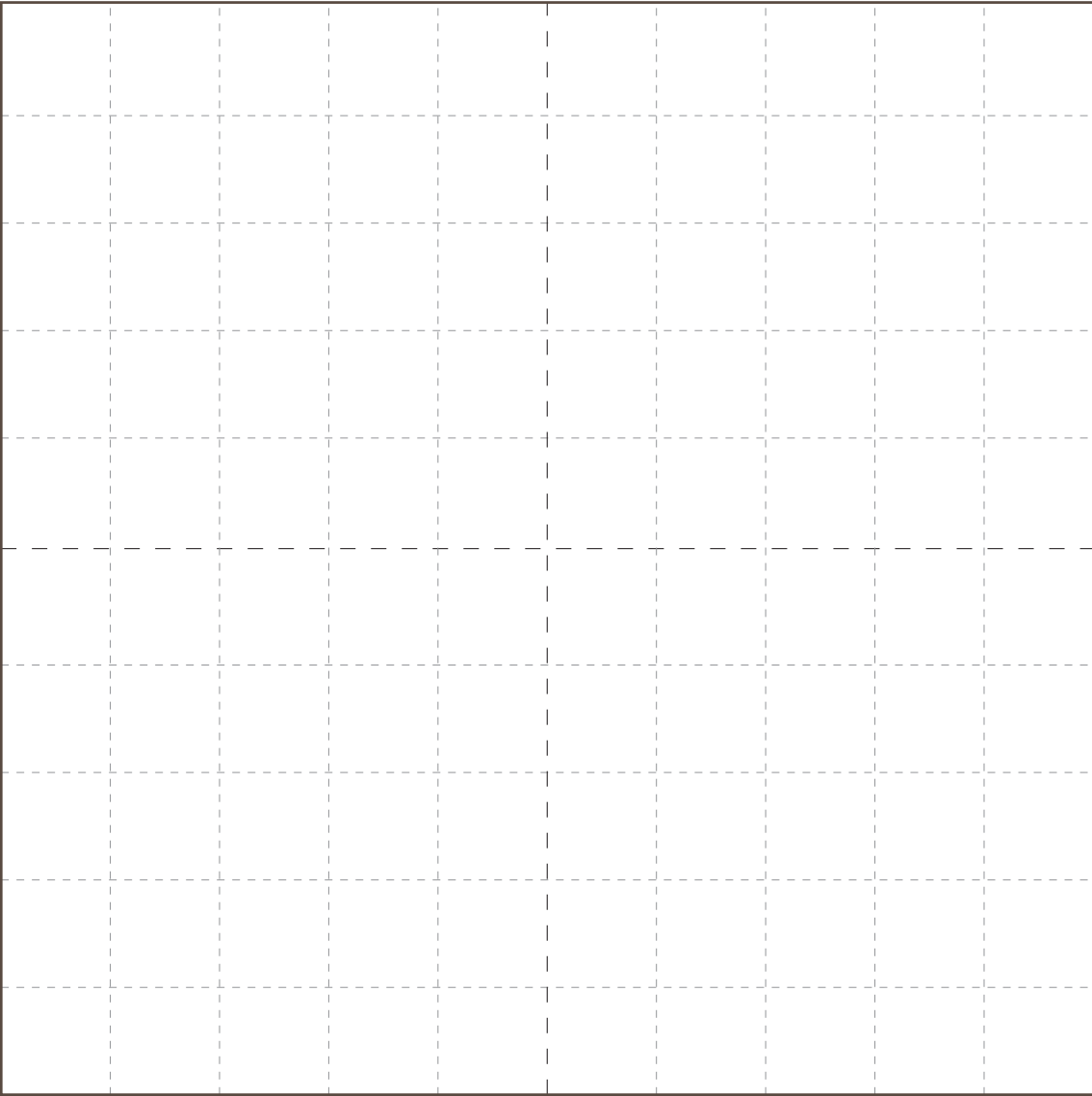
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# Regeneration cake recipe sheet

## Instructions

- 1 Make trees by poking holes in large marshmallows and colouring them with green food colouring. Put the marshmallows on chocolate finger biscuits to make trees. Make a minimum of five trees.
- 2 Have your ingredients assembled on a table where your audience can see them. Explain that you are going to make Regeneration Cake and that the sponge represents the bare rock. Explain what is happening at each stage.
- 3 Roughly break up the sponge fingers and spread them thickly over the ready made sponge.



"After a rock fall or tree avalanche the rock is left bare. The first things to grow on the site don't need soil. They grow on the bare rock. They include lichen (liken), algae and some types of moss."

- 4 Dollop some mashed kiwifruit into crevices between the broken rocks.

"These first plants trap wind blown dust and help to make the first pockets of soil."

- 5 Sprinkle some grated chocolate onto the plants.

"Small creeping plants begin to grow. Some of them arrive as windblown seeds."

