



## STATEMENT ABOUT CURRICULUM LINKS AND THE KITS

Because this kit is site-based and most kit users will visit the site, the main curriculum objectives will be based around an **environmental theme**.

The strongest links will probably be with the **science, social studies and health and physical education** documents, although aspects of the **art** curriculum is important in getting the best value from a visit.

Of course the **English** document is always the basis of any study as the other documents continually feed in material that develop students' learning in oral, written and visual language. Similarly, good opportunities exist at all sites to explore many ideas in all of the mathematics strands.

The best summary of links for the seven curriculum areas can be found in: **Ministry of Education. 1999. *Guidelines for Environmental Education in N.Z. Schools*. Ministry of Education. Wellington . New Zealand.**



### 1. THE ARTS



Ruakuri Caves and Bush Scenic Reserve offers opportunities for students, at appropriate levels, to develop concepts in each of the four interrelated art strands:

- Developing practical knowledge in the arts.
- Developing ideas in the arts.
- Communicating and interpreting in the arts.
- Understanding the arts in context.

The Arts are made up of four strands:

- 1a. Dance
- 1b. Drama
- 1c. Music
- 1d. Visual Arts

#### 1a. Dance

Pupils can create dances using their own movements and those of others. Emphasis should be placed on expressing the meaning of what they portray.

#### 1b. Drama

Encourage pupils to develop ideas in group situations and (according to their abilities and confidence) either act them out in a spontaneous way or write a brief outline of the main ideas to present to their group or the class.



### **1c. Music**

Encourage listening to music that represents / expresses ideas about the environment and culture. Pupils can use instruments available in the school to express the sounds they have heard and to combine in groups to produce small pieces they can perform amongst themselves. They can experiment in making symbols to represent the sounds they have heard and use them in group situations with either voice or instruments.

### **1d. Visual Arts**

There is a need to ensure that the objectives and media fit the levels of pupil skill and experience when setting the topic.

**The most important aspect of this area of the curriculum is to ensure that ALL students feel that they have achieved success and that adult concepts are not placed on their efforts. Only in this way will enthusiasm be gained for further effort.**

## **2. SOCIAL STUDIES**

**Social Studies education aims to enable students to participate in a changing society as informed, confident and responsible students.**

Ruakuri Caves and Bush Scenic Reserve offers opportunities for students, at appropriate levels, to develop concepts in each of the five strands:

- 2a. Social Organisation
- 2b. Culture and Heritage
- 2c. Place and Environment
- 2d. Time, Continuity and Change
- 2e. Resources and Economic Activity

### **2a. Social Organisation:**

- How people organise themselves to visit the reserve.
- What type of groups of people they are?
- How groups organise themselves to respond to reserve management issues.
- How Department of Conservation organises staff to manage the reserve.

### **2b. Culture and Heritage:**

- Aspects of Maori tradition associated with the reserve.
- The traditional use of the reserve by family, caving, community, visitor and educational groups.

### **2c. Place and Environment:**

- Why the reserve is a significant environment for people.



- How people's activities influence the environment.
- How and why people's perceptions of the reserve are reinforced or changed by information or experience.
- How and why people seek to resolve differences over how places and environments should be used.
- How people express a sense of belonging to the reserve.
- The importance of the place and environment for recreation.

#### **2d. Time, Continuity and Change:**

- How past management decisions change the nature of the reserve.
- How beliefs and ideas in society change and how this impacts on the reserve.
- How the process of change over time is used as a tool for reserve management.
- How Maori use of the reserve has changed over the centuries.

#### **2e. Resources and Economic Activities:**

- How Maori used the reserve as a resource in the past.
- The reserve as an economic resource.

### **3. SCIENCE**

Learning in science is fundamental to understanding the world in which we live and work. It helps people to clarify ideas, to ask questions, to test explanations through measurement and observation, and to use their findings to establish the worth of an idea. (Science in the N.Z. Curriculum p.7).

