Kepler Track

An education resource

Department of Conservation
Te Papa Atawhai

Department of Conservation
Te Papa Atawhai

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1 1 These icons refer to curriculum areas and levels. Please see the curriculum breakdown on page 6.

Contents

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introduction

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 a group.

DOC Education Ranger – field-trip assistance

Please contact the Te Anau DOC office if you require the help of a DOC Education Ranger or specialist in delivering activities on your Kepler Track fieldtrip.

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 interconnectedness of the environment. For specific curriculum objectives used in this Super Site refer to the curriculum breakdown, page 6 (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:

Community Relations Team
Department of Conservation
Te Anau Area Office
PO Box 23
Lakefront Drive
Te Anau 9600

Email: fiordlandvc@doc.govt.nz

Telephone: 03 249 0200

The Kepler track

Introducing the walking track and activity locations

The track

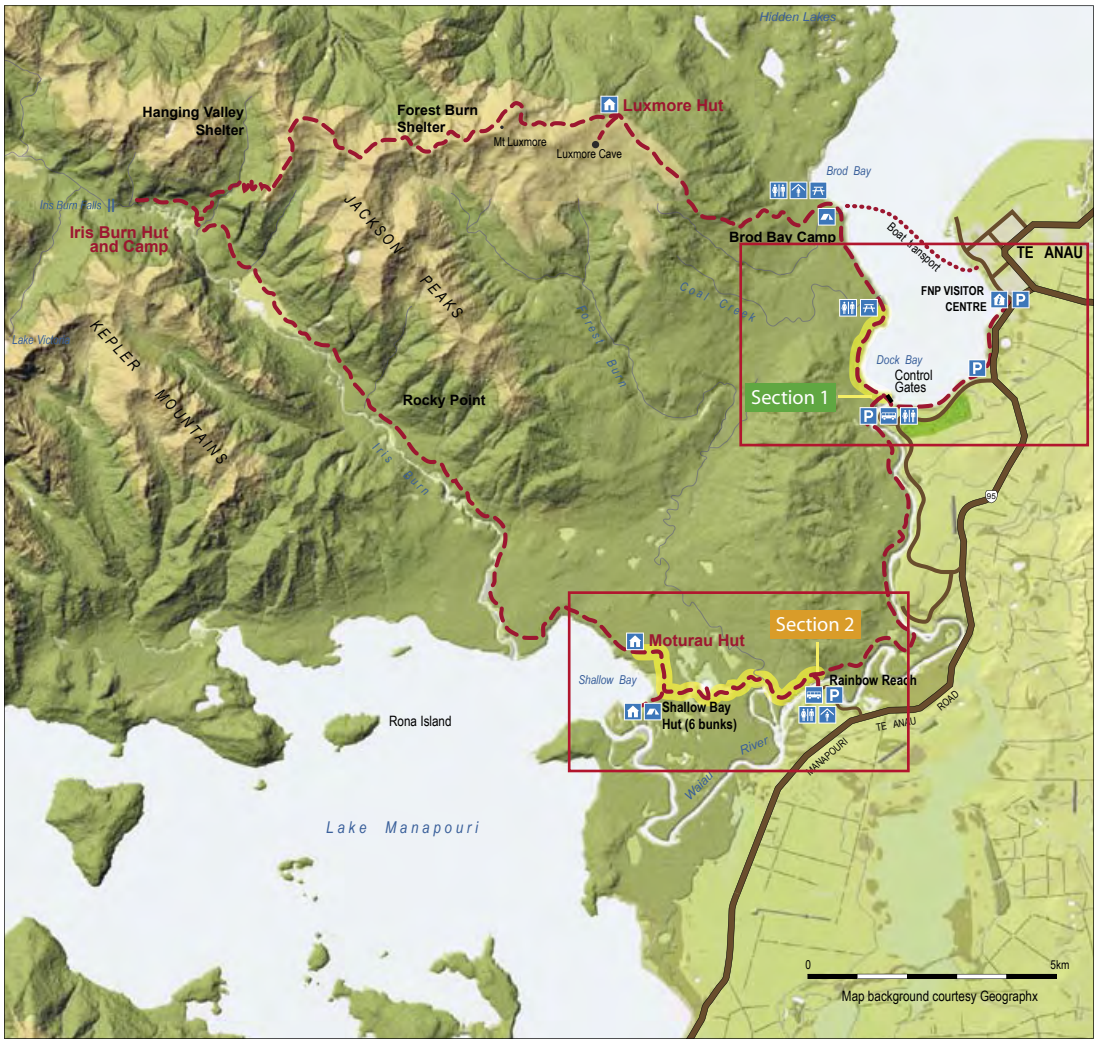
The lower sections of the Kepler Track provide easy walking through beech forest with beautiful lake and river views. The activities in this resource are designed to get students exploring the environment and using simple criteria to make an assessment of forest health.

The activities in this resource can be used on two sections of the track.

Planning ahead – pre and post activities

To get the best value from a field trip, teachers should plan good 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.

Before the group sets out, run a quick check on the list students complied in the pre-visit activity "Be Prepared" (p9).



Key

Shelter	Toilets
Parking	Camp site
Hut	Picnic area
Bus service	Information

The Kepler track

Note
There is a comprehensive information panel located at the control structure detailing how it works. This is worth stopping to read. Relates to activity 9b

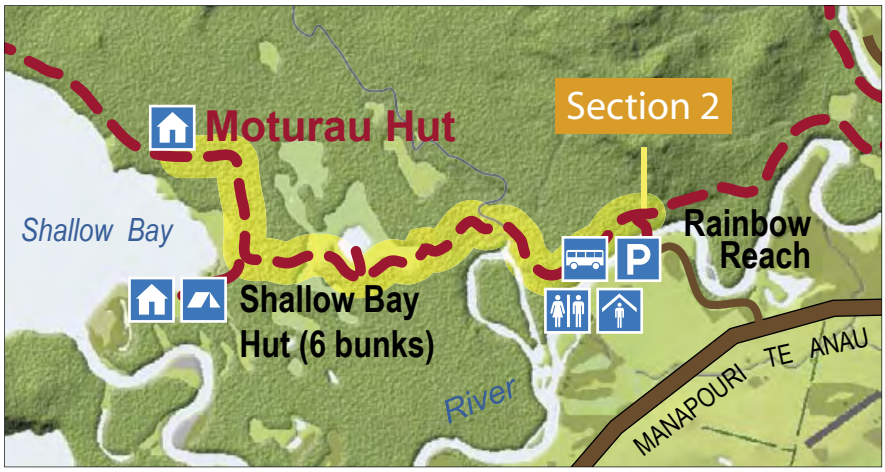
Track section one

Lake Te Anau Control Structure (5 minute drive from Te Anau) to Dock Bay. This section of track has a half hour walk time. There is an amenity area with shelter, toilets and picnic tables overlooking Lake Te Anau at the car park.

The walk begins by crossing the control structure and continues through beech forest before coming out onto the lakeshore at Dock Bay. There is a toilet and a picnic table at Dock Bay.

The walk can be extended by walking the lakeside track from Te Anau to the control structure (45 minutes) or by walking on from Dock Bay to Brod Bay (a further hour).

Activity Sites
Bollard 1 Beech Forest City 3a – leave the track at the bollard number one, five minutes walk from the control structure.
Bollard 2 Bird Café trackside menu 4a – look for these plants along a 5 minute stretch of the track beyond bollard number two.
Bollard 3 Bird Café lakeside menu 4a, and Location, Location, Location 4b – Beach area at Dock Bay.
Bollard 4 Rock Families 2a – Far end of Dock Bay, where the beach becomes stony.



Track section two

Rainbow Reach Swing Bridge (15 minute drive from Te Anau) to Moturau hut. This section of track has a 1½ hour walk time. There is a small shelter and a toilet at the car park.
The walk begins by crossing a large swing bridge over the Waiau River and continues through beech forest and wetland before reaching Lake Manapouri and Moturau hut. There are toilets at the hut.

Activity Sites -
Bollard 1 Beech Forest City 3a – Seven minutes walk from the Rainbow Reach swing bridge. Leave track at bollard number one.
Bollard 2 Bird Café trackside menus 4a – Immediately after the Forest Burn bridge (30 minute walk from the Rainbow Reach swing bridge).
Bollard 3 Rock Families 2a – If the river is not in flood, a short distance beyond the Forest Burn bridge 35 minutes from the Rainbow Reach swing bridge. Go down to the river at the bollard number two. Alternatively use the beach at shallow bay.
Bollard 4 Bird Café lakeside menus 4a – Beach area below Moturau hut, 1½ hours from the Rainbow Reach swing bridge.

Notes to the teacher

Minimise off-track damage
Unless students are careful when they are off-track they are going to cause a lot of damage to the environment. Help to minimise this damage by treading carefully in the forest.

Engage the senses
Engaging the senses is the fastest way to get your students relaxed and interested in the environment.

These activities are designed to get students looking (for hidden nest holes), feeling (moist humus and dry soil), smelling (scented leaves), listening (bird song) and tasting (pepper tree leaf). Look for other opportunities to engage the senses wherever possible (eg leaf and bark rubbings, sound mapping).

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

notes activities

section 2

Teacher notes and activities

Topic layout

This Super Site is broken down into topic areas. These are made up of supporting information, (which can be used either as teacher notes or handed out to students) and a number of activities. These may refer to additional work sheets in the resources section (section 3). Each activity includes a planning outline (see below)

An answer guide for teachers of relevant activities is included in section 2. A glossary of key words used throughout this Super Site Resource may also be found in section 3, page 32.

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 6 (opposite page).

Using the activity sheets

The topics have been organized into a logical sequence for students to work through. Teachers may choose to make use of all the activities provided under each topic area or they may focus on individual activities as stand alone topic areas.

Planning outline

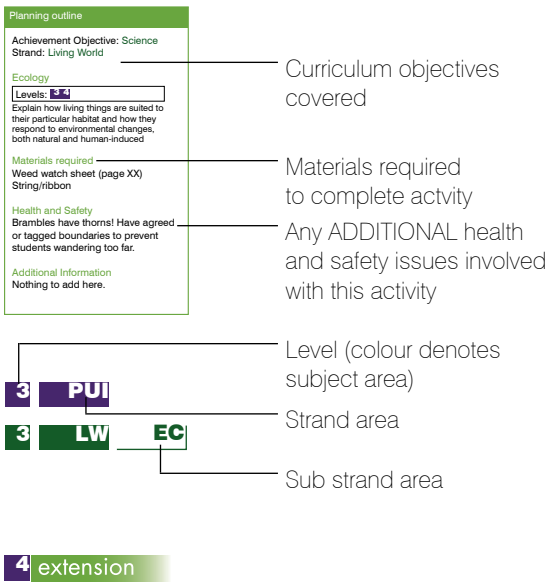
Each topic's activities have a brief overview box with a quick run-down of the curriculum objectives, materials needed, and additional health and safety issues you may need to be aware of as well as any other points of note.

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 6 for a breakdown of these.

Extension activity

Extension activity suggestions may be included with some activities. Many of the activities may be adapted to different learning levels.



#1 Notes

Information notes 1

Pre and post activities

Getting the most out of your trip

Pre and post-visit activities

To get the best value from a field trip, teachers should plan good 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.

The lakes

There are hundreds of lakes in Fiordland. They are full of fresh, clean water. The water in Lake Te Anau flows into the Upper Waiau which feeds into Lake Manapouri. From here water travels to the sea via the hydro-power station at West Arm or down the Lower Waiau river and out to Te Waewae Bay.

As the water flows on its journey out to sea it picks up increasing amounts of sediment and other additives which affects its clarity and purity.

Past journeys

Long ago, Tangata Whenua (local Māori) travelled regularly from Te Waewae Bay to Milford Sound/Piopiotahi to gather tangiwai, a type of greenstone. They had coastal and inland routes. The main inland route followed the Waiau River from Te Waewae Bay, to Lake Manapōuri and into the Upper Waiau River. From there travelling parties headed north up Lake Te Anau, and along what is now known as the Milford track to Anita Bay/Te Tauraka ō Hupokeka. Everything early Māori needed came from nature and around 200 different plant, animal and mineral resources were gathered along this route.

Predator control

Islands are valuable wildlife refuges because they are easier, and less expensive, to keep pest free than mainland sites. Predator control islands in Fiordland include:

- Anchor
- Bauza
- Centre (Te Anau)
- Chalky
- Coal
- Pomona (Manapōuri)
- Resolution
- Rona (Manapōuri)
- Secretary

#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 – Mega map

Activity description
Create a knowledge wall in your classroom. This activity establishes the setting for any field trip to the Kepler Track.

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

Location
Pre-visit activity, classroom based

Delivery
Use an electric whiteboard or projector to enlarge the map to make a wall display or photocopy a map per student.

1.1 If travelling to Te Anau, mark the road you will come in on.
1.2 Use the same colour to mark other routes you will travel while in Fiordland. Mark in where you will stay overnight.
1.3 How many kilometres will you travel to get to Te Anau?
1.4 How long will it take? What will your average speed be?
2.1 Mark in the approximate routes taken by Māori.
2.2 Find out what some of the resources gathered along this route were and add pictures of them to your map.
2.3 Find a picture of a mōkihi, the flax stem and raupō (bulrush) craft that was used for river travel.
2.4 Find out how Māori carried heavy loads of tangiwai across the mountainous route between Milford Sound and Lake Te Anau.
3.1 Mark in the components of the Manapōuri Power Station:
- Te Anau Control Structure
- 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
- The Mararoa Weir.