- 6 Pop Smarties down where there are pockets of soil.

"The creeping plants grow and die and make more soil."

- 7 Sprinkle a little more grated chocolate around the creeping plants.

"Now, when bird droppings land here, any shrub seeds in the droppings have a chance to grow."

- 8 Splat a few spoonfuls of mashed banana (bird droppings) onto the landscape. Plant kiwifruit slices in the banana.

"The shrubs make more soil and provide shelter so that, eventually, trees can grow on the site again."

- 9 Plant chocolate finger biscuits in amongst the shrubs, to represent the trees.

Your Regeneration Cake is now ready to serve.

Give the first helpings to the students who can answer these questions.

1. Name one of the first things to grow on a bare site.  
Lichen, algae or moss.
2. What are two ways in which seeds arrive on a bare site?  
Blown on the wind, or carried by birds.
3. Why aren't trees the first plants to grow?  
Because there is not enough soil or shelter for them.

# Forty Metre Band Jelly Recipe Sheet

## Instructions

**1** Before the demonstration, use butter knives to roughly cut up the jellies in the bowls until they are diced into very small pieces.

**2** Put the mixing bowl, slice of cake, prepared jellies and sweets on a table where your audience can see them.

**3** Explain that you are going to make an edible model of the sea in Doubtful Sound.

"Doubtful Sound is more than 400 metres deep at its deepest point. Scavengers like marine worms live in the sludge on the fiord floor."

**4** Squash the cake into the bottom of the bowl. Put the lolly worm on top.

"The water is really dark so dolphins need to use sonar to swim and predators like the snout eel find their prey by smell."

**5** Spoon in the purple jelly and flatten the surface with a spoon.

"The largest populations of seaweeds, corals, sponges, shell fish, star fish, sharks, eels and fish live in the top forty metres of salt water. This is called the forty metre band."

**6** Carefully spoon the blue jelly on top of the purple jelly. Pop in mini chocolate fish.

"Divers come to Fiordland because they can see deep water species close to the surface. This is because the brown coloured fresh water layer is like tinted glass and blocks out sunlight. Black coral usually grows 100 metres below the surface, but here divers can see it at 5 metres."

**7** Very carefully spoon orange or cola jelly on top as your final, but most important, layer. Hold up the jelly so that everyone can see the layers.

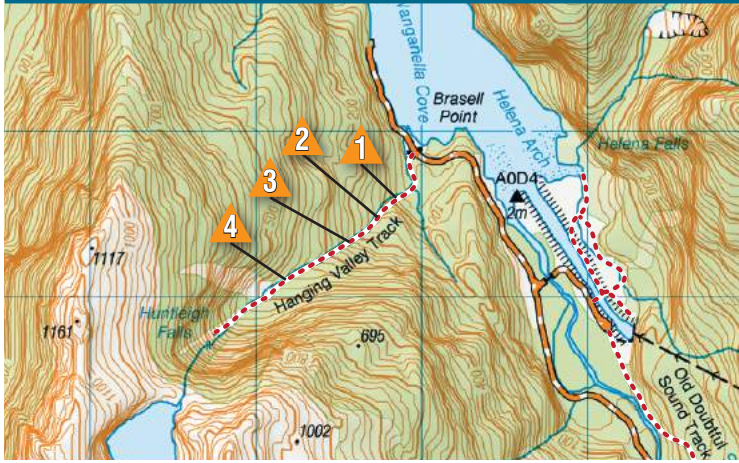
**8** Now you can serve up the edible sea but give the first helping to the students who can answer these questions

1. *How deep are the deepest parts of the fiord?* Over 400 metres (434m).
2. *How does a snout eel find its prey?* By sense of smell.
3. *How many metres deep is the band of water in which most fiord life exists?* 40 metres.
4. *Which layer of the fiord is like a pair of sunglasses?* The top, brown stained layer.

Think up a bonus question for whoever wants the marine worm at the bottom of the bowl.



## Walking track notes



## 1 First stop.

Water + Soil = Mud. Keep the hostel's drinking water clean.

**Environmental care code**  
Keep to the track (discuss after activity one).

The hostel's drinking water comes from the river you can hear nearby. It is clean and safe to drink, but it would not be safe if it was muddy.

*What happens when heavy rain falls on the track?*

If it's a dry day, get students to empty a quarter of their drinking water onto the track (they'll be able to fill up again two stops on) and watch what happens. Some students will see tiny grains of soil washing away. If it is a wet day, you can see where the water flows and how it has worn a path for itself.

*What happens when heavy rain falls onto moss on the forest floor?*

Get students to lean off the track and empty another quarter of their drinking water onto the mossy forest floor.

*What happens this time?*

Students will be unlikely to see soil washing away, because the moss protects the soil beneath it.

*How is the moss keeping the water at the hostel from being muddy?*

The moss stops raindrops from hitting the soil and washing it into the stream. It slows the water down so that it can be more easily absorbed into the soil.