Of the four contextual strands:

- 3a. Planet Earth and Beyond,
- 3b. The Living World,
- 3c. The Physical World, and
- 3d. The Material World

Ruakuri Caves and Bush Scenic Reserve studies will particularly enhance development of knowledge, understanding, skills and attitudes in **3a. planet earth and beyond** and **3b. the living world** strands.

#### **3a. Planet Earth and Beyond:**

Achievements in Aims One and Two (Science Curriculum p.106) lead to achievement of Aim Four: investigate how people's decisions and activities change the physical environment, and develop a responsibility for the guardianship of the planet and its resources. Any achievement in this aim through studies in the reserve is probably the most important of any in the entire N.Z. Curriculum Framework.

Research of published guides and signage in the reserve will give an interpretation and understanding of the history and geological structure of the Ruakuri Reserve area.

**3b. The Living World:**

Development of concepts in all of the four achievement aims (science curriculum p.52) could be attained during a reserve project with the first three aims culminating in an enhanced understanding of Aim Four. This can be achieved through appropriate activities at any level from one to eight.

## **4. HEALTH AND PHYSICAL EDUCATION**

Ruakuri Caves and Bush Scenic Reserve offers opportunities for students, at appropriate levels, to develop concepts in each of the four strands:

- 4a. Personal Health and Physical Development
- 4b. Movement Concepts and Motor Skills
- 4c. Relationships with other People
- 4d. Healthy Communities and Environments.

**4a. Personal Health and Physical Development:**

- Identify and use safe practices and risk management in the reserve.
- Share ideas and beliefs about how the use of the reserve enhances person health.

**4b. Movement Concepts and Motor Skills:**

- All achievement objectives in this strand could be met through the development of concepts relating to safe and efficient walking skills in a group situation.

**4c. Relationships with other People:**

- Development of skills relating to planning safe and enjoyable experiences in the reserve with class or family groups.
- Develop skills in relating to other group members while in the reserve - to maximise enjoyment and positive learning experience outcomes.

**4d. Healthy Communities and Environments:**

- Share ideas to identify factors that relate to reserve use and community mental and physical health.
- Identify concepts that are used in the management of the reserve environment that enhance the wellbeing of the plants and animals (ecosystem).

# TEACHER STUDY SHEETS

## I. AUDIO AND VISUAL ARTS



This site offers wonderful opportunities for teachers to extend and further develop the imagination and creativity of students. Depending on the emphasis the teacher wishes to gain from the visit, these aspects could be used to extend the activities offered through other curriculum links or could be developed as the major unit with the rest tying into it. This would need to be decided before the visit and after a pre-visit by the teacher (highly recommended).

Suggested ideas for your class to use when designing their artwork

- Explore the wonder of nature encountered on the walk.
- Look at the formation of the limestone rocks, with their unique and powerful structure.
- Observe the size, height and strength of the forest trees rising above in all directions.
- See the patterns made by the light playing on the paths.
- Listen to sounds of water, wind and birds calling out their greetings or warnings.
- Feel the mystery of the unknown as you travel further into the 'bush'.

### Let your imagination go wild!

The investigation sites map (page 34) shows sites (a) (b) (c) and (d) which can be used to develop **imaginative units**. Use your imagination to answer the following questions:

- Who lives in this forest?
- What kind of society do they have?
- Are they harmonious or are there different groups?
- How do they survive?
- Who can see them?
- Do they have programmes to take care of the forest?
- What do they look like?
- Which parts of the forest show evidence of habitation, dwelling-places, work sites, entertainment areas, burial areas?

It is suggested that these ideas be developed after pre-visit work has been taken in the classroom working around a theme of imaginative societies.

Suggested references that could be used include:

### Books

On Maori Mythology  
Greek Mythology  
The Lion, the Witch and the Wardrobe  
Where the Wild Things are  
Paper Bag Princess



Check through your School Journals, they will provide a wealth of material that could be incorporated into the unit.

### **Music**

In the Hall of the Mountain King

War of the Worlds

Native Birds Tape

## **II. SOCIAL STUDIES - TOURISM IN THE RESERVE**



Pupils could undertake a survey to establish what, if any impact tourists have on the reserve. For example:

- What is the biggest impact on the environment?
- What benefits result from tourist visits?
- Where do the visitors come from?
- Are they first time visitors?
- Why did they choose to visit Ruakuri Caves and Bush Scenic Reserve?
- How did they find out about this reserve?