4.1 Colour Fiordland's freshwater one colour, and the sea water another.
4.2 Trace the natural flow of water from Te Anau to the sea at Te Waewae Bay.

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 minimisation 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

Geology and glaciation

Fiordland's landscape illustrates the power of ice

Glaciation
Extent of the main ice sheet 20,000 to 18,000 years ago years ago as it formed the Fiordland coastline. Note that the coastline is further out to sea as ocean levels were around 100m lower than today.

Ancient rocks and new mountains

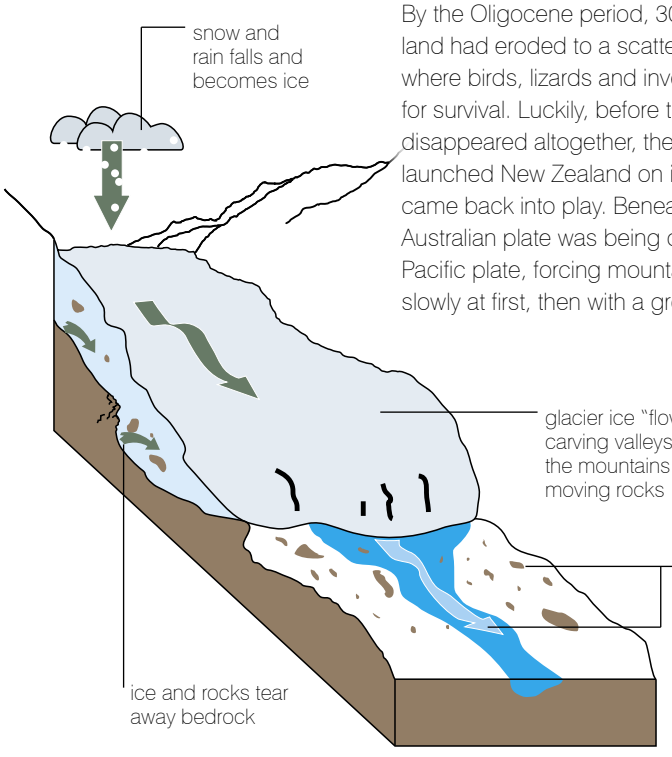
Fiordland's mountains are young. Driven up by the collision of tectonic plates during a period 5-2 million years ago, they have not had time to lose their raw edges. In fact, they are still growing about as fast as your fingernails, though erosion wears them back at around the same rate. While they are among the newest mountains in the world, they are built of some of the oldest material in New Zealand. The oldest of Fiordland's basement rock began forming about 500 million years ago, at a time when the first shellfish-like creatures were living in the seas.

Adrift from Gondwana

150 million years ago, during the Jurassic period, the land that eventually became New Zealand was mainly an underwater part of the super continent Gondwana. This was the era of dinosaurs as shown by fossil records that persist in the rock today. The movement of tectonic plates gradually broke up this giant landmass and by 80 million years ago New Zealand had become an island adrift. Later, when mammals evolved, only bats, seals and sea lions were found on these isolated shores.

Erosion and uplift

By the Oligocene period, 30 million years ago, the land had eroded to a scattering of small islands where birds, lizards and invertebrates struggled for survival. Luckily, before these little islands disappeared altogether, the tectonic plates that had launched New Zealand on its journey into isolation came back into play. Beneath the land the Indo/Australian plate was being driven up and over the Pacific plate, forcing mountains of rock upwards, slowly at first, then with a growth spurt that gave us the Southern Alps and Fiordland Massif (group of mountains). The ancient rocks had formed new mountains, but the landscape was not yet recognisably Fiordland.



Glacier in action
How a large body of ice carves mountains.

Ice ages – Putting the fiord into Fiordland

The movement of tectonic plates that broke up Gondwana also shifted land around the polar regions, creating new ocean currents. Ice sheets built up on, and around the land. A cold water current isolated the Antarctic fragment of Gondwana, creating a colder world climate. It didn't stay cold however. Influenced by the Earth's distance from the sun (the Milankovich cycle), ocean current changes and land movement around the polar regions, the Earth's climate cooled and warmed as many as 30 times over two million years. New Zealand's plants and animals again lost part of their home as glaciers advanced. Not all the ice ages affected New Zealand, but those that did reduced the amount of land habitable to plants and animals. With each ice age snow began to accumulate in the mountains. The snow melted and refroze and was compressed by new snow until, at the base, ice melted under pressure and the whole mass began to move. Glaciers, great slow-moving rivers of ice, advanced down every valley. As they poured into the dip of the Te Anau area they gouged great trenches that would later become lakes. On the coast they flowed seaward, carving valleys that would eventually flood with sea, creating fiords. It was this period that shaped the land we see today; it put the 'fiord' into Fiordland.

The end of the ice

The last ice age ended 10,000 years ago. Parts of Fiordland were scoured clean, while in other areas alpine vegetation survived in beds of ice-shattered rock. From these sites vegetation slowly recolonised Fiordland as the glaciers and ice retreated.

Geology and glaciation

Is this greenstone?

Greenstone is not found around Manapouri and Te Anau. Any green stone is likely to be green stained quartz. A number of minerals including chlorite can give a green colour to rock.

Fiordland...rocks!

You will see a wide variety of different coloured stones on the shores of lakes Te Anau and Manapouri. The many colours tell the story of Fiordland's dramatic geological past. The stones are igneous, metamorphic and sedimentary (see glossary). They range from 500 million years to a hundred million years or less in age. The rock seams from which they came have been exposed by the processes that grow mountains, and wear them back. And they have been delivered to their present site by the most recent force to shape Fiordland – glaciation.

Have we found gold?

Some rocks are quite sparkly because they contain pyrite or mica, two common sparkly minerals. Gold is soft, so although the mineral quartz may sometimes contain gold, it is unlikely to persist in the glassy white quartz pebbles you might find on the lakeshore.

Quartz
Glassy white rocks are called quartz. Quartz is made of the mineral silica which is used to make glass.

Quartz bands
Banded rocks are created when liquid quartz flows into cracks in older rock layers.

Sedimentary rocks
Layered rocks with a slightly grainy texture are made up of layers or sediment like sand, mud and silt.

Ultramafic rocks
Rusty red rocks contain a lot of the mineral iron.

Speckled rocks
These are made up of clusters of light and dark minerals.

Rocky questions

Why are the stones different colours and textures?
- They are made of different minerals and formed through different processes. Sugar is granular, but when it is heated with water it becomes golden brown and will set into hard, glassy candy. In the same way, minerals can change colour and texture if they are heated and compressed.
- They come from different places. The mountains of Fiordland are made of layers of different rock. Over time, these different layers have been broken up by earthquakes, tectonic plate movement and weathering.

How did the different stones get here?
- During the ice ages glaciers gouged deep troughs in the Earth's surface and scraped chunks out of the mountains. Some of this rock debris was pushed ahead of the glacier as it flowed forward. You can demonstrate this by pushing your hands, like bulldozers, through lake or riverside sand.

Why are some stones brittle and crumbly?
- Water expands when it freezes. In harsh Fiordland winters, the moisture that has soaked into stones can break them apart.

Why are the stones smooth?
- These stones were raw-edged chunks when they broke from their parent rock seams. Many thousands of years of being jostled together in rivers and lakes has worn them smooth.

#2 Activities

Planning outline

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

Levels: 1 2 PEB ES

Explore and describe natural features and resources

Levels: 3 PEB ES

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

Materials required
- Rock Families sheet (see page 33)
- Magnifying glasses
- Blanket or sheet to place rock famiilies on
- If required: a digital camera

Health and Safety
Ensure water safety is considered.

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

Activity 2a – Rock Families

Activity description
This activity helps students to realise that the stones at their feet are water worn fragments of mountains both near and distant.

Supporting information
This activity consolidates all areas of supporting information #2.

Location
If walking to Dock Bay – the western end of Dock Bay beach (bollard 4).
If walking towards Moturau Hut from Rainbow Reach – a short distance from the Forest Burn bridge. This site may not be accessible after heavy rain (bollard 3).
The activity can also be done at Shallow Bay, a short side trip from the main track, around 20 minutes from Moturau Hut.

Delivery
Briefly discuss the concept of glaciation and how rocks and mountains formed.

Some questions to ask students
Additional questions can be formed from the supporting info #2.
1 2 Ask students to find 6 different-looking rocks or stones. Hold up one rock and ask each student if they have a similar looking rock. Discuss the similarities. Is the rock smooth or rough? What colour is it? etc. Place the similar rocks in a pile as one 'rock family' (a blanket or sheet may be useful for this activity). Continue sorting your collected rocks into 'rock families'. You may end up with five or six groups. Ask the students why so many different rocks are found in one place. Where are they from? How do you think they arrived here?
3 Use the Fiordland Rocks activity sheet (page 33) to identify some of your stones. extension Locate their "homes" on the activity sheet map and trace the route they may have taken.

#2 Activities

Planning outline

Curriculum coverage
Achievement Objective: Social Science
Strand: (NA)

Social Studies

Levels: 2 CP

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

Levels: 4 CH

Understand how people pass on and sustain culture and heritage for different reasons and that this has consequences for people.

Materials required
Access to creation stories (via internet or library)

Health and Safety
No additional issues related to this activity.

Activity 2b – Legends and landscapes

Activity description
Students investigate creation stories associated with landscapes. Comprehension based activity looking at cultural heritage.

Supporting information
If the geological forces that shaped Fiordland have been discussed with students, it may also be interesting to look at the creation stories associated with the landscape. For an up to date and comprehensive list of creation stories visit www.tki.org.nz and search for "creation stories".

Location
Classroom based

Delivery
According to Maori legend the principle lakes of the South Island were dug by the chief Rakaihautu with his ko (a tool similar to a spade) while the fiords were carved out by the iwi god Tu Te Raki Whanoa.

All long established cultures have had a time before written language. Legends are an important part of cultural identity and had to be passed orally from generation to generation. Music, rhythm and drama were used in storytelling to make information more memorable.

Set students (in groups or as a class) the challenge of communicating a creation story so that their audience will remember the who, what, when, where, why and how of the story.

For example, Rakaihautu (who) dug lakes (what) when he explored the South Island (when). He dug lakes Te Anau and Manapouri (where) so that the landscape would be more useful to humans (why). He dug the lakes with his ko (how).

Students can choose creation stories from New Zealand or around the world, or make up their own stories.

They can deliver these stories of magic powers and superhero feats as a short play or as a chant or rap.

One month later, can the audience remember the who, what, when, where, why and how of the story?

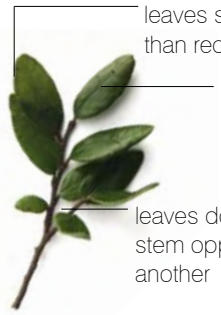
#3 Notes

Information notes 3

The beech forest

Fiordland and beech trees, a perfect partnership

Sensational seeding
Beech tree seeds, such as these from a silver beech, litter the forest floor in a mast year. Up to 6000 may be found in a single square metre.



mountain beech

silver beech

red beech

Hardy survivors

Cool temperatures, high rainfall and shallow nutrient-poor soils mean that Fiordland forests simply have to be beech. No other forest type could thrive in these conditions. (There are areas of podocarp forest in Fiordland, but only in warmer and more fertile sites) Fiordland's climate means the decay that makes soil-enriching humus happens slowly, while high rainfall washes many nutrients away. Soils are shallow because soil-building started from scratch after the last ice age and there just hasn't been time for good soil depth to accumulate. No farmer or gardener would be impressed by Fiordland soils (in fact that's why more beech forest survives than any other forest type - the ground it grows on is generally too poor for farming) but beech trees have a few tricks that help them survive.

Hanging in there

Most trees have roots that reach down deeply into the soil, acting as an anchor and gathering water and nutrients from far below the surface. Beech are different, they have shallow, spreading roots which form supporting buttresses on larger trees. The roots cling to rock and intertwine with the roots of neighbouring trees to keep these forest giants standing in a storm. It doesn't always work and on steep slopes a tree sometimes loses its grip and falls, dragging others with it. This is called a tree avalanche and can leave a section of the mountainside nearly as bare as it was after the last ice age.

Friendly fungi

Besides collecting water and keeping the tree standing, beech roots work in partnership with fungi to gather nutrients. The fungi live on, and sometimes in, the tree roots. The fungi feed nutrients from the soil to the tree, while the tree supplies sugars it makes in its leaves during photosynthesis, to the fungi. If you visit Fiordland in the autumn you are likely to see large numbers of colourful fungi in the forest. The toadstools above ground are the fruiting bodies of the fungi and are only a tiny fraction of the whole organism. Most of the organism is made up of pale fungal fibres, which spread out through leaf litter and rotten wood, helping dead material to decay. It is easy to find these fibres by turning over damp wood or leaf litter.

Sensational seeding

There are three types of beech in Fiordland - red beech, mountain beech and silver beech. All three beech species produce prolific amounts of seed (up to 6000 seeds per square metre of forest floor) every four to six years. These 'beech mast' years happen after a warmer than usual summer. Other native plants, including tussock (the most common plant above the bush line in Fiordland), also seed irregularly and in response to temperature. Masting ensures that no matter how many different creatures eat the seeds, they will never be able to eat them all and some will be left to germinate.