**Environmental care code - Keep to the track.**

WHY?

Encourage students to come up with answers like...

- So you don't get lost.
- So the moss doesn't get worn out. If the moss dies the soil beneath will wash away in heavy rain.
- So that the track doesn't get wide and muddy. If this happens the environment looks less like the beautiful wilderness that many people come here to see.

## 2 Second stop

The number one rule for safe drinking water.

**Environmental care code**  
Bury toilet waste away from streams and rivers (discuss after activity).

Gather the group here, but only take four students at a time along the short track to see the dam as space is restricted. You can see where water leaves the dam through a pipe and pours into a surge chamber where air bubbles can escape before it continues its journey downhill to the hostel.



Find the plant that has this leaf. Pick one or two leaves and crush them. Meet stinkwood.

Pass the leaves around and ask the group what they think you are going to discuss next. Most will guess that you are going to talk about poo!

Point to a tree on the river-side of the track and ask the group what would happen if someone went to the toilet behind that tree.

*If it rained, where would the poo 'flush' to?*

If it rained it could wash into the dam (into the pipe, into the taps at the hostel), or into the fiord.

Ask the group (including your parent helpers) if anyone has heard of giardia. If anyone has had giardia they will explain that it causes a really bad upset stomach.

If no one has heard of giardia, explain that it is a parasite that spends part of its lifecycle in water and part in the gut of a human or animal. Giardia causes 'explosive diarrhoea' and can make some people ill for months. It is now very common in New Zealand rivers and streams because human poo has got into the water.

From here on up, what happens in the bush affects the water you drink at the hostel.

If anyone needs to poo in the bush, they need to go at least **50 metres** away from the water.

If this means walking far off the track, they must be VERY careful not to get lost. Students must always tell an adult if they need to leave the track.

Bury or cover toilet waste; it will rot away more quickly. Remember to wash your hands really well, but not in the river or stream.

**Environmental care code****Bury toilet waste away from streams and rivers.**

## WHY?

Encourage students to come up with answers like...  
So that rivers stay clean and aren't contaminated by harmful bacteria and parasites like giardia.

Because poo and toilet paper on the ground looks really gross!

Note: It's fine to wee behind a tree.

**3 Third stop****Don't rubbish the environment.****Environmental care code****Remove rubbish (discuss after activity).**

Have the group rest for a minute or two in silence. Encourage students to look around them and notice the different colours and textures of the bush. Listen for bird calls. When everyone has relaxed a little, let them go down the bank to the waterfall. Encourage students to refill their drink bottles (from flowing water, not from any still pools) and look at the mountain stream and generally enjoy their surroundings.

While students are at the stream, ask a parent helper to take the bag of rubbish back up to the track and scatter it around the area where the group rested before climbing down the bank.

When you return to the track to continue your climb, ask students about their reactions to seeing the rubbish.

**Environmental care code****Remove rubbish.**

## WHY?

Encourage students to come up with answers like...

- So it doesn't look ugly! Rubbish can spoil the wilderness experience for other visitors.
- So kea and weka don't choke on snack bar wrappers.
- So rubbish doesn't get washed into the fiord where it could harm marine life.
- Collect up the rubbish before continuing!

**Additional activity**

The water that leaves FNP is drinkable. Usually water cannot be safely drunk from rivers on farmland. However water quality is improving as more and more land owners are fencing and planting along waterways.

On the bus journey home, have students look for fenced waterways on farms.

**4 Fourth Stop****The kea cairn. A fed kea is a dead kea.****Environmental care code****Protect plants and wildlife (discuss after activity).**

This site has a story from the past to tell. Where the track comes out into an open area by the river students will find a round bronze disc set into the rocks overlooking Deep Cove. This memorial is part of the human history of the area and it carries a strong message for us today. The plaque remembers Neddy the kea who crash landed and drowned in Deep Cove in 1965. Neddy crashed because he was drunk; he had been given alcohol by Manapouri Power Station workers hosted on the ship Wanganella at Deep Cove. Neddy was a pet and his death was very much regretted.

We can learn from the past and be aware that our actions can help or harm wildlife.

There may be as few as 1000 kea left in the wild so they need our help. Under the Wildlife Protection Act it is an offence to feed or otherwise harm kea. The maximum penalty is a fine of \$1000.

*Why not feed kea?*

A fed kea is a dead kea.

If young kea are fed they do not learn how to find their own food in the wild and may starve when people are not around.

When kea are given high energy food they don't have to forage and they spend their spare time playing with human stuff, which gets them into trouble.

Some foods that kea like are actually poisonous to them – Dark chocolate is toxic to kea.

Use the crayon and paper to take a rubbing of the kea cairn to put on the knowledge wall, along with messages about why we should not feed kea.

**Environmental care code****Protect plants and wildlife.**

## WHY?

Encourage students to come up with answers like...