### **Back at school activities**

- Contact (email/fax) local information centres, Waitomo Museum of Caves, and Otorohanga Kiwi House to obtain information and statistics about visitors to the area.
- Collate data into graphs
- Develop plays based on the interviews they carried out with the visitors
- Display graphs and findings about the reserve in your local community to encourage people to visit the reserve.
- Offer to organise and guide visits to the reserve – you could have a family/grandparents day. Older students could offer to take a special needs unit within their school to the reserve.



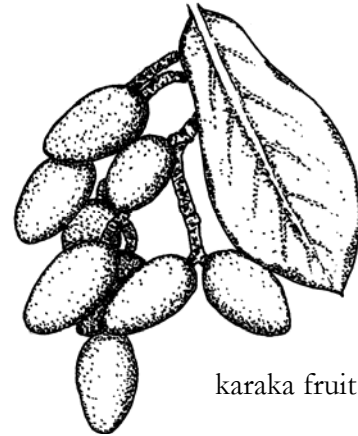
### III. SOCIAL STUDIES – TRADITIONAL LOCAL MAORI USES OF NATIVE PLANTS

Please note that some signs no longer have corresponding trees growing next to them.

#### Opapaka Pa

About 1km east of Waitomo village is a sign to the Opapaka Pa Track. The return walk is 45 minutes and it is worth taking the time as interpretive signs identify different native plants and explain the traditional uses of each plant including:

- foods to eat and drink
- hunting, fishing and other food gathering equipment
- storage and cooking containers
- weapons and tools
- weaving materials
- clothing materials
- dyes, colours and paints
- construction materials
- sleeping materials
- medicines
- perfumes
- musical instruments, poi, toys
- fire making, torches.



karaka fruit

Divide students into ‘buddies’ and tell them which panels to look for (for example each pair could be told to look for a different plant use).

Get students to sketch the plant they have found, and write down what it is used for:

<p>Name of plant: _____</p> <p>Sketch the plant below:</p> <p>What shaped leaves does it have? How are leaves arranged on a stem? Any distinguishing features?</p>	<p>List uses for the plant you’ve found:</p>
<p>Name of plant: _____</p> <p>Sketch the plant below:</p> <p>What shaped leaves does it have? How are leaves arranged on a stem? Any distinguishing features?</p>	<p>List uses for the plant you’ve found:</p>

## Ruakuri Bush Walk

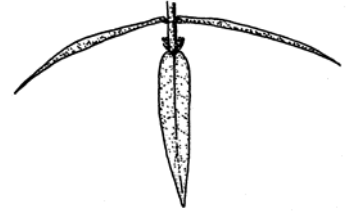
At Ruakuri, ask students to locate and label (on the map provided on page 30) as many trees and their uses as possible. Look out for the following plants:



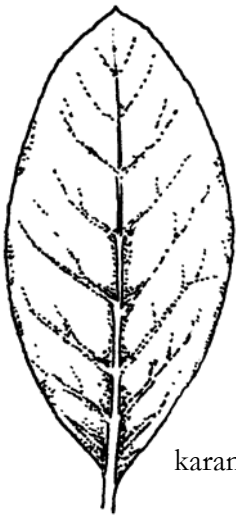
kawakawa



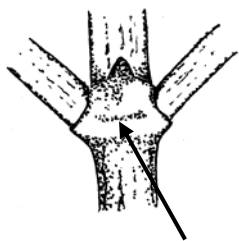
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koromiko