Seeds and stoats

Mast years are dramatically different from non-mast years in the beech forest. Today, the biggest change comes from the increase in rodent and stoat populations. Read more about this under the heading 'Rat Rollercoaster'. (See page 22)

Department of Conservation
Te Papa Atawhai

#3 Activities

Planning outline

Curriculum coverage
Curriculum area: Science
Strand: Living World
Substrand: Ecology

Levels: 1 2 LW EC

Recognise that living things are suited to their particular habitat

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
- Beech forest city sheet (see page 34-36)
- Writing/drawing materials

Health and Safety
Avoid this area in high wind. Keep off fallen logs, they may collapse.
Have agreed or tagged boundaries to prevent students wandering too far.

Additional planning notes
Students can help the environment by avoiding damaging plants or rotten logs. Help to keep this area looking natural for other school groups.

Activity 3a – Beech Forest City

Activity description
This activity encourages students to think about how the forest supports its population of birds. It is a field and classroom based activity involving observation, presentations and the completion of an activity sheet.

Supporting information
This activity consolidates all areas of supporting information #3.

Location
Bollard 1 1 track section 1 or 2.

Delivery
Explain to students that a human city needs roads and subways, storm water systems and sewers, shops and homes and public spaces. Ask them to imagine that this is Beech Forest City and that they want to convince more birds to come and live here.
Divide students into eight groups.

Cut out the cards on page 36 and give each group one area of the Beech Forest City to investigate. They need to find one thing that makes this forest a good home for birds. On site or back in the classroom the groups prepare a brief advertisement aimed at persuading more birds to come and live here. They can present this advertisement to the rest of the students, who can help by pretending to be an audience of birds!

After each presentation, the students can write the main points on their Beech Forest City worksheet (page 34-35).

#4 Notes

Information notes 4

Kepler bird life

Native birds face many threats to their survival


Stoat


Kea


Kiwi


Whio

Challenges to survival

Kurī and kiore, the Polynesian dog and rat, arrived with the first people to settle New Zealand. Both preyed on native species and the kiore in particular had a serious impact on some bird populations. However the stoat, introduced by European settlers in 1884, was a more serious threat to some of the larger birds. New Zealand's unique birds evolved in a land without mammalian predators. Millions of years of evolution had hard-wired their brains to recognise birds of prey as a danger, but not small, furry mammals. New Zealand's amazing indigenous birds survived two million years of ice ages. But while these challenges occurred over millions of years, the arrival of stoats and other new predators happened so swiftly that New Zealand birds could not adapt.

Fight or flight

When we hear the unexpected bark of a dog nearby, our hearts race. The lifesaving 'fight or flight' response has sent adrenalin racing through our bodies. Suddenly, we are quicker, stronger and more agile. We think faster and we are less able to feel pain. This surge of extra ability may not last long, but it can save lives.

'Fight or flight' is triggered for our indigenous birds when the shadow of a bird of prey passes over. Squeaking chicks fall silent. Adult birds freeze and merge into the vegetation, or race for deep cover. Unfortunately a four-legged, furry-faced creature is usually not recognized as a threat until too late.

The silent forest

There are songs and sounds missing from this forest. The dawn chorus has changed. Before rats and stoats arrived it was home to the bush wren, the piopio, the laughing owl and the South Island kōkako. These birds have gone forever. Throughout New Zealand the loss of their forests, and hunting by humans and other predators, has driven them to extinction.

In 2006 a final, Fiordland-wide search confirmed what had been suspected for decades: there were no kākāpō left on the mainland. Today, the critically endangered kākāpō is found only on predator-free islands. Without help, kiwi, whio, weka, kākā, kea and takahē could be lost too.

Explorer Charles Douglas described the forest birdlife as it was before introduced predators became established:

"The weka prowled around the tent, annexing anything portable and the kiwi made the night hedious with its piercing shriek. The blue duck crossed over the river to whistle a welcome. The caw caw (kākā) swore and the kea skirled, piegeons, tuis, saddle backs and thrushes hopped about unmolested. The chorus of the bell bird was heard in the dawning and all were tame and inquisitive..."

Restoring the dawn chorus

Years of work have gone in to developing an effective method of controlling stoats in native forests. Predator control must be humane, effective and affordable. Traps placed in a grid pattern, with 100-metre spacing throughout the forest, will catch pretty much every stoat in the area, but the cost of boxes, traps, bait and staff time makes this unaffordable. Traps placed at 200 metre intervals along a track or route, and cleared once a month (on average), catch enough stoats to give good protection to more vulnerable bird populations at a manageable cost. Now that this method of trapping is proven, more people are investing in traps to protect bird life on their own land, and more community groups are undertaking predator control at local reserves. In Fiordland, a number of local businesses, organizations and trusts support the Department of Conservation by maintaining and checking trap lines. On the Kepler Track the cost of setting up a trap line of around 250 two-trap boxes, and all the work of maintaining it, is managed by the Kepler Committee (the group responsible for organising the annual mountain run, Kepler Challenge), with help from members of the Te Anau community.

The future for birds on the Kepler Track looks bright. With stoats attracted to the egg used as bait in the trap box, and killed before they reach nesting birds, it is expected that increases in vulnerable species will soon be noticeable.

Kepler bird life


Kaka


Weka

Kepler 'Big Birds'

These are the species that are most likely to benefit from stoat control.

Kākā nest in deep holes in tree trunks. A stoat can easily climb the tree and slip in through the nest hole. The female kākā cannot escape and is devoured along with her eggs or chicks.
Kākā nesting within a 400-metre radius of a trap have a greatly improved chance of raising their young to fledging.

Kea nest in rock stacks or fallen trees near the bush line. Like kākā, their chances of raising young will increase if they nest near the trap line.

Tokoeka (South Island brown kiwi) are seldom killed by stoats once they are adult but they are very vulnerable as chicks and sub-adults. In some areas only 5% of kiwi survive to adulthood. Stoats account for 60% of these deaths. Trampers staying overnight in the huts on the Kepler Track should hear more kiwi calling at night in future.

Whio have already begun to return to the Iris Burn River, which was the first part of the Kepler to be trapped. Whio are a nationally endangered species with an estimated population of fewer than 2,500 birds (2004).

Weka were once common in Fiordland, but are now seldom seen. Weka are inquisitive birds, so when their numbers do increase, they are likely to be seen around campsites and huts.

Bats, lizards and invertebrates will also benefit from the trapping programme as all are eaten by stoats and rats.

Fact sheets on these species are available free of charge from Department of Conservation Visitor Centres, or by visiting www.doc.govt.nz

Stoat trapping the Kepler Track will help to increase bird populations. However, birds need more than predator control to thrive. They need a healthy forest, but deer and possums continue to compete with them for food by browsing the shrubs and trees that birds need. Rats eat eggs and fledglings and prevent the regeneration of the forest by eating seeds. Pigs also halt regeneration by rooting up the forest floor in search of grubs and roots.

Refer to the glossary in the supporting info (page 32) for definitions of key terms.

Forest / Forest Edge Birds

Birds that live in, or visit, the forest of the lower Kepler Track

Endemic
Tokoeka (brown kiwi)
Kārearea (native falcon)
Kūkupa/kererū (native pigeon)
South Island Kākā
Mōhua (yellowhead)
Koekoeā (long- tailed cuckoo)
Kakaruai (South Island robin)
Miromiro (South Island tomtit)
Tītitipounamu (rifleman)
Riroriro (grey warbler)
Tūī
Pīpipi (brown creeper)
Korimako (bellbird)

Native
Pīpīwharauroa (shining cuckoo)
Ruru (morepork)
Kākāriki (yellow crowned parakeet)
Pīwakawaka (fantail)
Tauhou (silvereye)

Introduced
Dunnock
Blackbird
Redpole
Chaffinch
Thrush
Australian magpie
Starling
Yellowhammer
Goldfinch
Greenfinch

Lake / Lake Edge Birds

Birds that live on, or visit, the lakeshore and lake

Endemic
Tarapiroe (black fronted tern)
Pūtangitangi (paradise shellduck)
Tarapunga (black-billed gull)
Papango (scaup)

Native
Kāmana (crested grebe)
Kawau (black shag)
Kuwau iti (little shag)
Pārera (grey duck)
Tētē-moroiti (grey teal)
Kahu (harrier)
Spur-winged plover
Poaka (pied stilt)
Pied oyster catcher (torea)
Karoro (black backed gull)
Kōtare (kingfisher)
Tara (white fronted tern)
Welcome swallow

Introduced
Canada goose
Mallard

#4 Activities

Planning outline

Curriculum coverage
Achievement Objective: Science
Strand: Living World
Strand: Living World
Substrand: Ecology

Levels: 1 2 LW EC

Recognise that living things are suited to their particular habitat

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
Bird café menu and order cards (page 37-41)

Health and Safety
Have agreed or tagged boundaries to prevent students wandering too far.

Activity 4a - Bird Café – Trackside and lakeside menu

Activity description
Students complete activity sheet to gain an understanding of some of the plants birds need to survive.

Supporting Information
This activity consolidates all areas of supporting information #3.

Location
Track section 1: Trackside menu (bollard 2) Lakeside menu (bollard 3)
Track section 2: Trackside menu (bollard 2) Lakeside menu (bollard 4)

Delivery
Use the leaf pictures on the menus to find some of the plants that birds need. You may choose to find the plants one at a time with the whole classs, or split into six groups and have each group focus on one plant. Students complete the "Kepler Kapers Café order card" (page 41). (You may choose to do this in the classroom).

Planning outline

Curriculum coverage
Achievement Objective: Science
Strand: Living World
Substrand: Ecology

Levels: 1 2 LW EC

Recognise that living things are suited to their particular habitat

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
'Location, Location, Location' activity sheet (page 42/43), pens/pencils.
(You may also want to refer to the Bird café menu page 37-40)

Health and Safety
Have agreed or tagged boundaries to prevent students wandering too far.

Additional planning notes
This activity is best done after completing '4a Bird Cafe - Trackside and Lakeside Menus'. It is also a good post-trip activity.

Activity 4b - Location, Location, Location

Activity description
Students will identify if this forest is a good home for different types of native birds

Supporting Information
See 'Location, Location, Location' activity sheet page 42-43.

Location
Designed to be used on Track section 1, bollard 3 This activity can also be done as a post-trip activity in the classroom.

Delivery
Complete the activity sheet 'Location, Location, Location' to assess whether this forest provides a good home for native birds.

#4 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
Bring Back the Brids activity sheet, page 44

Health and Safety
No additional issues related to this activity.

Activity 4c - Bring back the birds

Activity description
This activity encourages students to think about the different things we can do to help native birds.

Supporting Information
This activity consolidates all areas of supporting information #4.

Location
Classroom/school based

Delivery
New Zealand's native plants and animals set us apart from the rest of the world. Recognising what is uniquely ours helps strengthen students' sense of belonging. If students can hear tui or bellbird in their school grounds, they experience something no one elsewhere in the world can. Try to identify birds seen in the school grounds. Ask students to identify birds seen in their gardens at home. Providing there is good bird habitat (bush, or parks and gardens with well established trees) within 20 kilometres of your school, birds will return if you encourage them.

Start by having students assess the school environment using knowledge they gained doing the activities Beech Forest City, Bird Café and Location Location Location.
Use the activity sheet 4c page 44 checklist as a guide.

Students can then make up menu cards to advertise what's on offer at the school's bird café.

Discussion and further activities
How do these menus compare to the ones they made up for the Bird Café? Discuss whether there is enough food to encourage birds to visit, and to stay. Discuss whether there is an area that could be made more bird friendly by planting trees, shrubs or flaxes, or whether it would be possible to allow leaf litter to build up under some shrubs.

What might discourage birds from making your school their home? Are there cats or magpies? Do birds injure themselves flying into windows at the school?

Answer 4c

Solutions to the cat problem – Educate cat owners to keep their cats under curfew at night. Two bells on a cat collar make it hard for a cat to stalk silently. Students can design posters to encourage cat owners to be bird friendly. Display posters at local vets and pet shops.

Solution to the magpie problem – Borrow a magpie trap. They are sometimes available through local councils and come with instructions on how to use them humanely.

Solutions to 'window strike' – This serious problem kills millions of birds world wide. Reflectors can be hung in windows to make them more visible to birds. Students can make them out of old CDs, paua, aluminium foil and other shiny bits and pieces. Streamers hung outside window frames are also effective. Another possible solution is to draw on windows with yellow highlighter pens. The pen marks are almost invisible to humans but look very bright to birds because they reflect ultraviolet light, which birds are able to see.

Stoat story

Stoats were introduced to New Zealand to control rabbits

Super Predator

Weasels, stoats and ferrets are small predators belonging to the mustelid family. All prey on birds but the stoat is by far the most damaging to native bird populations.

Weasels are too small to tackle larger birds, and prefer mice, while ferrets are too large to climb up to nests in trees so more often prey on rats and rabbits. Both species are more common in farmland than in forests. Forests have become the domain of stoats, which hunt from forest floor to canopy. Sharp claws help the stoat to climb tree trunks and explore the forest canopy by running along interlacing branches. Sharp teeth deal death to birds in nests and nest holes. Besides being agile, the stoat is strong; at as little as 160 grams in weight, it can kill a 650-gram kereru and drag the body into its den, usually between the roots of a large tree. This weight difference is the equivalent to a 40 kilo 10 year old tackling a 160-kilogram red deer stag. When food is plentiful, female stoats will have as many as 13 kits in a litter.

Stoat – *Rod Morris*

The lethal legacy

The native birds of New Zealand are endangered because they have lost most of their forest and wetland homes. Added to habitat loss, many birds have to compete with animals like possums, deer and goats for food. Further tipping the balance are the predators, omnivores like pigs, rats and hedgehogs, and carnivores like mustelids, cats and dogs. All these animals, except the mice and rats, were brought to New Zealand for a reason. The stoats were intended to act as biological control agents for rabbits. But the assassins did not fulfill their contract and remain here as the lethal legacy of a failed venture.