- Because many of the plants and animals in the bush are only found in New Zealand (they are endemic).
- Because some of the plants and animals in the bush are endangered (because of habitat loss, predators and competitors). If we don't take action to protect them they might become extinct.
- Because some of the plants and animals in the bush are an important part of our culture, especially for Māori people.

## Broadleaf

worth knowing

**kapuka/broadleaf** *Griselinia littoralis*

*Worth knowing because...* Deer love to eat this small tree. Hunters think this plant is worth knowing because it gives clues about how many deer are in the area (kotukutuku and wineberry are other deer favourites).

*Get to know kapuka...* The leaves are shiny and slightly lop sided. The ripe berries are black, and not edible.



## Fuchsia

worth knowing

**kotukutuku/fuchsia** *Fuchsia excorticata*

*Worth knowing because...* The berries of this shrub are edible and taste sweet.

*Get to know kotukutuku...* Look for tan coloured papery looking bark on the trunk and leaves that are pale on the underside (this plant loses its leaves in winter). The berries are almost black when ripe and look a bit like rat droppings!

*Worth remembering...* These berries are safe but many berries in the forest are poisonous.



Fuchsia bark falls off in strips to stop moss growing on it

## Kiokio

worth knowing

**Kiokio** *Blechnum Novae-zelandiae*

*Worth knowing because...* The koru or fiddleheads of this fern are edible, raw or cooked.

*Get to know kiokio...* In summer, you can recognise kiokio by its red or orange tinged young fronds (leaves). Kiokio grows on damp banks where there is some sunlight.



Useful emergency rations!

## Koromiko

Worth knowing

**koromiko/hebe** *Hebe salicifolia*

*Worth knowing because...* The top leaves of this shrub can be eaten to cure an upset stomach.

*Get to know koromiko...* Learn to recognise the neat fused top leaves of this plant. Look at the pattern of leaves on the stem, and the pattern of the veins in the leaf.

*Rongoā Māori...* This is a traditional medicinal plant of Maori and is still in use today.



## Silver beech

Worth knowing

**silver beech/tawhai** *Nothofagus menziesii*

*Worth knowing because...* This common tree can 'decide' to drop small branches when it is stressed by climate or pests. For this reason it is best not to camp under silver beech.

*Get to know tawhai...* This tree has small, serrated (jagged) leaves. Look on the ground for fallen branches. If the branch has a smooth end, then it has been deliberately dropped by the tree.



## Snow Tussock

Worth knowing

**broadleaf snow tussock** *Chionochoa flavescens*

*Worth knowing because...* The leaves of this tussock cut!

*Get to know broad leaf snow tussock...* The soft tufted seed heads make this plant easy to recognise.



## Tutu

worth knowing

**Tutu** *Coriaria arborea*

*Worth knowing because...* this shrub is one of the most poisonous plants in the world.

Avoid touching the plant and never eat the berries which contain poisonous seeds.

*Get to know tutu...* try to memorize the pattern of leaves on the stem, the dark green colour and the way the leaf veins make the shape of a leaf within each leaf.

*Amazing fact.* Tutu is a traditional food plant of Maori. The toxic seeds were strained from the sweet juice which was cooked with seaweed to make a jelly.

**Don't try this at home!**



## Wineberry

worth knowing

**makomako/wineberry** *Aristotelia serrata*

*Worth knowing because...* The ripe berries of this small tree are edible (but are not very sweet)

*Get to know wineberry...* Look at the serrated (jagged) leaf edges and the bright green of the leaves. This plant loses its leaves in winter. The berries are small and round and black when ripe.

*Worth remembering...* These berries are safe but many berries in the forest are poisonous.



## Stoat

**What is it?** The stoat is a small fast carnivore related to the weasel and ferret.

**Why is it here?** It was introduced in the 1880s to kill rabbits (which had been introduced for food and sport but had bred... like rabbits). Preferred forests to farmland.

**What harm does it do?** Stoats eat large invertebrates like weta, lizards, birds (including young kiwi) and birds' eggs.

**What is its most repulsive habit?** Likes to live in kiwi burrows snugly lined with kiwi feathers.



Did you know... stoats can swim for more than a kilometre!

## Kiore / Ships Rat

**What are they?** They are small omnivores related to mice. Why are they here? Kiore (Polynesian rats) arrived with the ancestors of Māori. Ship rats and Norway rats jumped ship when the first Europeans arrived.

**What harm do they do?** They eat invertebrates (insects, worms, etc), birds' eggs and small baby birds, forest fruit and lots and lots of seeds.

**What is its most repulsive habit?** They eat their relatives, the mice, alive.

Mice can squeeze through a 7mm gap and rats through a 12mm gap - that's ONLY THIS BIG!!! I guess you could say they can squeak through anything...



A single pregnant rat could have 15000 descendants in ONE YEAR if all offspring survived. Yikes!!