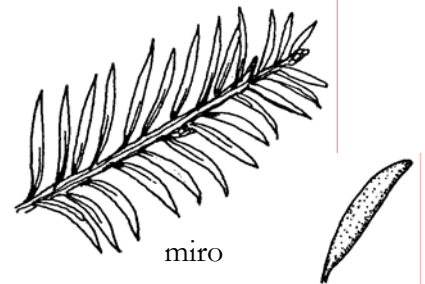
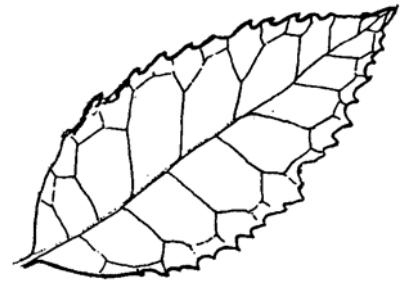


karamu



Look for 'stipules' at base of pairs of leaves.

lacebark



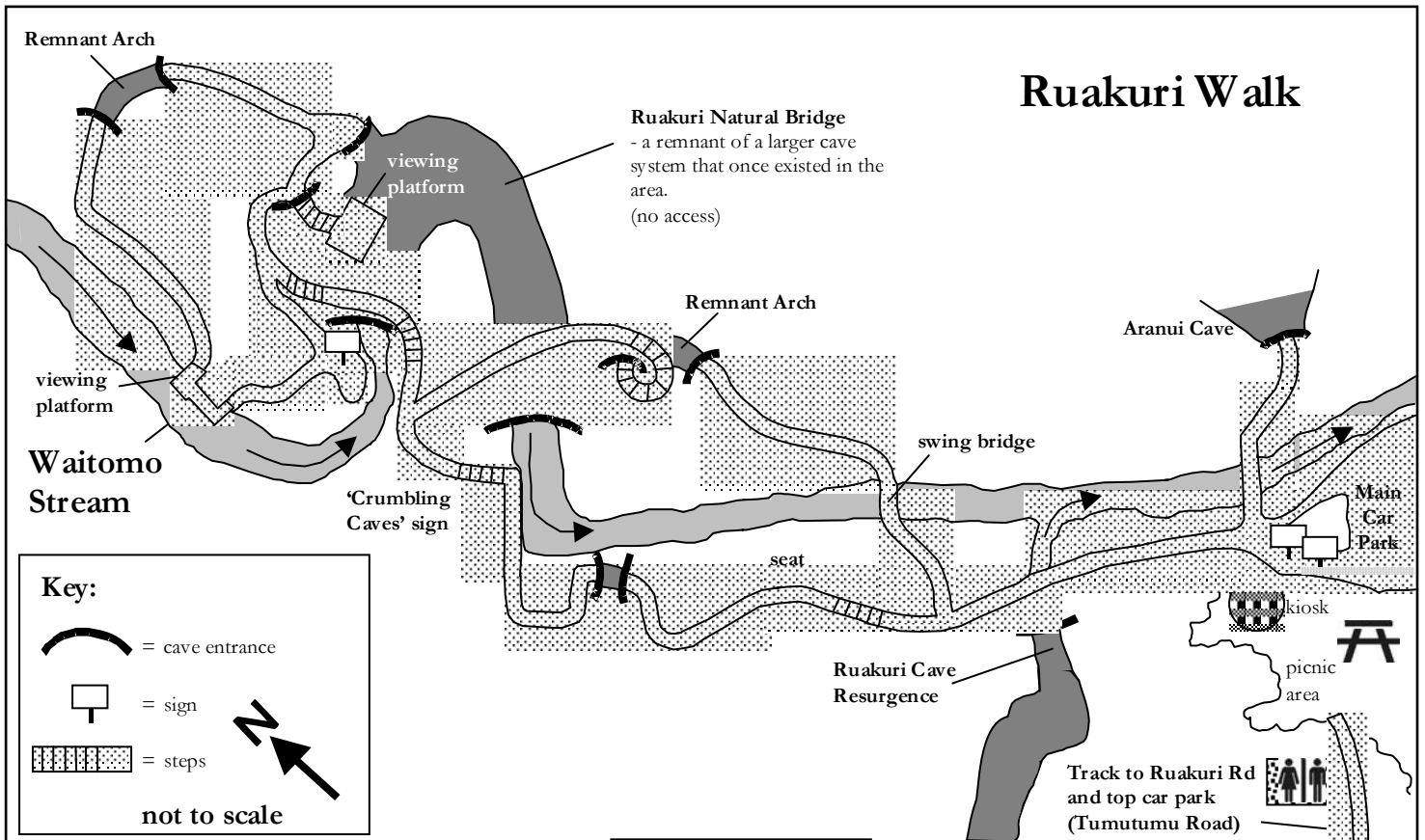
miro

## Back at School

Collate this information into a class map of the Ruakuri walk, showing where the plants are located and listing their traditional Maori uses. This theme could be further developed to include drawings of the plants and introducing language and performing arts by creating plays based on the diagnostic skills, gathering of plants and preparation of plants for use.