Overrun with rabbits

It's easy to take sheep and cattle for granted in New Zealand today; there are just so many of them. But early in European settlement, each and every animal was a precious part of a very small population. Meat for the table frequently came from native birds rather than livestock. Back home in the British Isles, wild rabbit was often on the menu and, tired of weka stew and pigeon pie, the settlers had rabbits brought to New Zealand. It was a bad move. In Britain, foxes and mustelids help to control the rabbit population, but here in New Zealand, with no foxes, stoats or ferrets, the rabbits could breed without check. Very soon the pastures were overrun with rabbits, soil was being lost to erosion and sheep and cattle were going hungry. When you think about how hard people worked to fell the forests and drain the swamps to make their farms, you can imagine the heartbreak they must have felt at seeing their animals starve on rabbit-ruined pasture.

Stoats to the rescue?

Desperate to save their farms, the settlers petitioned to have weasels, stoats and ferrets introduced (but not foxes, which could take lambs). Some people realised the consequences this would have for native birds and protested, but the introduction went ahead. Unfortunately for the farmers, the weasels, stoats and ferrets did not bring the rabbits under control. The stoats, in particular, preferred birds.

In 1883, Richard Henry, who was to become a well known naturalist, described kākāpō, little spotted and brown kiwi, the piopio/native thrush, South Island kokako and tieke/saddleback as being often seen or heard on the shores of Mount Luxmore. Sadly, he soon after reported:

"Someone has put ferrets across the Waiau, under Mt Luxmore. I was trapping rabbits there and caught two ferrets, so I think that the end of the kakapo has already begun".

#5 Activities

Planning outline

Curriculum coverage

Achievement Objective: Science
Strand: Living World
Substrand: Ecology

Levels: 1 2 LW EC

Recognise that living things are suited to their particular habitat

Levels: 1 2 LW EV

Explain how we know that some living things from the past are now extinct

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: 3 4 LW EV

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.

Materials required

Time-line information, photocopied and cut up. Activity sheet p45.

Health and Safety

No additional issues related to this activity.

5a Stuck with stoats

Activity description

This activity encourages students to think about the impact of stoats on our native bird life. It involves completing a timeline wall display with alternative futures created by the students.

Supporting Information

This activity consolidates all areas of supporting information #5.

Location

Classroom

Delivery

Create a timeline to add to or start a Knowledge Wall. Display in the classroom. Working individually, or in groups, students can first work out the sequence of events, then match the dates to the text using the activity sheet 5a, page 45.
Finish the activity by extending the timeline into the future. Create a fan of alternatives to illustrate these 'what if's.
extension Use the extra questions (see below) to stimulate further discussion.

Answer 5a

1864 Wild rabbits are brought to New Zealand. They are let go in the wild to breed so that settlers can hunt them for food and sport.

1870 The rabbits have bred really well. Hundreds of thousands of sheep and cattle die of starvation because rabbits have eaten all the grass.

1879 Ferrets are brought to New Zealand. They are let go in the wild to breed so that they will hunt the rabbits.

1883 Ferrets spread across the country. Two ferrets are caught in rabbit traps on what is now the Kepler Track.

1884 The ferrets are not killing enough rabbits. Stoats and weasels are brought to New Zealand and let go in the wild to breed so that they will hunt the rabbits.

1890 The first stoats are seen in the Fiordland beech forest. People notice that there are suddenly fewer birds.

1900 A stoat is seen swimming to the Resolution Island bird sanctuary in Fiordland's Dusky Sound. The last little spotted kiwi on the island are taken to Kapiti Island in the North Island.

1930 Kakapo were common when the first settlers arrived in Fiordland. In the 1920s people walking the Milford Track could still see them. Now, they are rare.

1947 This is the last year in which the native thrush or piopio was seen. The piopio was declared extinct in 1963. The last sighting of piopio was in Fiordland.

1967 This is the last year in which the South Island kokako is seen. The last sighting of South Island Kokako was in Fiordland.

1997 Stoat trapping begins in Fiordland's Eglinton Valley.

2009 The piopio and the South Island kokako are thought to be extinct. Kakapo survive only on pest free islands. Pest control (poisoning possums and rats, shooting deer and pigs and trapping stoats) on the mainland helps the remaining native birds.

1999/2000 Warmer than usual weather causes beech trees to make seeds two years running instead of once every four to six years. There are more mice and rats in the forest because of the extra food. There are more stoats in the forest because there are more mice and rats for them to eat. When the seeds run out, the mice and rats stop breeding. A big population of hungry stoats eats more birds than usual. Only a handful of endangered mohua (yellowhead) survive.

Extension questions

1 *What if stoat trapping is continued and extended to more areas?*
2 *What if stoat trapping was stopped?*
3 *What if a disease could be found that would kill stoats?*
4 *What if a predator was introduced to hunt the stoats?*
5 *What other possibilities can students suggest?*
6 *What if warmer summers happen more often due to climate change, causing beech trees to seed more often that once every four to six years?*

#6 Notes

Information notes 6

Rat roller-coaster

Beech forest mast (seeding) years are bad years for the forest birds

Rats attacking a bird nest and eating eggs

The beech forest goes nuts

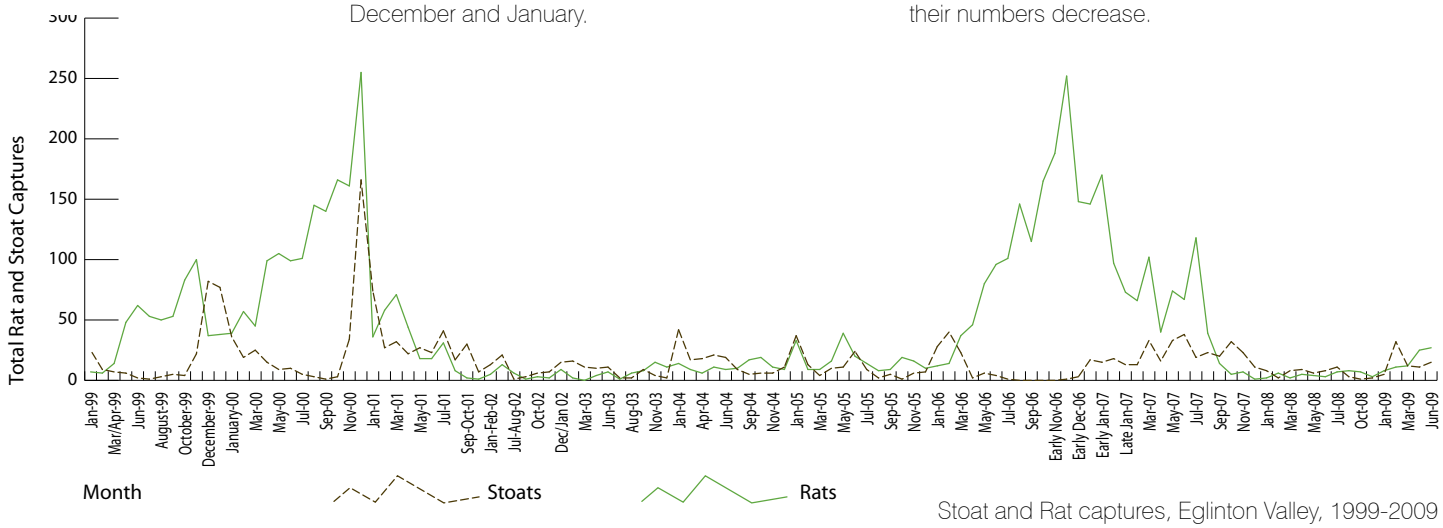
Every spring, some beech trees flower, but every four to six years they all flower very heavily. The forest canopy turns red and clouds of pollen rise like yellow smoke. If conditions are right the flowers set seed and in late summer beech nuts will fall so densely that the forest floor will be carpeted in them. This is the beech mast.

Rodents rise and stoats soar

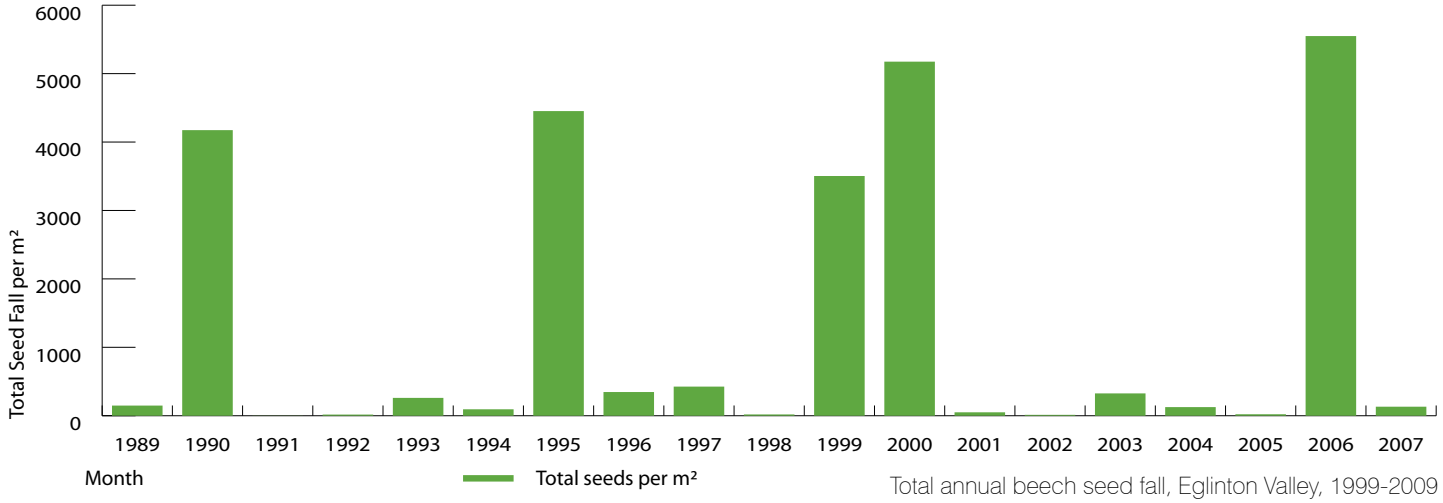
The little nuts provide a feast before winter for birds and insects, but also a bonanza for mice and rats. Rodent populations rise and stay high thoughout winter. Stoats respond to the increased food supply by having larger litters, and there are still plenty of mice around when the young stoats leave the den in December and January.

What goes up...

But by now the beech nuts are running out. They've either decayed, been eaten, or have germinated. Mice and rats turn to eating birds' eggs, small nestlings, insects and berries but there is not enough food to support them and the population drops abruptly. Suddenly, the easy pickings are over for young stoats. Like the rats, they begin to hunt more birds. Many stoats die and the population drops again, but until this happens very few chicks in the forest will survive to fledging. Some of the smaller birds, which have more than one clutch of eggs in a season may recover their numbers before the next beech mast season. Larger birds, however, which lay fewer eggs and are slow to reach breeding age, are unlikely to recover and each masting year will see their numbers decrease.



Stoat and Rat captures, Eglinton Valley, 1999-2009



Total annual beech seed fall, Eglinton Valley, 1999-2009

#6 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
Coloured paper, scissors, pens. Coloured ribbon if desired.

Health and Safety
No additional issues related to this activity.

Activity 6a. Food Web

Activity description
Students will construct a simple beech forest food web

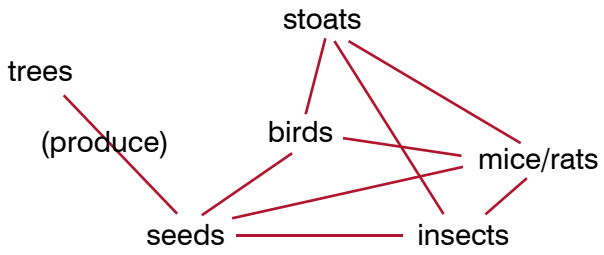
Supporting Information
This activity consolidates all areas of supporting information #6.

Location
Classroom

Delivery
The dynamic beech masting cycle influences life in Fiordland's forests. Make a food web to display in your classroom.
Can you show the connections between these things?
Seeds, insects, birds, mice and rats, stoats.
Can you add other things to this web?

Answer 6a

Sample food web



Planning outline

Curriculum coverage
Achievement Objective: Science
Strand: Living World
Substrand: Ecology

Levels: 1 2 LW LP

Recognise that all living things have certain requirements so they can stay alive.

Materials required
Bird Café menu and order cards page 37-41.

Health and Safety
No additional issues related to this activity.

Activity 6b. The Ratarant

Activity description
Students will make menus for forest pests.

Supporting Information
This activity consolidates all areas of supporting information #6.

Location
Classroom

Delivery
Imagine how possums, stoats and rats see the Bird Café menus.
Make up menu cards for the foods these creatures like to dine on.

#6 Activities

Planning outline

Curriculum coverage

Achievement Objective: Science
Strand: Living World
Substrand: Ecology

Levels: 3 4 LW EC

Recognise that there are life processes common to all living things and that these occur in different ways.

Levels: 3 4 LW LP

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

Materials required

Rat Rollercoaster activity sheet 6c page 46.

Health and Safety

No additional issues related to this activity.

Activity 6c. Rat Rollercoaster

Activity description

Students interpret a graph to deepen their understanding of how rat and stoat populations respond to abundant food supplies in beech seeding years.