## Possum

**What is it?** The possum is a roughly cat sized marsupial.

**Why is it here?** It was introduced from Australia in the 1830s to start a fur trade.

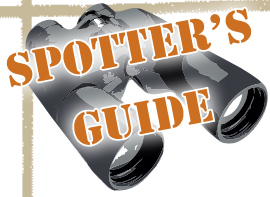
**What harm does it do?** There are around 30 million possums in New Zealand. In some forests the trees can't grow enough leaves to keep up with possum demand. The trees die.

**What is its most repulsive habit?** Mugging birds to steal their eggs. Possums were thought to be herbivores, but are now known to eat birds' eggs and nestlings.



Possums munch through around 9,000 tons of leaves, berries and fruit EVERY night!!





## Kea *Nestor notabilis*

endemic uncommon

Probably the smartest bird in the world, but not bright enough to know that chocolate contains the chemical theobromine which is poisonous to parrots.

Kea are very endangered. Never feed kea, human food can harm them.

Multipurpose beak to pick up seeds, gouge rotten wood to reach grubs, dig up roots, pluck flower buds and berries, and, sometimes, tear flesh.

If you can see yellow around eyes and mouth it's a teen parrot

Burnt orange under-wing feathers to impress other kea.



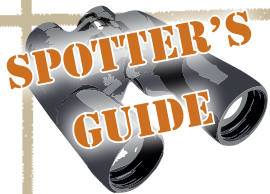
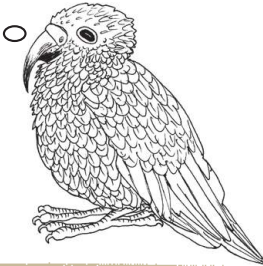
Bush green feathers for camouflage.

"K" feet for a powerful grasp (check out any parrot or parakeet e.g. budgie and you'll see the same foot design).

Hey, back off!



I'm sleepy...  
leave me to nap...  
zzzzzzz



## Weka *Gallirallus australis*

endemic declining

Weka belong to the same family as pukeko and takahe. They are all rails. Pukeko and takahe flick their tails just like weka.

Listen - Weka make gentle booming sounds to call their chicks to food.

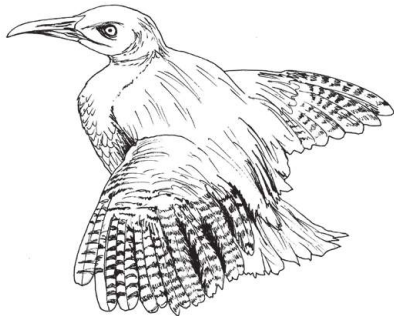
Strong, sharp beak to stab mice and lizards, pluck maggots out of road kill possums, cut juicy plant stems and pick berries.

Dark feathers for camouflage on the forest floor.

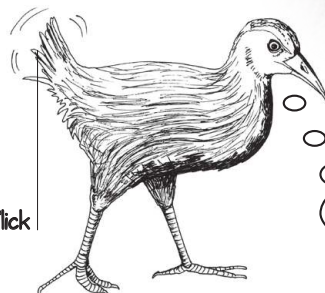


Long claws for scratching in the leaf litter.

Get away from my babies!



Tail flick



I'm a bit nervous



## Fantail/piwakawaka *Rhipidura fuliginosa*



native



not threatened

Flocks of up to fifty fantails have been seen on the Fiordland coast recently.

Tail helps with speedy mid air turns.



Long whiskers help locate flying insects.

Sharp beak for catching small insects like SANDFLIES.

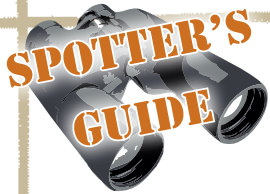
Dinner time!



Hawking - flies into cloud of insects with beak open.

Come out, come out, wherever you are...

Flushing - flutters through bushes, fanning tail to dislodge insects.



## Sandfly/namu *Gallirallus australis*



native



rare, ~~endangered~~ *just kidding!*

Sandflies are good... no, really, they are:

- food for fantails
- for fear factor competitions (who dares to bare their forearm and let one suck until full?)
- water filters. Sandfly larvae live in streams and eat tiny bacteria and other organisms that can make humans ill.

Sawing mouthpart for cutting skin.



Expandable abdomen for holding blood.

Claws for holding on to victim

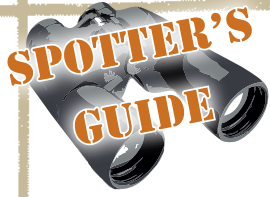


Sandfly larvae live in fresh water. They like to eat tiny bacteria and other things that make people ill. This means they are great news for people in the bush.

As the sandfly gathers blood it's abdomen (body) expands. This blood is used to increase the number of eggs the sandfly can lay - only females suck blood.



sandfly photos courtesy and © georgenovakphoto.com - that's one brave photographer!