# MAP FOR LOCATION OF NATIVE PLANTS



## Using the map

Each individual or group is to have a copy of the above map.

Have one person record on the map the location of different species found.

Add to the example key below, or develop your own.

Code:	Plant / Tree:	Uses:
A	Kawakawa	
B	Kohekohe	
C	Koromiko	
D	Karamu	
E	Lacebark	
F	Miro	
G	Pukatea	
H	Rewarewa	
I	Rimu	
J	Tawa	

## TIPS ON USING THE SCIENCE RECORDING SHEET

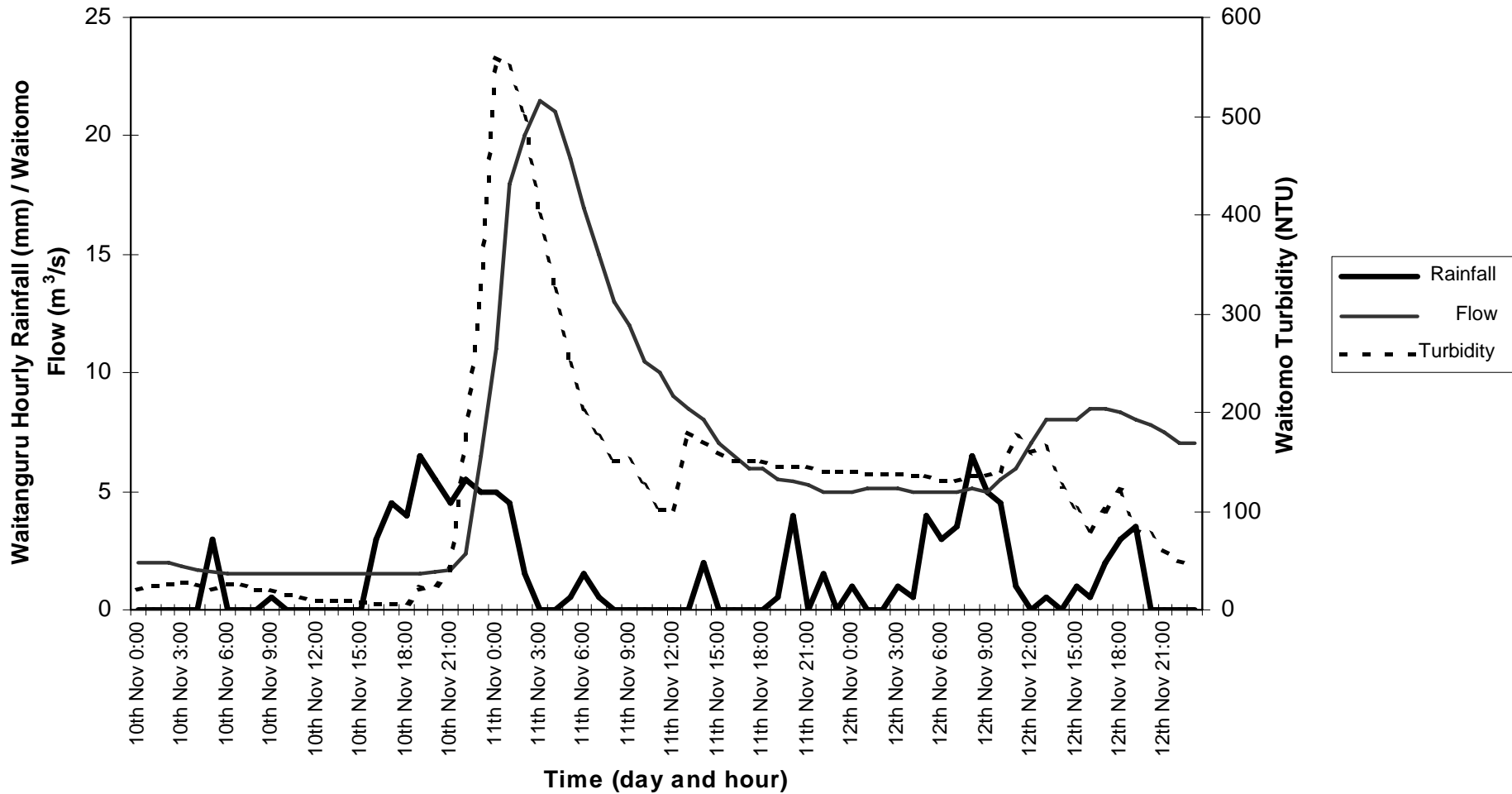


- ❖ To complete the activities in the recording sheet, you will need to book and collect one of three site investigation kits from the education office at the Waitomo Museum of Caves.
- ❖ The education office will photocopy your completed recording sheets so they can load the information into a database that you will be able to access on their web page.
- ❖ Over time and as more schools record data it is hoped that trends in environmental conditions will be able to be detected.
- ❖ Primary schools would be advised to organise the responsibility of recording the data with an adult supervisor in the group.
- ❖ Secondary pupils could make either individual records or group summaries.
- ❖ Water clarity assessments can be related to recent rainfall events in the local area. The best rain gauge to use is the Environment Waikato record from Waitanguru rainfall from the past seven days; go to this through the web at [www.ew.govt.nz/ourenvironment/river](http://www.ew.govt.nz/ourenvironment/river).
- ❖ The Waitomo Stream is monitored by Environment Waikato. Some of their records are included in this kit. Erosion control has been undertaken in the stream catchment for many years to reduce sediment in the water to stop silting of the glow-worm caves during floods.
- ❖ The Waitanguru gauge is in the Mangaotaki River catchment about 20km south west of Waitomo.