Supporting Information

This data comes from the Eglinton Valley Operation Ark site on the road to Milford Sound. Trapping on the Kepler Track has not been going on for long enough for useful data to have been collected. See 'Rat Rollercoaster' Activity Sheet

Location

Classroom

Delivery

Complete the activity sheet 6c on page 46.

extension Warmer than usual summers occur in Fiordland every four to six years, triggering beech seeding. Climate change could have an effect on this pattern. What consequences could more frequent warm summers have?

Answer 6c

1. *Which side of the graph records the number of stoats and rats caught?* (left axis)
2. *Which side of the graph records the number of seeds per square metre of the forest floor?* (right axis)
3. *Where are the years recorded?* (horizontal axis)
4. *What was the longest time that trees rested in between heavy seeding years?* (5 years)
5. *What was the shortest time?* (0 years)
6. *Why did rat numbers rise when beech trees seeded heavily?* (because rats eat beech seeds and the extra food meant more young rats survived to breed)
7. *Why did stoat numbers rise when rat numbers were high?* (because stoats eat rats and the extra food meant more young stoats survived to breed)
8. *The usual resting time between seeding years is 4 to 6 years. Can you predict when the next seeding year might be?* (between 2012 and 2014)

extension *What consequences could more frequent warm summers have?* (More frequent warm summers could result in more frequent beech seeding years. More seeding years could result in more frequent high rat and stoat numbers. This would lead to lower bird populations. Producing flowers and seeds more often than usual could weaken beech trees, making them more prone to disease and insect attack).

#7 Notes

Tangata Whenua – people of the land

Forest experts

A healthy forest gives a wide variety of birds all they need to live. In the past it also provided Māori with many of the essentials of life. They became experts at understanding the forest because their lives depended on it. Hundreds of years of watching the flowering and fruiting cycles of the forest lead to a deep understanding of what signs to look for. Failure to foresee a lean season could lead to starvation.

The genealogy of life

The early people would have recognized when a beech mast was due, but while they may have anticipated a rich harvest of kiore/Polynesian rats and plump kākā, they certainly would not have talked about it. To discuss how many birds or rats might be taken in a season would invite bad luck. Trees and birds were considered the children of Tāne, god of the forest. Humans were also his off-spring, they were the younger siblings of trees and birds. In the world of Māori, all things come from a common ancestor so birds are part of the family of man. Bird harvest could only take place after careful spiritual preparation and under the guidance of tohunga.

Tohunga - the holders of knowledge

Tohunga were essential members of the community. They gave spiritual guidance and held specialist knowledge. Today we use libraries, or the internet, as storage places for knowledge, but in the old days it was all held in the head. Potential tohunga were recognised early in childhood and underwent intensive training in spiritual lore and the skill of recalling large amounts of information. There are still tohunga practicing today, mainly in the field of rongo (traditional medicine). To the tohunga of the birding season, success depended on many factors. The most important of these was the mauri of the forest.

Māori and mauri

All things have mauri, or an energy force. Forest mauri can be seen as the health and energy of the place, the way in which all living and non-living things within it are related, and the way in which it is made up of both spiritual and physical elements. The English language does not have a word for this, though a forest with weak mauri might also be degraded by browsing animals and have poor biodiversity (a lack of variety of living things).

Ancient Ara (pathways)

There were once small Māori settlements in this area but they were deserted before the first European explorers arrived. The local people had moved to the coast attracted by whaling stations at Bluff and Riverton. They continued to visit Fiordland seasonally on eeling and birding expeditions and to take the inland route to Anita Bay/Te Tauraka ō Hupokeka, where they collected tangiwai (bowenite, a type of greenstone). This trail led up the Lower Waiau River from the coast, through Lake Manapōuri and the Upper Waiau to Te Anau and then to Milford/ Piopiotahi via the route we now call the Milford Track.

New Nohoanga – resting places

These seasonal patterns of travel began to change, as pigs and potatoes introduced by the whalers and sealers made it possible for Māori to stay in one place and farm. Traditional routes continued to be used but to a lesser extent. As land was bought by European settlers, Māori began to lose access to traditional sites. Bush remnants were felled and many waterways became polluted and obstructed. Māori believed that the Treaty of Waitangi would protect their traditional food sources, but it failed to do so. In recognition of this there are now 72 nohoanga sites in the South Island. Nohoanga (meaning a place to sit) are river or lakeside sites to which Ngāi Tahu/Kai Tahu have exclusive camping rights. All nohoanga sites are on crown land and while anyone can visit the sites, only Ngāi Tahu/Kai Tahu may camp there. There are nohoanga sites at Queens Reach on the upper Waiau River and on the Eastern shore of Lake Manapōuri.

Lessons from legends

Legends often contain lessons about how we should behave.

In Māori legend, people who failed to respect the gods (and there are many of them, the Sky Father and Earth Mother, Ranginui and Papatuānuku had 70 children!) were often horribly punished, but in this beautiful story Rata is taught his lesson gently.

The Legend of Rata

Rata needed to build a canoe, so he and his men went to the forest and chose a tall straight tōtara to cut down. At the first blow of the adze, a hundred birds flew out of the branches in fright. As the blows continued, beetles and moths and wētās dropped to the ground and anxious green geckos clambered to the branch tips. The work took many days and when the tree was felled the workers went home to rest. However, that night the birds and insects and fairy folk of the forest put all the woodchips together and rebuilt the tōtara so that when the men returned it was standing in the forest once more.

Angrily, Rata had the tōtara felled again and he and his men did not stop until the branches were cut from the trunk. Then, very tired, they went to rest. That night the birds and insects and fairy folk of the forest put the tree together again. The next morning when Rata saw the tree standing, he was even more determined to build his canoe and again he felled it.

This time when his men went home he hid in the forest and waited. When the night came and the birds and insects and fairy folk set to work again, Rata stood up and cried, "That is my tree! I need it for my waka!" And they replied, "It is not your tree, it belongs to Tāne, and we need it for our home!" Rata was ashamed. He had been so determined to have his canoe that he had not thought of how it would affect the forest and the creatures that lived there. Rata apologised to the forest dwellers and spoke to Tāne, the God of the forest, explaining that his need for a waka was great. His karakia (prayer) to Tāne was long and humble and when he had finished, he fell asleep, exhausted.

As he slept, fluttering and scuttling, rasping and scraping sounds filled the air. The birds and insects and fairy folk were at work again. When Rata woke at dawn he could not believe his eyes, the most beautiful waka he had ever seen rested on the forest floor before him.

Rata's waka carried his tribe for many generations, and the lesson he learned was long remembered.

Painting by A.S. Paterson. Wonder Tales of Maoriland by A.W. Reed, first printed 1948

Early European illustration of Maori in Dusky Sound

#7 Activities

Planning outline

Curriculum coverage

Achievement Objective: Social Science
Strand: Cultural heritage

Levels: 2 CP

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

Levels: 3 RP

Understand how people remember and record the past in different ways

Levels: 4 CH

Understand how people pass on and sustain culture and heritage

Materials required

Collage materials, scissors, glue

Health and Safety

No additional issues related to this activity.

Activity 7a. A forest in your classroom

Activity description

Students draw on their experience of the beech forest and their knowledge of native birds to make a mural depicting a scene from the legend Rata and the Totara.

Supporting Information

This activity consolidates all areas of supporting information #7.

Location

Classroom

Delivery

Use students observations of the forest on the Kepler Track to help create a giant picture of the forest. You could brainstorm in groups or as a class. This activity aims to get students thinking about what birds might have been in the forest when this legend first began being told around campfires. Choose the scene in the legend where Rata is confronting the creatures of the forest as they rebuild the totara. Build the mural up, collage style, on your knowledge wall.

extension Students could include bats, lizards, insects and fairy folk (the tūrehu).

Answer 7a

Planning the forest scene

1 *What do students remember seeing on the forest floor?* (may include moss, ferns, fallen leaves, rotten logs. Students may have noticed that the forest floor is dim and shady)
2 *What do students remember about the forest overhead?* (the forest canopy is a ceiling of branches and leaves, with occasional windows where a fallen tree has left a gap. Students may have noticed that a beech forest canopy has very small leaves)
3 *What do students remember about what is in between the forest floor and the canopy?* (Depending on the site visited this may include clusters of young beech trees or larger- leafed shrubs.)
4 *What do students know about what a forest needs to contain to support a strong population of birds?* (birds need berries and flowers and seeds and bugs)

Rata

1 *Can students research to find sketches of pre-European Māori to help them decide what clothes Rata might have been wearing?* Look at www.nzetc.org/tm/scholarly/tei-BesMaor-c6-6.html for detailed descriptions and pictures of pre-european clothing.

Choosing the birds

1 *Which extinct birds could be included in the mural?* (could include South Island kokako, laughing owl, moa and piopio)
2 *Which birds do students think are endangered in Fiordland?* (could include kiwi, takahe, kākāpo, blue duck, mohua, kākā, kea)
3 *Have students seen birds in the bush, in the school grounds or in their home gardens, that could be included in the picture?* (these will need to be native species)

Designing the birds

1 *Find pictures of the birds you want to use in your mural. Ask students to decide what size the birds are. Which are smaller than Rata's hand? Which are larger than his head?*
2 *Decide what the main features of each bird are.* For example: Kiwi - long beak, small eyes, round body, big feet. Concentrate on these features when drawing the birds (alternatively, assemble birds from simple shapes, starting each bird with an egg-shaped body).
3 *To rebuild the totara, would birds carry the woodchips in their beaks or claws?* (Kiwi would have to use their beaks, as they can't fly so need their feet for walking. Some students may know that parrots use their feet to hold food. If kaka, kakariki or kea are included in the picture, they might carry woodchips in their claws.)

#8 Notes

Information notes 8

European history

In pursuit of resources

First impressions

The first European sealing party began work on the Fiordland coast in 1792. Over the next 60 years (until first the seals and then the whales were hunted almost to extinction) the coast was thoroughly explored. However, it wasn't until 1852, that Europeans first reached the interior. Three men travelled inland along the traditional route from Riverton/Aparima, led by Māori guides. One of the men, Charles J.Nairn, reported:
"the land to the east is undulating and covered with mānuka scrub and high fern", and that,
"The soil on the plain to the east is very stony, but well adapted to grazing".

First farms

By 1858 the first run holders had arrived. Land to the east of the upper Waiau River was steadily cleared of mānuka and bracken, while across the river tracts of forest were burnt. Grass was sown and pasture established.

Although it is 70 years since sheep and cattle were run on the lower slopes of Mount Luxmore you can still see where the mānuka that replaced the grass is slowly giving way to beech forest. There are other clues that this landscape was once inhabited, but as time passes they become harder to find.

First fences

The first runs were enormous and bordered by natural boundaries like rivers, lakes and mountains. By 1890 however, there were more runs and farming had begun to intensify. Fencing was needed, but there were no concrete or tanalised wood posts and no metal warratahs in those days. Red beech was used because it split easily and did not rot in the earth.

Red beech does not grow naturally any further south than the Rainbow Reach swing bridge on the Kepler Track. The Kepler beech was a valuable resource and camps were set up in the bush to fell and split the trees. An unfinished log lies on the forest floor along side the track, downriver of the control structure. Unlikely to have been felled after 1930, it is proof of how well beech wood resists rotting. Old beech posts can still be found on farms in this area.

First tourists

In the early 1890s trees were not only being felled for posts, but also cut for firewood. The Milford Track was open, and transport to the start of the walk was by steamer. The steamer's captain, T. M. Broderick, would put his passengers ashore to collect wood for the furnace at what is now called Brod Bay. You can see blocks of younger trees in the forest there, but whether these replace trees felled for the steamer's furnace or destroyed by a forest fire is not known.

Jack Beer

Jack Beer was the last to farm on the national park side of the river. He came to Fiordland after being jilted at the altar (it is said that he threw the wedding ring into the Waiau River) and lived as a recluse for 40 years. He had about 400 sheep, which he drove up onto the mountain to graze during the summer months. For most of the year, Jack Beer's stock grazed the lower slopes and river flats, and he had a beech slab hut in the bush, down-river from the control structure. He also established an orchard, planted gum and fir trees and built a water race, stock-yards and pigpens. The earth foundations of his hut and some old fence posts can still be seen at the site.

Jack died alone in his beech slab hut above the river at the age of 70. After his death, the land he had leased reverted to national park but feral populations of his sheep, cattle and pigs lived on into the late 1930s. Jack Beer's grave can be seen at the Lumsden Cemetery.

New pathways

By the 1940's "Beer's Meat" had been hunted out, but deer numbers had become very high. As more hunters visited the area, a rough track formed from Brod Bay to the tops. In time, this track came to be used by skiers and in the early 1960s a ski hut was built at the bush line, not far from present day Luxmore Hut. Two attempts were made to establish ski fields on Luxmore (the Beers Farm Route was even surveyed for a cog railway in the early 1970s) but the snow proved unreliable. The Luxmore ski field did not succeed, but the Kepler Track, part of which follows the route used by hunters and skiers,

European history

has become one of Fiordland's great attractions. Trampers experiencing this 60 km track can spend several hours high in the mountains, as well as walking the shores of lakes Te Anau and Manapōuri and the Waiau and Iris Burn rivers.

The Kepler Track was made possible by the Manapōuri power station's Te Anau control structure. This created easy walking access to the west side of the river.