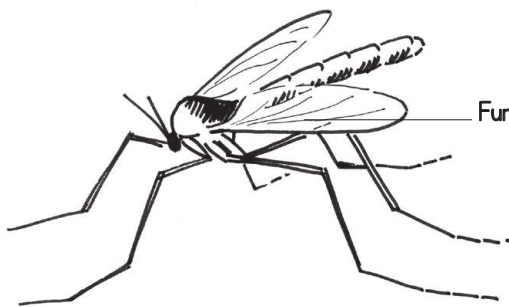
## Glow-worm/Titiwai *Arachnocampa luminosa*

endemic protected

Live on damp banks and in caves. Glow-worms grow up to become fungus gnats, a type of fly.



Larvae - (glow-worm stage)



Fungus gnat stage



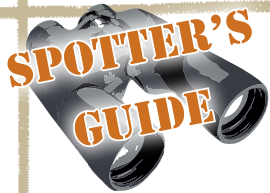
Hammock suspension lines

Slime hammock

Glowing tail light to attract prey

Sticky fishing lines

Strong little mouth for pulling up lines and eating prey.



## Moth/Pepe or Pepepe

endemic protected

Moths are valuable pollinators, and great bird food.

Why do moths fly at lights? Moths are thought to use the brightest light in the night sky to navigate. Artificial light confuses them.

Furry antennae to smell with. Super furry antennae if you're a male (you can smell a female moth 11 km away with these).



Camo colours to avoid being spotted by hungry birds.

Some moths have furry bodies for warmth.

# A Doubtful Tale

Props: Two stones. Two stick spears.

- Narrator:** The first people to explore this area would have been the ancestors of today's Māori. They were known as MOA HUNTERS, and they came seeking food and other resources.
- One:** I can't believe you left the knife behind! I'm not paddling back to that cove near Kāhui-te-kākāpo to get it. How are we going to skin that seal you clubbed?
- Two:** You are as agitated as a fantail, stop stressing! I picked up a bit of slate back down the coast. It'll do the job if I can flake it.

**Two** picks up one stone and knocks it on the edge of the other stone (aiming to chip a sharp flake off)

**One:** *(Looks to stage right)* Hey, is that a moa?

**One** and **Two** crouch and pick up their spears. Exit stealthily stage right.

## Knowledge map question

You will need: A Maori dictionary or someone who speaks Te Reo Maori

Kahui-te-Kakapo is an area in Doubtful Sound. What does kahui mean, and what does this place name tell you about the past? Remember, kakapo are no longer found on the mainland.



Props: Greenstone pendants. Mussel shells. Two stick spears.

- Narrator:** By 1700, TANGATA WHENUA (local Māori) passed here on their way to Milford Sound/Piopiota. There, they collected takiwai, a rare greenstone that they traded with tribes from other areas.
- One:** *(holds out a mussel shell to Two)* Want another mussel?
- Two:** Nah, I'm full. Still got room for some of that kūmara though.
- One:** You'd be lucky. We finished that two days ago. Last kūmara we'll be having until we have some more greenstone to trade with the northern tribes.
- Two:** *(Looks to stage left)* Hey, check out that fat seal! Tū meke (choice)!
- One** and **Two** crouch and pick up their clubs. Exit stealthily stage left

## Knowledge map question

You will need: Internet/library

Takiwai (or tangiwai) is the type of pounamu or greenstone collected at Milford Sound/Piopiota. What's the meaning of the name? What is the legend behind the naming of the stone?



# A Doubtful Tale – continued

*Props: Spy glass (telescope).*

**Narrator:** Captain James Cook and his crew were the FIRST EUROPEANS to see Fiordland. In 1770 they went ashore at Dusky Sound, but sailed past Doubtful Sound, which Cook named Doubtful Harbour.

**Banks and Cook** are standing at the rail of the *Endeavour*

**Banks:** *(excitedly)* At last, a harbour! What a great many seals. Coats and hats made of their skins are greatly in demand in England this season.

**Captain Cook:** *(thoughtfully)* It might be a good harbour, but it's narrow and I am doubtful the ship could safely get out again in this wind.

*(turns and calls an order)* Ready about!

**Banks:** *(in anguish)* Ready about??? But there are plants and animals unknown to science here, and who knows what valuable minerals! My granny takes more risks than the captain!

## Knowledge map question

*You will need: Pencil and paper; leaf of a native plant.*

*James Cook was the captain of the Endeavour. Sir Joseph Banks was a naturalist and botanist who accompanied him. Banks did many detailed drawings of the plants and animals he saw on his travels. Make a careful drawing of a leaf as though drawing for people who had never seen a plant like this before.*



*Props: Surveyor's map*

**Narrator:** In 1793 a SPANISH EXPEDITION of two ships waited at sea outside the entrance to the fiord while two longboats went in to explore. Malispina Reach and Bauza Island are two of the features they named.