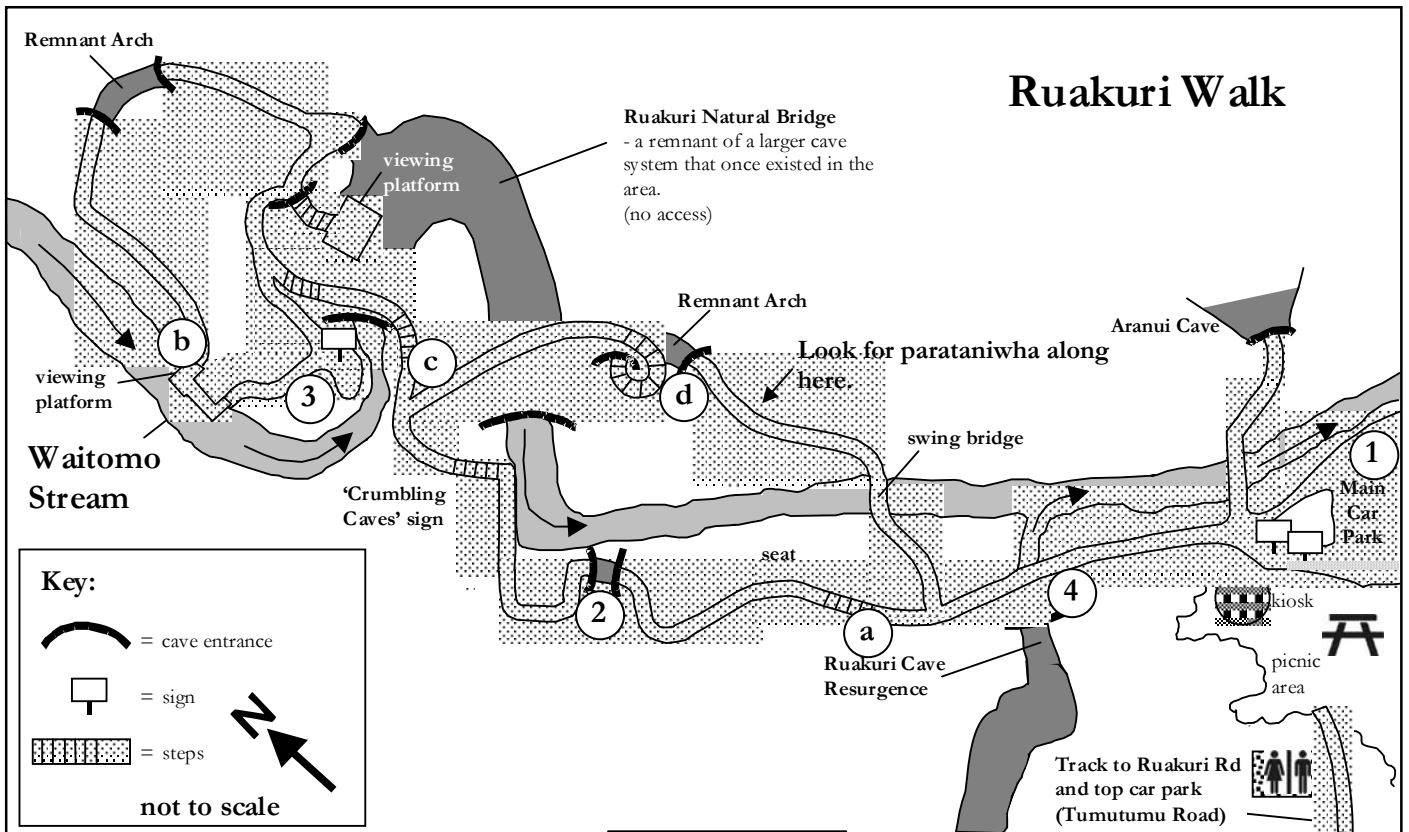
The graph on page 32 shows how the amount of water, measured in cubic metres flowing past each second ( $\text{m}^3/\text{s}$ ) increases dramatically soon after heavy rain. For example, the flow increases from about  $2 \text{ m}^3/\text{s}$  to  $21 \text{ m}^3/\text{s}$  in the six hours from 8pm on 10 November 1999 to 2am on 11 November 1999.

Notice how rapidly the water clarity decreases, ie the water becomes more turbid (measured in nephelometer turbidity units). The water goes from very clear around 5 NTU to about 560 NTU. During the flood, the water would be the colour of mud and could be covering the path.

### Waitomo at Aranui Caves Bridge 10th to 12th November 1999



# RUAKURI INVESTIGATION SITES MAP



## Sites for Audio and Visual Arts:

The following sites can be used for audio and visual arts activities, and for the development of **imaginative units**:

- **Site (a)** Shows limestone formations.
- **Site (b)** An ideal habitat for imaginary creatures.
- **Site (c)** A natural 'theatre' with 'stage' area for meetings and performances.
- **Site (d)** Look for imaginary creatures in the contours of tree roots, rock formations, etc.

## Ruakuri Investigation Sites

The sites ① ② ③ and ④ are used to collect information that can help in the future to find out more about the reserve environment and monitor any changes that may be taking place.

- **Site ①** is located in the lower car park.
- **Site ②** is located between the seat at the top of the first steps and the 'Crumbling Caves' sign.
- **Site ③** is in the area between the 'Power of Water' sign and the boardwalk on the stream edge.
- **Site ④** is located near the Ruakuri resurgence.

Use the following **Science Recording Sheet** for activities at these sites.



## IV. SCIENCE RECORDING SHEET

School: \_\_\_\_\_ Class: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ am \_\_\_\_\_ pm

This information will be used to monitor changes that occur in the Ruakuri Caves and Bush Scenic Reserve over the seasons and between years.

### SITE ONE: The car park and picnic area.

- 1. Microclimate.** Use the thermometer to record the temperature in the lower car park. Lay it on the ground and leave for two minutes before making an assessment. Make an assessment of the light levels, bright (high light level), dull (cloud cover), shade (low light level). Assess the wind strength, eg calm, light, breeze, windy.