Power for big business

The Te Anau control structure forms a bridge across the Waiau River where it leaves Lake Te Anau. It has three 'gates' which can be opened and closed to regulate the flow of water to the Manapouri Power Station at West Arm on Lake Manapouri. This power station was built by the New Zealand Government to supply power to an aluminium smelter at Tiwai Point near Bluff. The lakes were intended to act as giant reservoirs for the smelter and initially the level of Lake Manapouri was to be raised thirty metres. Today, a rock monument near the road at Manapouri shows where the water would reach today if this had happened.

Had the lake been raised, hundreds of hectares of forest would have been drowned. Thousand year old rimu trees and rare plants like the tiny white flowered herb *Iti lacustris* (which is found on the Manapouri foreshore and nowhere else in the world) would have been lost forever. Islands would have been submerged and the clear water poisoned by rotting vegetation. Still standing, dead trees would have been a hazard to boats for decades to come.

Power to the people

Fortunately for us today, hundreds of thousands of New Zealanders rose to the defense of the environment in the first major conservation battle of Aotearoa New Zealand. The Save Manapōuri Campaign ran for 13 years (1959 to 1972) and succeeded. The country got its power station, but it kept its lakes intact.

Since 1973 the government-appointed Guardians of Lakes Manapōuri, Monowai and Te Anau have ensured that the lakes are maintained within their natural range.

Hands off
This photo was taken during one of the protest marches by locals opposed to the raising of the Manapouri Lake level. It was first published in the Otago Daily Times in 1960.

#8 Activities

Planning outline

Curriculum coverage
Achievement Objective: Social Science
Strand: Recording the past
Strand: Community challenges

Levels: 3 RP
Understand how people remember and record the past in different ways

Levels: 4 CC
Understand how people participate individually and collectively in response to community challenges

Materials required
Internet access

Health and Safety
No additional issues related to this activity.

Activity 8a. Save Manapouri

Activity description
Students will make enquiries to find out whether the great Save Manapouri Campaign that ended in the 1970s is remembered today.

Supporting Information
This activity consolidates all areas of supporting info #8.

Location
Classroom

Delivery
The 13 year long Save Manapouri Campaign jolted New Zealanders into an environmental awareness they had not previously had.
If this activity is used as a follow up, students will already know something about the Manapouri Power Station from having completed the Mega Map activity (page 16). They will have seen one or more of the lakes and may also have visited the monument to the Save Manapouri campaign. What answers will students get if they ask adults what the words "Save Manapouri" mean to them?

Give students a few days to collect some information from people they know who may have been around during the time and the internet (eg try wikipedia and search for 'save manapouri campaign'). In class, discuss the responses they collected. Did students find that the Save Manapouri campaign was remembered/ known about?

Create an anniversary spread for a magazine or local newspaper commemorating the campaign.

extension Are there current issues that are of similar importance? (For example wind farms, foreshore and seabed debate.)

Planning outline

Curriculum coverage
Achievement Objective: Social Science
Strand: People and places
Strand: Resource descisions

Levels: 2 PPI
Understand how places influence people and people influence places

Levels: 3 RD
Understand how people make decisions about access to and use of resources

Materials required
Access to the panel on site or copy available on CD or via the DOC website.

Health and Safety
No additional issues related to this activity.

Activity 8b. Which does what?

Activity description
Use the panel to identify the different parts of the control structure.

Supporting Information
Panel at the Lake Te Anau Control Structure.

Location
Start of the Kepler track section 1.

Delivery
Use the panel on site or copy available on CD or via the DOC website to identify the different parts of the Control Structure.

supporting

section 3

Resources and work sheets

Native Wildlife

The Department of Conservation Community Relations Team may be able to help you with additional resources. A bat detector is available on loan, for schools interested in doing a night walk on the track. 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
P O Box 29 Te Anau
Ph 03 249 0200
Fax 03 249 0237
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.

For activities and information on native birds (and pests) visit the Kiwi Conservation Club (New Zealand Forest and Bird) website 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 .

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. 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

Water Quality

Go to 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

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.

Fiordland rocks

Use the information below to identify some of the rocks you have collected. Locate their 'homes' on the map and trace the route they may have taken to reach the point where you found them.

Granite

Granites
May be white, pink or grey.

Possible source – anywhere in central Fiordland.

Diorite

Diorite
Clusters of dark mineral make a speckled pattern on the creamy surface.

Possible source – South or Middle Arm of lake.

Rock type – Granite and Diorite are *igneous rocks* formed 100 to 300 million years ago.

Schist

Biotite Schist
The mineral mica gives schist its silvery sheen.

Possible source – head of South Arm of lake.

Rock type – Schist is a *metamorphic* basement rock formed 500 million years ago.

Quartz

Quartz
Has a glassy look. Quartz is pure silica, one of the commonest minerals.

Possible source – almost anywhere! Quartz can also form bands within older rock.

Ultramafic

Ultramafic
Very high in iron and magnesium. Oxidising (rusting) iron gives the rock its colour.

Possible source – Mount Luxmore or South Arm of lake.

Rock type – Quartz and ultramafic rocks are *igneous*.

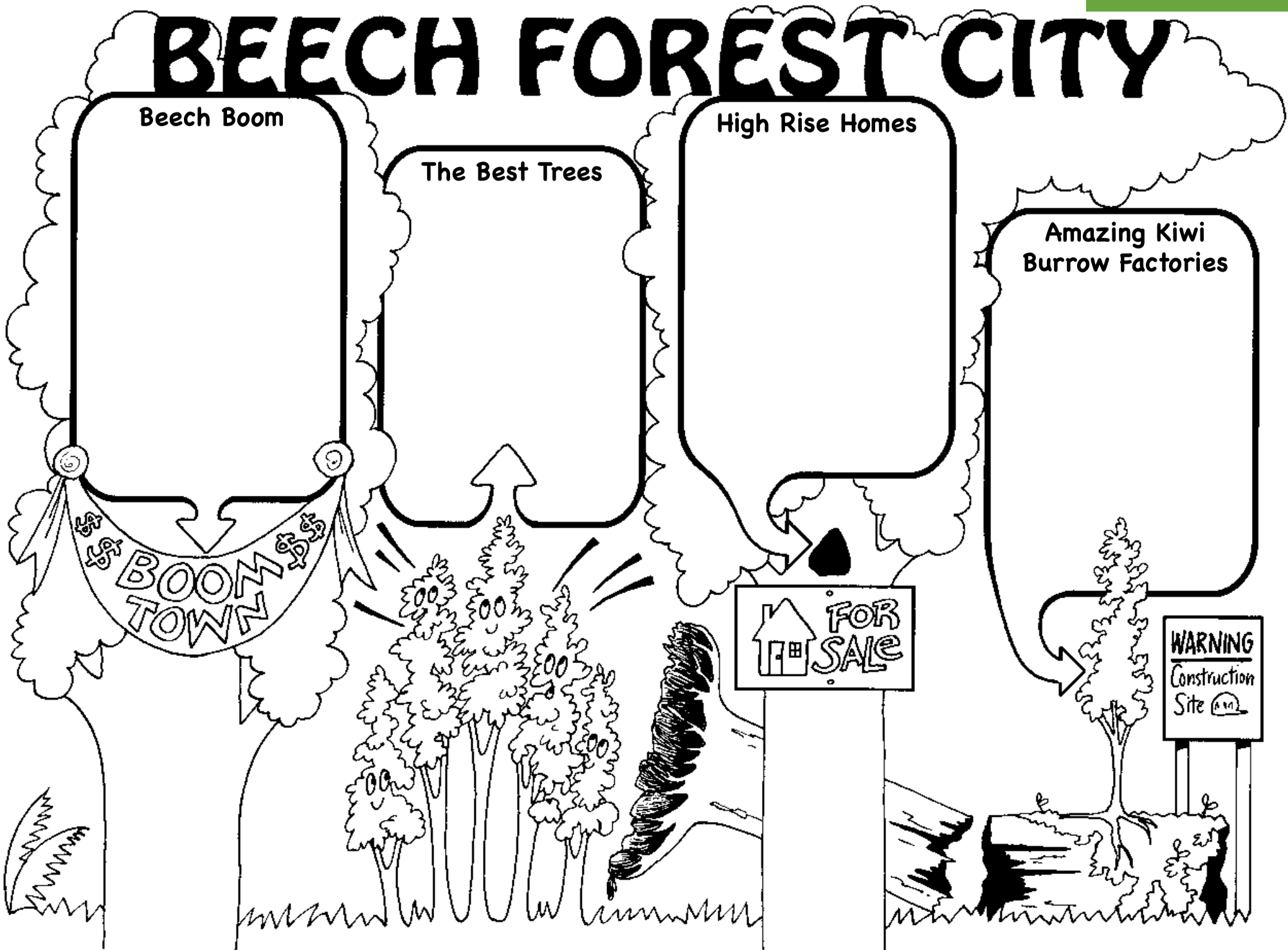
Siltstone

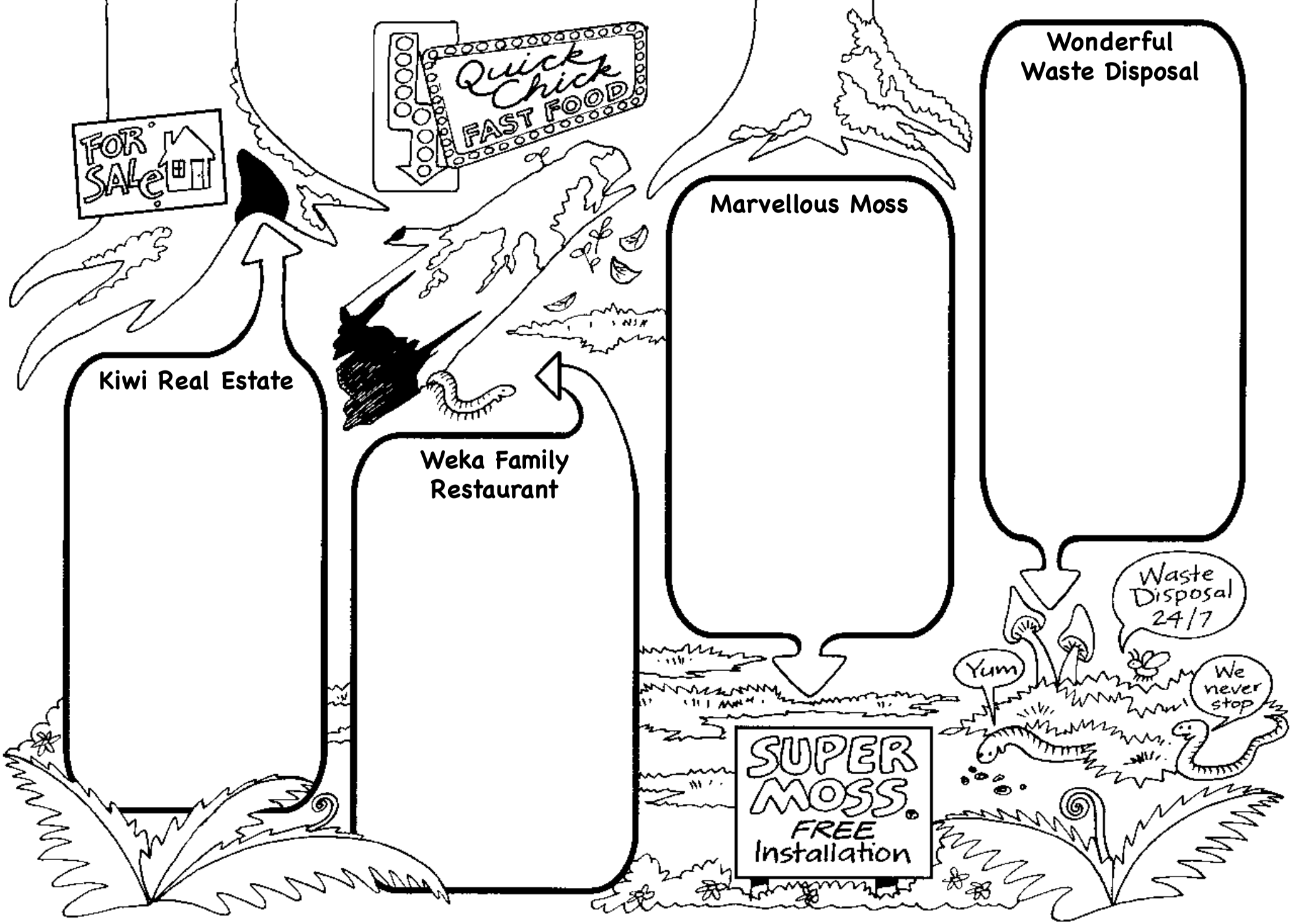
Siltstone and mudstone
Grainy in texture.

Possible source – Key Summit.

Rock type – Siltstone and mudstone are *sedimentary rocks* probably formed 300 to 200 million years ago. These rocks may also be in transition between sedimentary and metamorphic.

BEECH FOREST CITY




FOR SALE
Quick Chick
FAST FOOD
Wonderful
Waste Disposal
Marvellous Moss
Kiwi Real Estate
Weka Family
Restaurant
Waste
Disposal
24/7
Yum
We
never
stop
SUPER
MOSS
FREE
Installation

Beech Forest City

The Best Trees
When a large tree falls it leaves a window in the ceiling of the forest. Beneath this window you can find crowds of young beech trees growing up to the light. In this city, the demolition of old trees makes way for new ones.

Find a group of saplings (young trees) growing in a cluster and use them to demonstrate that only the fastest and fittest will survive to take the place of the old tree. The sapling that is tallest now, is likely to be the winner. Soon, it will overshadow the others.

Explain how this means the trees in this city are top quality!