**Commander Malispina:** Ola, Don Felipe. What did you find?

**Don Felipe Bauza:** *(scratching madly)* Commander, we found mosquitoes, and no good timber on the islands we visited. But we will leave our names on these places to show we dared to linger longer than Cook!

**Commander Malispina:** *(with satisfaction)* This is good.

## Knowledge map question

*You will need: Map of Doubtful Sound (this will be available on the boat cruise)*

*Use a map of Doubtful Sound to find Bauza Island and Malispina Reach. Can you find other Spanish place names? You may need the help of the boat crew.*



# A Doubtful Tale – continued

*Props: Two clubs.*

- Narrator:** By 1808 news of the hundreds of thousands of fur seals on the Fiordland coast had reached SEALERS. By 1830 seals had been hunted to the brink of extinction.
- Sealing Captain:** We got 4500 sealskins from this coast last year, but numbers are way down this season.
- Crew One:** Where have they gone, d'you think?
- Sealing Captain:** Beats me. Time to move on, I reckon.
- Crew Two:** *(looks to stage right)* Hey, is that a whale?
- All:** *(happily)* Let's go whaling!

## Knowledge map question

*You will need: Internet/ DOC ranger.*

*Seals, and then whales, were hunted almost to extinction. Today, seal numbers are recovering and seals are moving back to the beaches. Visit the Department of Conservation website (search 'the seal deal') or ask a DOC ranger to find out how we are learning to share the beaches with seals.*



*Props: Gun.*

- Narrator:** Percy Seymour left his teaching job in 1888 and lived as a hermit and BIRD COLLECTOR in Doubtful Sound. He lived on an island (now called Seymour Island) and shot and skinned birds for museums and other collectors.
- Seymour:** *(sitting down and patting his dog)* Good lad, Jack. What a day, I've been starved and frozen and bled dry by sandflies. Still, it beats teaching.
- Hmm, let's check that list. Still to go, one piopio, one kōkako, one kiwi, one takahē. Should be able to get those by the end of the week, and if the skins'll dry the collectors will pay well. Definitely better than teaching.

## Knowledge map question

*You will need: Library or internet. Drawing materials and paper.*

*Some of the bird species Seymour collected are now extinct. South Island kokako were declared extinct in 2007\*, so North Island kokako have been introduced to pest free Secretary Island in Doubtful Sound. It is hoped that one day the island population might spill over into the mainland forests.*

*Find out more about kokako and design a 'Spotter's Guide' card for the time when students visiting Deep Cove Hostel may hear or see a kokako.*

*\*NB South Island kokako are currently assumed to be extinct, although it is possible they may survive in low numbers in remote parts of the South Island and Stewart Island.*



# A Doubtful Tale – continued

Props: quartz rock.

- Narrator:** Through the late 1800s and early 1900s European SURVEYORS, TRACK MAKERS and PROSPECTORS explored the mountains and fiords.
- One:** *(scratching)* Bloody fleas biting hard tonight.
- Two:** *(looking at palms of hands)* The bites take my mind off my blisters.
- One:** It'll all be worth it on payday. Though I can't see why the Government thinks people will walk the tracks we cut to see this gloomy place.
- Two:** Ha, the only reason I'm cutting tracks is so that I can walk to the gold.
- One:** Ah you are a hopeful man.
- Two:** *(takes quartz rock out of his pocket and holds it up)* Look. That's quartz. In my opinion, where there's quartz, there's gold.

## Knowledge map question

You will need: to talk to other students after your Deep Cove visit.

Silver, gold, coal, mica and marble were all mined in Fiordland at one time. Ask other students whether they think it would be OK to carry out mining in Fiordland National Park today. Why?



Props: fish.

- Narrator:** By the 1950s, tourists were walking the Doubtful Sound Track from West Arm to Deep Cove, where a small lodge had been built.
- Tourist One and Tourist Two are admiring the view**
- Tourist One:** What a splendid hike! We made it from West Arm to Deep Cove in just 4.5 hours!
- Tourist Two:** Gosh, I am hungry though. *(looks to stage left)* Oh, good, here comes our guide with dinner.
- Guide:** *(enters from stage left)* Blue cod from Brassel Point, chums! There is an endless supply off those rocks!

## Knowledge map question

You will need: to read about marine reserves and bag limits on the beach near the hostel on your visit to Deep Cove.

Seals and whales nearly became extinct because too many were killed and not enough were left to breed. How are we (recreational and commercial fishers) stopping the same thing happening to blue cod?



# A Doubtful Tale – continued

*Props: Beer cans. Two chairs.*

- Narrator:** In the 1960s an old passenger liner called the Wanganella was moored at Deep Cove. She was used as a hostel for around 300 MANAPŌURI POWER STATION PROJECT WORKERS.
- One:** Hard yakka today, wasn't it?
- Two:** Yeah, I reckon that blasting that road over the pass is going to take way longer than they said.
- One:** More work, more money, more beer. *(tips can up, showing that it is empty)*
- One** gets up and starts to walk away, leaving beer can.
- Two:** Hey, don't leave your can there, you slob. Chuck it over board.
- One** returns and pitches his can over the side. **Two** chucks his in and they exit stage left.