Light level: \_\_\_\_\_  
 Air temperature: \_\_\_\_\_  
 Wind: \_\_\_\_\_

### 2. Tourism

Total number of vehicles in the lower car park:

\_\_\_\_\_

Number of vehicles obviously owned by a tour company:

\_\_\_\_\_

Estimate the number of visitors using the track during your visit:

\_\_\_\_\_

- Use the 'Pest Control' display panel section on page 30 as an example of focussing on the information displayed. In this space summarise the most interesting information learnt from the panel.

\_\_\_\_\_

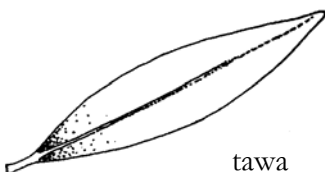
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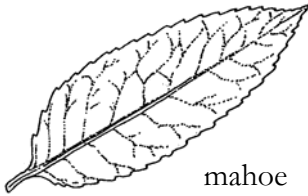
\_\_\_\_\_

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### SITE TWO: From the seat at the top of the first steps through the tunnel to the 'Crumbling Caves' sign.

- 1. Forest Health.** Tawa and mahoe trees are common along this section of the track between the seat to the cave tunnel.
  - Look for their leaves on the path, as this will indicate what tree you are standing under.
  - Use the Native Plant Identification Guide to identify the leaves.
  - The trunks by the boardwalk railings are mostly tawa.





- Use the kit to assess the amount of damage possums are doing by eating the leaves of tawa and mahoe trees (see pages 32 and 33).

2. Study the 'crumbling caves' sign. In the space below make a summary of the processes that form caves and natural bridges:

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### **SITE THREE: The area by the 'Power of Water' sign.**

1. Microclimate. Record the conditions at this site as suggested for 'site one'

**Light level:** \_\_\_\_\_  
**Air temperature:** \_\_\_\_\_  
**Wind:** \_\_\_\_\_

Summarise the differences between the two sites:

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2. Study the 'Power of Water' sign. Summarise below the important points in understanding the relationship between water and limestone:

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3. On the boardwalk beside the Waitomo Stream notice the appearance of hanging moss on the trees. After exploring the area record where the moss grows best and why:

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**SITE FOUR: The area around the Ruakuri Resurgence.**

1. Water sampling at Waitomo Stream.
- ❖ Temperature: Clip the cord to the thermometer and place in the water, leave for two minutes, carefully retrieve and record the temperature with water still in the bottom

Water temperature: \_\_\_\_\_

- ❖ Clarity: Use the clarity tube – following the instructions in the kit. Take care not to allow any bottom sediments to enter.

Assess the clarity (turbidity): \_\_\_\_\_

- 1 = clear like tap water,
- 2 = clear but with some sediment,
- 3 = murky,
- 4 = very murky with sediment settling on the bottom.

2. Ruakuri Resurgence

- ❖ Record the height of the water on the water level gauge \_\_\_\_\_ metres
- ❖ Optional: If the water is flowing under the bridge, clip the container to the cord and take a sample for water clarity

Assess which stream has the clearest water?

\_\_\_\_\_

Why? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

The education office at Waitomo Museum of Caves will photocopy your results for their records. They hope to place school results on their webpage and as more schools record data it is hoped that trends in environmental conditions will be able to be detected.

## V. PEST CONTROL PANEL

From the Pest Control Panel at the main car park answer the following questions:

1. What is a *reserve*?

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2. Name the two major pests that pose a threat to the forest at Ruakuri.

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a) What harm do these pests cause?

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b) List other pests that also pose a threat to the forest.

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3. What weeds are present in the reserve?

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4. List the birds that were once found in the reserve but are no longer here.

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a) Which of these birds could be re-introduced?

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b) What would have to be done to allow them to survive?

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### Back at school

- Use references at school to research methods of controlling animal pests.
- There is much debate about which methods are most suitable when managing animal pests. Conduct a class survey to find out the range of opinions.
- If the class were the managers of the Ruakuri Caves and Bush Scenic Reserve, what control methods would they use?