Beech Boom
Every four to six years all the beech trees in the forest burst into flower at the same time. Insects come to feed on the flowers, and tomtits and fantails feed on the insects. After flowering, the trees make seeds and kaka and kakariki feast on the beech nuts for months. When there is plenty of food, birds can raise bigger families and bird populations get stronger. The forest economy is booming! In beech forest city, you can count on the good times.

Can you find any of these leaves on the forest floor?

See if you can match the leaf to the tree and tell your audience what type of tree it is, and why it means that this city has a great economy!

High Rise Homes
When a female kakariki (parakeet) sits on eggs, the male kakariki brings her food. After 19 days he may have to bring food for six hungry chicks too. Kakariki nest in hollow trees. Big old trees often have hollows inside them. The nest hole may be so high up the trunk that you can't see it.

Find the biggest tree you can. Can you convince any kakariki in the audience this high rise home is just right for them?

Remember that stoats can run right up tree trunks, so it is lucky there are stoat traps in this neighbourhood.

Amazing Kiwi Burrow Factories
A fallen tree trunk with tiny seedlings or small trees growing on it is a kiwi burrow factory. Some of the little trees will eventually grow their roots over the sides of the trunk and down into the soil. When the fallen tree has rotted away, there may still be a hollow, just right for a kiwi burrow, beneath the new tree.

Find a fallen log with little seedlings growing on it. Use it to demonstrate to your audience how well this city is planning for its future.

Kiwi Real Estate
A kiwi pair need a burrow for the female kiwi to lay her egg in.
It needs to be a cosy dry burrow because the male will have to stay there, sitting on the egg, for around 80 days!

Look at the base of trees around you until you find a hole between the roots. This hole could be prime real estate to kiwi. Can you sell it?

Is it a 'fixer upper' or is it ready to move in to? Don't forget to tell your audience that this neighbourhood has great security (stoat traps!).

Marvellous moss
Moss protects this city. Beneath the moss a thin layer of mountain soil lies on the rocky bones of Fiordland. Your city is built on a foundation of soil that could easily wash away, leaving bare rock. Luckily, a blanket of moss covers the ground, soaking up the rain and protecting the soil.

Find a good mossy area. To persuade the audience to become citizens of your city, you'll have to convince them that moss will give the soil unbeatable protection against the rain.

Wonderful Waste Disposal
This is a zero waste city. All food packaging (beetle shells, seed cases etc) is 100% recyclable. Night and day millions of tiny workers turn the fallen leaves, animal droppings and other waste products into wonderful compost.

Dig a hand full of rotting leaf compost from the forest floor. Collect a handfull of pale dusty soil from the roots of a tree that has been blown over by the wind.

Show your audience the rich compost that feeds the re-growth of beech forest city. Compare it to the dry powdery soil. The city's recyclers (the bugs, bacteria and fungi) never stop working, so this city will never stop growing.

Weka Family Restaurant
Weka eat just about anything and enjoy all kinds of bugs. Weka chicks follow their parents around for weeks learning how to find and catch food.

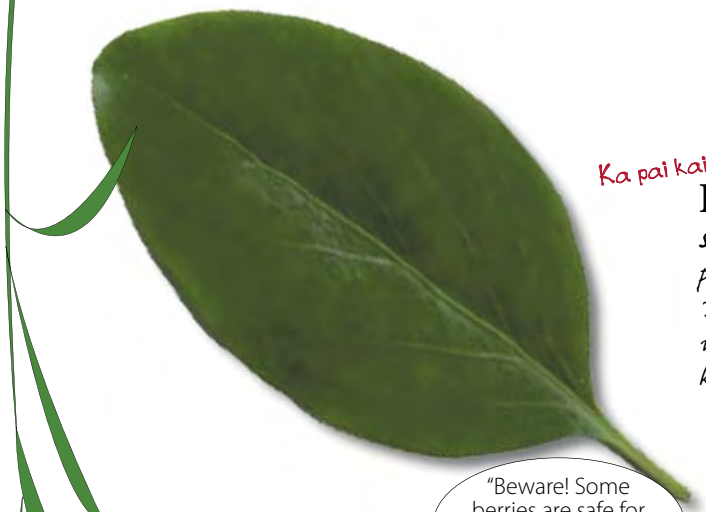
Carefully roll over a rotten log or fallen branch. If the wood is very wet and rotten, you may find worms. If it is moist and crumbly, you may find grubs and beetles and very tiny insects. Moths sometimes shelter in dry dead wood. Please roll back the log or branch and leave the area as you found it.

Imagine your log is a family restaurant for weka. Tell the weka about the delicious grubs, worms, beetles and moths you have on the menu. What do you recommend as the starter, the mains and dessert today?

your yummy trackside menu

THE KEPLER KAPERS BIRD CAFÉ

your local seasonal eatery



Ka pai kai!

Käpuka/Broadleaf

Summer, autumn and winter *- dark purple fruit, pick as you please*

Tucker for tom tits. You can trust kapuka for a snack for most of the year. You'll never go hungry when there are kapuka berries in the forest.

What about this then?
Kapuka leaves are the most delicious food in the forest, to possums and deer. Look for nibbles and gnaws on leaves and branches.

"Beware! Some berries are safe for birds but poisonous to humans"

Tree-top treat

Miro

Late autumn to winter *- fat fruit, ripe and ready to go Hey Kereru! These are the biggest fruit in the forest and you can swallow them whole. Please remember to recycle. Just drop the seeds off somewhere so they can grow into new trees. Thanks.*

Did you know?
This tree is one of the forest giants, but look for seedlings on the forest floor too. The seeds they grew from probably got there by pigeon post.

Small and sweet

Putaputäwëtä /Marbleleaf

Summer long *– star-like flowers attract tasty flies.*
Late summer to early winter *– soft, sweet flesh and small, hard seeds. They're little, but there's lots!*
Kia ora Kiwi. Lots of birds love the berries of this plant, but its Maori name means 'trunk full of weta holes' so there might be a feed here for you too.

Just beautiful.
The leaves of this small tree have a pretty, marbled leaf, especially when the light shines through them.

"Err... put a weta where??"

your yummy trackside menu

THE KEPLER KAPERS
BIRD CAFÉ
your local seasonal eatery

Red means Go!

Totara

Early winter - *beaut fruit, red when ready*

Hey, kaka, this tree has a message for you. When totara seeds are fully formed, the totara fruit turns bright red. This is your signal! The fruit is ready to eat.

Want to know more?
Totara and miro have similar leaves, but the totara will prickle your hand if you grasp it, while the miro is much softer.

Hot for you!

Horopito/Pepper Tree

Spring - *tiny flowers attract tiny insects*
Autumn and Winter - *beautiful black berries*

Kereru café. Your ancestors ate here and stayed off the menu. Olden day Maori did not hunt you when you had been feeding on these berries because they spoilt the flavour of your flesh.

Hot hot hot!
Pepper tree leaves are hotter than chilli and safe for humans to taste. The berries are not recommended.

Berry nice!

Makomako/Wineberry

Spring - *tender leaves and tasty flowers*
Summer - *sweet berries*

Hey, Mohua don't miss out! Everyone's after these leaves and flowers and berries. Rotting fruit and bird droppings attract flies and flies attract spiders. These are your favourite foods, so this is the place for you, especially in summer!

What about this then?
Possums and deer love makomako. Torn leaves and nipped branches will show that they have been feeding here.

splash out *lakeside* menu

THE KEPLER KAPERS
BIRD CAFÉ
your local seasonal eatery

Did you know?
This shrub prefers to grow in the open, so look for it on the lake shore. The leaves have a strong perfume if crushed.

Fast food!

Mānuka

Early summer - honey bees love this nectar so be in quick to get your share
Autumn - tiny seeds packaged in neat capsules

Food for fantails! Millions of speedy little insects come to feed on the nectar and pollen from these flowers. You can feast on them, but watch out that karearea the falcon doesn't come and feast on you!

Perfect for parakeets! This is food and feather care for you. Eat the tiny seeds and rub the scented oil from the leaves into your feathers to keep them clean and glossy.

Bugs and berries

Tātarāmoa/Bush lawyer

Late spring through to early autumn - like the humans' blackberries, and just as prickly

Weka this is the spot for you! The flowers and berries attract insects, birds, lizards and mice. These are all things you like on your menu so hang out here and don't go hungry. At night, ruru (morepork) can hunt here too.

Watch out!
This is a climbing plant with sharp thorns.

Slow food!

Weeping Matipo

August to May - berries galore, but a tangle of branches means dining takes time

Treats for tomtits. In the winter little birds like you can creep amongst the branches and take your time picking berries. You'll be sheltered from the weather, and safe from the sharp eyes of the falcon.

Lots of options...
Many native shrubs have a weeping or tangled way of growing. If you can't find a plant with heart-shaped leaves like these, just look for any twiggy, tangly little shrub instead.

splash out *lakeside* menu

THE KEPLER KAPERS
BIRD CAFÉ
your local seasonal eatery

Christmas cracker

Yellow Mistletoe

Christmas time - *nectar with a twist*
Late summer - *sweet and super sticky berries*

Tui, this one's for you! Twist the tightly closed flower with your beak and there will be an explosion of yellow pollen. Have a sip of the sweet nectar, then twist another flower. Each time you do this, you're helping to pollinate the plant. Pollination means the plant can make berries, so come back later in the summer and eat your fill.

What about this then?
Mistletoe grows in trees. It plumbs it roots into the tree to get free water and minerals. Mistletoe rarely harms the tree it grows on. It is a very rare plant.

Go for Gold!

Köwhai

Spring - *thousands of single-serve nectar sachets on every tree*
Early summer through to autumn - *dainty leaves are sure to please*

Come on kaka! Join the crowds of nectar-loving birds at the kowhai tree. You need fattening up after a long hard winter.

Come on kingfisher! Kowhai grow on the edge of your lake and river hunting grounds. The little mice and lizards that come to feed here make a nice change from fish.

Did you know?
This tree sometimes loses its leaves in winter but its long, brown seed pods make it easy to recognise even without leaves.

Stop!!!
Never touch the leaves or pick the berries of this plant. It is a wonderful food for birds (possums love it too) but it is deadly poisonous to humans.

Best for birds!

Tutu

Late spring to Autumn - *Strings of juicy black berries*

Tea for the tui. Birds like you can safely enjoy the juicy berries and snap up flies that have come to drink the sweet juice.

Bird table .....

Appetiser .....

.....

Starter .....

.....

Main course .....

.....

Dessert .....

.....

SUMMER

Bird table .....

Appetiser .....

.....

Starter .....

.....

Main course .....

.....

Dessert .....

.....

AUTUMN

Fold here

ORDER CARD

WINTER

Bird table .....

Appetiser .....

.....

Starter .....

.....

Main course .....

.....

Dessert .....

.....

SPRING

Bird table .....

Appetiser .....

.....

Starter .....

.....

Main course .....

.....

Dessert .....

.....

Fold here

LOCATION LOCATION LOCATION

Is this a good home for native birds?

ACTIVITY SHEET

USE WITH CAFÉ MENUS

KAKA

- ☐ PREDATOR CONTROL
- ☐ NEST HOLES IN TREES
- ☐ INVERTEBRATES SUCH AS HUHU GRUBS
- ☐ NECTAR, ESPECIALLY FROM MISTLETOE

KAKARIKI

- ☐ NEST HOLES IN TREES
- ☐ FLOWER BUDS, LEAVES AND SEEDS (ESPECIALLY BEECHNUTS)
- ☐ INVERTEBRATES LIKE LEAF MINERS AND SCALE INSECTS

MOHUA (YELLOWHEAD)

- ☐ PREDATOR CONTROL
- ☐ NEST HOLES IN TREES
- ☐ INVERTEBRATES ESPECIALLY SPIDERS AND FLIES

CANOPY

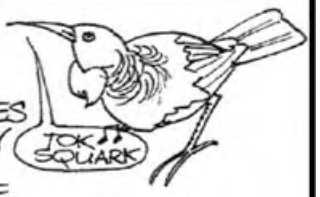
KAREAREA (FALCON)

- ☐ FALLEN LOGS OR CLIFF LEDGES FOR NESTING
- ☐ SMALL AND LARGE BIRDS
- ☐ MICE AND RATS
- ☐ LARGE INVERTEBRATES LIKE HUHU BEETLES