## Knowledge map question

*When the Wanganella was no longer needed at Deep Cove the tug struggled to dislodge her from a reef of discarded beer cans.*

*Attitudes to rubbish have changed since the 1960s. Today, we recycle cans. The Manapouri Power Station was built to provide electricity for the Tiwai Point aluminium smelter. Producing aluminium is expensive, so recycling it makes sense.*

*How do you think aluminium cans would be recycled? Are they recycled in New Zealand? Find out more by contacting your local Waste-Buster group, or by using the internet when you get back to school.*



*Props: Protest placard.*

- Narrator:** At the time the power station that discharges water into Deep Cove was built, the intention was to raise the level of Lake Manapōuri by 30 metres. THE PUBLIC OF NEW ZEALAND refused to let this happen and thanks to the Save Manapōuri campaign, the lake is controlled within its natural range.
- Protestor One:** *(waving placard)* Save our lake! Damn the dam!
- Protestor Two:** *(to Protestor One)* D'ya know, one of Lake Manapōuri's earlier names was Moturau? It means many islands.
- Protestor One:** Yeah? Well, man, if they raise it, it'll be Lake Not So Many Islands. Seventeen forested islands will be drowned and the lake will stink like a sewer for years as the plants rot.
- Protestor Two:** Far out.
- Protestor One and Two:** Save our lake! Damn the Dam!

## Knowledge map question

*You will need: to speak to locals or local organisations like the district council, Department of Conservation or Forest and Bird.*

*The Save Manapouri Campaign of the 1960s and 70s was the first time large numbers of New Zealanders had stood together to defend the environment.*

*If people had not protested, the level of Lake Manapouri would have been raised, drowning large areas of forest and many islands. Find out about One project in your area where ordinary New Zealanders are working together to help the natural environment.*





# A Doubtful Tale – continued

*Props: Camera.*

- Narrator:** The road that was built during the construction of the power station opened up Doubtful Sound to DAY TRIPPERS, and made it easier for COMMERCIAL FISHERMEN and HUNTERS to use the area.
- Day Tripper One:** Goodness, planting these forests must have been a big job.
- Day Tripper Two:** Well, New Zealanders seem very outdoorsy, all that farming and suchlike.
- Day Tripper One:** Fetch me a latte, would you. This is such a strenuous trip. That bus journey over the pass must have taken nearly an hour.
- Day Tripper Two:** Hey! Is that a dolphin?
- Day Trippers** *hurry to the rail with camera at the ready.*

## Knowledge map question

*You will need: to talk to crew on your Doubtful Sound or Lake Manapouri boat trip.*

*What do tourists most enjoy about a visit to Doubtful Sound? Ask the skipper or crew on your boat trip on the lake or fiord. Ask family and friends who have visited the fiords.*



*Props: Cell phones.*

- Narrator:** STUDENTS have been coming to stay at Deep Cove since 1971. Internet has been available at the hostel since 2005.
- Student One:** *(holding up cell phone to find coverage)* No cell phone reception. No TV. And the internet is sooooo slowww.
- Student Two:** Primitive.
- Student One:** Primitive and unnatural.

## Knowledge map question

*You will need: To do a survey of students' experience of camp.*

*Ask questions like:*

*What are three things you like about Deep Cove Camp?*

*Have you seen any birds or animals that you did not expect to see?*

*What is the hardest thing about being on camp?*

*What is the most surprising thing you have seen?*

# Evaluation form

## Deep Cove Supersite

Thank you for taking the time to complete this form. This information will be used to make improvements to this Supersite and to inform the planning of future education resources.

### User profile

School or Group (optional): .....

Number of students: .....

Age of students: .....

### Resource evaluation

How did you find out about this Supersite resource?

.....

1. Do you think the students benefited from their involvement in this Supersite? (Please circle)  
Not at all    1            2            3            4            5            Yes definitely

Comments: .....

2. Please indicate at what stages of the Supersite a DOC ranger provided support to you?

Planning stages             Pre-visit activities             Other:  
 Fieldtrip                       Post-visit activities            .....

Comments: .....

3. Did the topics covered link to the New Zealand curriculum framework?

Social Science     Science     Health     Other     Not Applicable

Comments: .....

4. What aspects of the Supersite were most valuable? .....

5. What aspects of the Supersite did not work so well? .....

6. Were there any significant comments from the students? .....

7. How do you think we could improve the Supersite resource? .....

8. Please provide any further comments: .....

Please return this evaluation to: Department of Conservation, P.O. Box 29, Te Anau 9600,  
Ph: (03) 249 0200 Email: fiordlandvc@doc.govt.nz