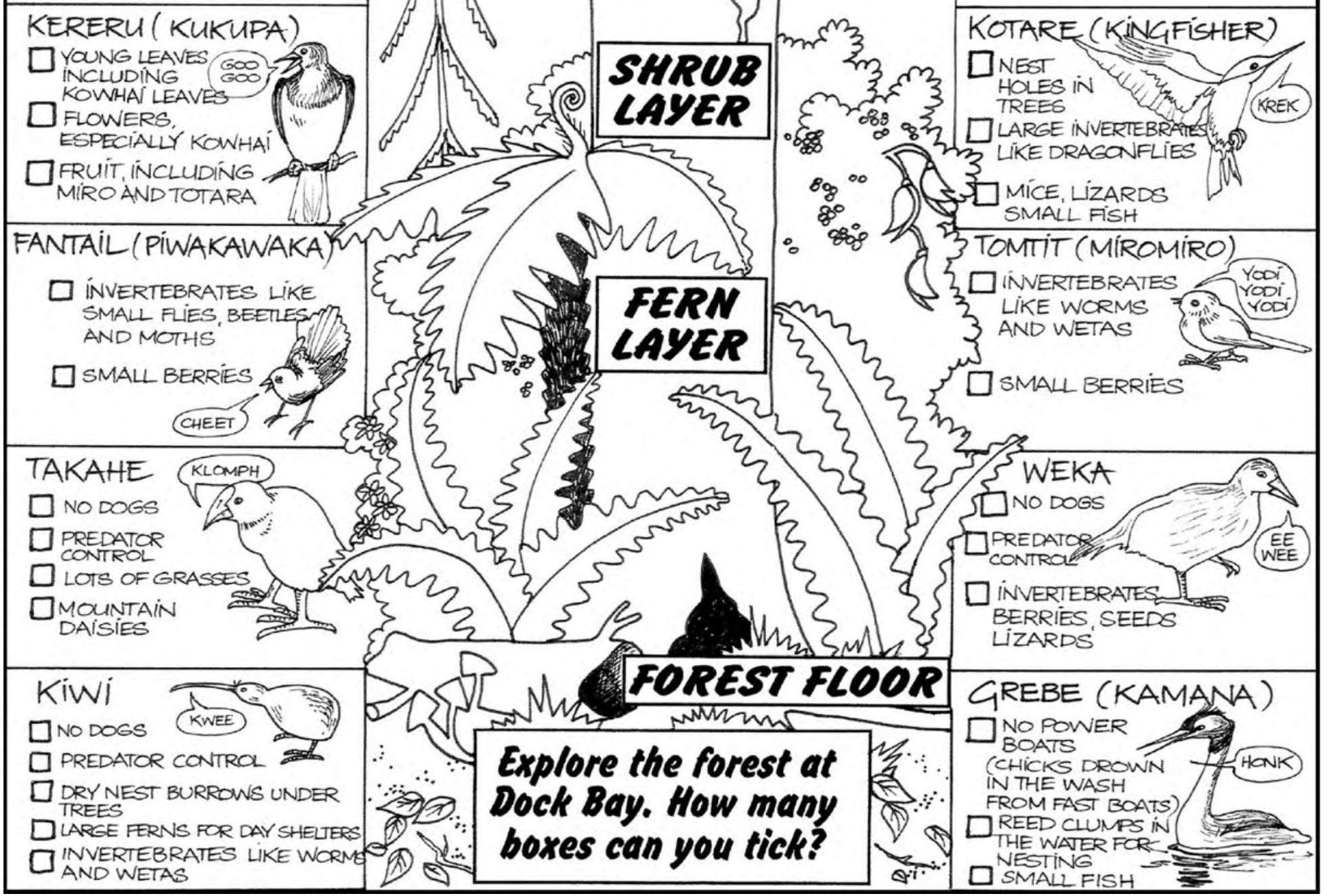
RURU (MORE PORK)

- ☐ NEST HOLES IN TREES
- ☐ INVERTEBRATES LIKE LARGE MOTHS
- ☐ SMALL BIRDS, MICE BATS AND LIZARDS

TUI



- ☐ NECTAR AND BERRIES ESPECIALLY FROM MISTLETOE
- ☐ INVERTEBRATES LIKE SPIDERS AND STICK INSECTS


KERERU (KUKUPA)
YOUNG LEAVES INCLUDING KOWHAI LEAVES
FLOWERS, ESPECIALLY KOWHAI
FRUIT, INCLUDING MIRO AND TOTARA
GOO GOO
SHRUB LAYER
KOTARE (KINGFISHER)
NEST HOLES IN TREES
LARGE INVERTEBRATES LIKE DRAGONFLIES
MICE, LIZARDS SMALL FISH
KREK
FANTAIL (PIWAKAWAKA)
INVERTEBRATES LIKE SMALL FLIES, BEETLES AND MOTHS
SMALL BERRIES
CHEET
FERN LAYER
TOMTIT (MIROMIRO)
INVERTEBRATES LIKE WORMS AND WETAS
SMALL BERRIES
YODI YODI YODI
TAKAHE
NO DOGS
PREDATOR CONTROL
LOTS OF GRASSES
MOUNTAIN DAISIES
KLOMPH
WEKA
NO DOGS
PREDATOR CONTROL
INVERTEBRATES BERRIES, SEEDS LIZARDS
EE WEE
FOREST FLOOR
KIWI
NO DOGS
PREDATOR CONTROL
DRY NEST BURROWS UNDER TREES
LARGE FERNS FOR DAY SHELTERS
INVERTEBRATES LIKE WORMS AND WETAS
KWEE
Explore the forest at Dock Bay. How many boxes can you tick?
GREBE (KAMANA)
NO POWER BOATS (CHICKS DROWN IN THE WASH FROM FAST BOATS)
REED CLUMPS IN THE WATER FOR NESTING
SMALL FISH
HONK

Bring back the birds!

Use this checklist to assess if your school environment is a good home for native birds.

	Lots	Some	None
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

Check list

Is there leaf litter? Deep beds of leaf litter support lots of tiny insects and attract birds like fantails and grey warblers.

Are there flaxes? Flax flowers have nectar that attracts tui and bellbirds.

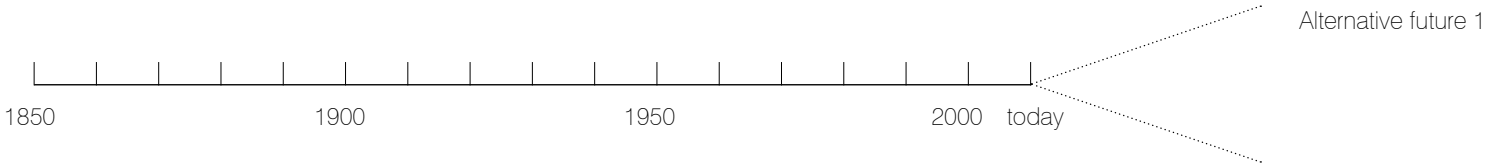
Are there native shrubs that produce berries? Native pigeons and silver eyes love berries. (Beware of berry-bearing weeds like cotoneaster. These plants can feed birds, but also destroy native habitat)

Are there toetoe or grasses that are allowed to go to seed to attract seed eating finches?

Can you see worm casts on the playground? Introduced birds such as blackbirds and thrushes hunt worms, and these birds provide a meal for native falcons.

Stuck with stoats

Cut out the dates and text and match them together so that the text is with the correct date. Draw a line to the timeline to show the course of events.



1864

1870

1879

1883

1884

1890

1900

1930

1947

1967

1997

1999/2000

2009

The rabbits have bred really well. Hundreds of thousands of sheep and cattle die of starvation because rabbits have eaten all the grass.

Kakapo were common when the first settlers arrived in Fiordland. In the 1920s people walking the Milford Track could still see them. Now, they are rare.

This is the last year in which the native thrush or piopio was seen. The piopio was declared extinct in 1963. The last sighting of piopio was in Fiordland.

Wild rabbits are brought to New Zealand. They are let go in the wild to breed so that settlers can hunt them for food and sport.

Warmer than usual weather causes beech trees to make seeds two years running instead of once every four to six years. There are more mice and rats in the forest because of the extra food. There are more stoats in the forest because there are more mice and rats for them to eat. When the seeds run out, the mice and rats stop breeding. A big population of hungry stoats eats more birds than usual. Only a handful of endangered mohua (yellowhead) survive.

Ferrets spread across the country. Two ferrets are caught in rabbit traps on what is now the Kepler Track.

Stoat trapping begins in Fiordland's Eglinton Valley.

A stoat is seen swimming to the Resolution Island bird sanctuary in Fiordland's Dusky Sound. The last little spotted kiwi on the island are taken to Kapiti Island in the North Island.

The piopio and the South Island kokako are thought to be extinct. Kakapo survive only on pest free islands. Pest control (poisoning possums and rats, shooting deer and pigs and trapping stoats) on the mainland helps the remaining native birds.

This is the last year in which the South Island kokako is seen. The last sighting of South Island Kokako was in Fiordland.

The first stoats are seen in the Fiordland beech forest. People notice that there are suddenly fewer birds.

Ferrets are brought to New Zealand. They are let go in the wild to breed so that they will hunt the rabbits.

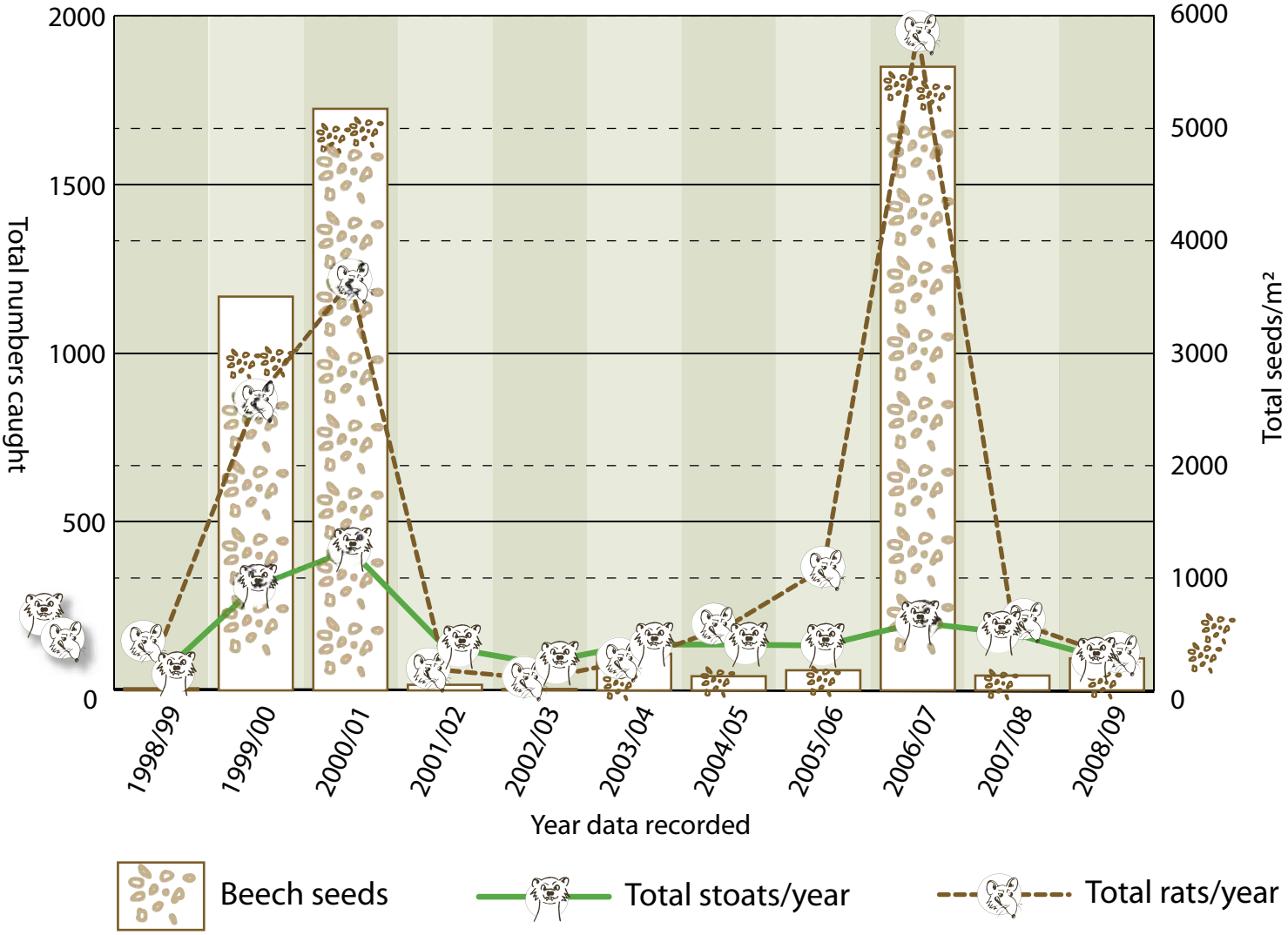
The ferrets are not killing enough rabbits. Stoats and weasels are brought to New Zealand and let go in the wild to breed so vthat they will hunt the rabbits.

1. What if stoat trapping is continued and extended to more areas?
2. What if stoat trapping was stopped?
3. What if a disease could be found that would kill stoats?
4. What if a predator was introduced to hunt the stoats?
5. What other possibilities can students suggest?
6. What if warmer summers happen more often due to climate change, causing beech trees to seed more often that once every four to six years?

Beech seed / Rat roller-coaster

Rat and stoat captures

The Eglinton Valley (on the road to Milford) stretches for 40 kilometres. Along its length there are 200 two-trap tunnels. They are spaced at 200 metre intervals. The graph below shows how numbers of rats is linked to the number of beech seeds on the forest floor.



Questions

1. Which side of the graph records the number of stoats and rats caught?

2. Which side of the graph records the number of seeds per square metre of the forest floor?

3. Where are the years recorded?

4. What was the longest time that trees rested in between heavy seeding years?

5. What was the shortest time?

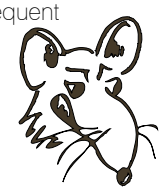
6. Why did rat numbers rise when beech trees seeded heavily?

7. Why did stoat numbers rise when rat numbers were high?

8. The usual resting time between seeding years is 4 to 6 years. Can you predict when the next seeding year might be?

Extra question

9. Warmer than usual summers occur in Fiordland every four to six years, triggering beech seeding. Climate change could have an effect on this pattern. What consequences could more frequent warm summers have?



Evaluation form

Kepler Track 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: Community Relations Team, Department of Conservation, P.O. Box 29, Te Anau 9600, Ph: (03) 249 0200 Email: ccarter@doc.govt.nz