Students from Te Kura Kaupapa Māori O Te Rotoiti at the floating wetland on Lake Rotoiti 2011

Floating Wetlands
Te Kūkūwai Rewa

Learning stage 3

Exploring a floating wetland hands-on! Field trips

Learning Stage 3. Exploring a floating wetland hands-on! Field trips

Activity Title	Nature of Activity	Focusing question/s	Curriculum area	Suggested Curriculum level	Page
3a Pre-field trip preparation	Discussion and brainstorming around field trip preparation, risk management and being a great and safe visitor to the wetland. The activity aims to 'pre-think' the field trip	What do we need to do before we leave the classroom? How can we keep ourselves and others safe? How should we behave? What does kaitiakitanga mean? Relate it especially to this experience.	Environmental Education Health and Physical Education	Any level	179
3b Plan for action	Group discussion. Complete a plan for action worksheet	Who is doing what on the field trip?	Environmental Education	Any level	183
3c Field trip #1 – what is living on the floating wetland?	Field trip with a range of field activities and reflective activities for back in the classroom.	What is living on the floating wetland? What effect is the floating wetland having on its immediate environment? How does the appearance of the floating wetland change over the seasons? What are the patterns of bird activities and numbers?	Science Environmental Education	Any level	185
3d Field trip #2 – what is living under the floating wetland?	Field trip with a range of field activities and reflective activities for back in the classroom.	What animals and plants are around/under a floating wetland?	Science Environmental Education	Any level	197
3e Evaluating the field trips	Individual or class mural illustrating learning from the field trips	What did I see when I went to the floating wetlands?	Science Environmental Education The Arts	Any level	207
3f What did we learn? Comic strip	Create the text for a comic strip about floating wetlands	What have we learnt about floating wetlands?	Science Environmental Education English / te reo Māori	Any level	209
3g Building a prototype floating wetland	Construct and monitor a floating wetland in the classroom	How do we build a simple floating wetland for the classroom?	Technology Science Environmental Education	Any level	215
3h What else is affecting the quality of our lakes? (Extension)	Watch a DVD and summarise the key points Find the key messages from a fish book and create a poster to help protect the lakes	What are aquatic pest animals and plants? What damage do they cause our lakes? How can we help prevent the spread of aquatic pest animals and plants?	Science Environmental Education Social science	Any level	221

Activity 3a

Pre-field trip preparation

Focusing questions

- What do we need to do before we leave the classroom?
- How can we keep ourselves and others safe?
- How should we behave?
- What does kaitiakitanga mean? Relate it especially to this experience.

Resources

- RAMS form (See the 'Resources' section at the back of this resource)
- Worksheet 3a: How to be a great and safe visitor to the floating wetland (see following pages)
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Method

1. Introduce the experience (see Activity 3c Field trip #1 for detail).
2. Students, in pairs or small groups, brainstorm any questions they might want answered during their outdoor experience.
3. Identify student responsibilities

   (a) Introduce what a Risk Management Plan is.

   (b) In small groups students brainstorm all risks – record all on paper.

   (c) In same groups, students come up with preventions for each risk.

   (d) Complete a RAMs form (or outdoor safety action plan) as a class from information gathered.
4. Go through the day outline and all recording materials and methods.

   (a) Discuss what they will measure.

   (b) Why is it important to gather this information?

   (c) Go through an example for each recording.
5. Before your visit, discuss what kind of things could damage our environment, especially plants and animals living there, and what actions we can do as visitors to protect the environment from damage. Hand out copies of the Worksheet 'How to be a great and safe visitor to the floating wetland' or draw this on the whiteboard. In pairs, or as a group, brainstorm information to include under the impacts and actions columns. Ideas for impacts you may like to discuss include; trampling plants and animals with your feet, littering, sampling (taking souvenirs), noise pollution – scaring birds, fire – deliberate or accidental, vandalism of living and non-living things or harming or killing living things. You might like to introduce the concept of kaitiakitanga as part of this discussion.
6. Go through what students need to bring and wear.
7. Complete the reflection questions.
8. When new words are encountered, record the word(s) in the glossary (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection questions

- Why is it important to consider all risks before leaving the classroom?
- Why is it important to be a safe visitor to the floating wetland?

Activity Title:

Pre-field trip preparation

Nature of Activity:

Discussion and brainstorming around field trip preparation, risk management and being a great and safe visitor to the wetland. The activity aims to 'pre-think' the field trip

Focusing question/s:

What do we need to do before we leave the classroom?

How can we keep ourselves and others safe?

How should we behave?

What does kaitiakitanga mean? Relate it especially to this experience.

Curriculum area:

- Environmental Education
- Health
- Physical Education

Suggested Curriculum Level:

Any level

Worksheet 3a

How to be a great and safe visitor to the floating wetlands

Impacts	Actions

Activity 3b

Plan for action

Focusing question

Who is doing what on the field trip? Let's plan

Resources

- Plan for action Worksheet 3b (see following page)
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Method

1. In small groups (3-4 students) (ideally the groups they will work with on the field trip) complete the Plan for action sheet.
2. You might like to do a 'dry practice' of some of the field trip activities.
3. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection questions

- How prepared do you feel for the field trip?
- Is there anything we haven't yet considered? Do you have any questions still, about the field trip?

Activity Title:

Plan for action

Nature of Activity:

Group discussion. Complete a plan for action worksheet

Focusing question/s:

Who is doing what on the field trip?

Curriculum area:

- Environmental Education

Suggested Curriculum Level:

Any level

Worksheet 3b
Plan for action

Group Name: _____

What things are we going to do?	Who is going to carry out the task?	What resources are needed?
Finger frame		
Enviro-I-Spy		
Take photos of observation points		
Record information on datasheets		
Help with information gathering		

Activity 3c

Field trip #1 – what is living on the floating wetland?

Focusing questions

- What is living on the floating wetland?
- What effect is the floating wetland having on its immediate environment?
- How does the appearance of the floating wetland change over the seasons?
- What are the patterns of bird activities and numbers?

Resources required

- Observation Worksheet – Bird watching (see following pages)
- Finger frame record sheet (see following pages)
- Enviro-I-spy record sheet (see following pages)
- Learning Journal Activity 3c (see following pages)
- Teacher Resource: Freshwater Life (see following pages)
- Identification Slides from the PowerPoint: 3c Freshwater Identification ON the floating wetland (see following pages for a copy of these slides)
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).
- Identification guides for birds, plants and weeds (see note below)
- Camera
- Thermometers
- Laptop – with Word and Excel (if you wish to complete during field trip)
- Clear file (optional)
- Each student or small group bring clip board and pen/pencil/eraser

NOTE: Identification Guides: Having some identification guides in the field will be useful to help identify the various plants, animals and insects etc that you see! There are a range of freshwater identification guides that you will find in your local library or bookshop. There are also online Identification guides (a comprehensive list of these is provided on the following pages). We have also put together a few slides of some of the key plants and animals you might see (see the PowerPoint 3c Freshwater Identification ON the floating wetland).

Prior learning

- Observation and recording skills
- Kaitiakitanga
- Brainstorming

ACTIVITY 3c

Activity Title:

Field trip #1 – what is living on the floating wetland?

Nature of Activity:

Field trip with a range of field activities and reflective activities for back in the classroom.

Focusing question/s:

What is living on the floating wetland?

What effect is the floating wetland having on its immediate environment?

How does the appearance of the floating wetland change over the seasons?

What are the patterns of bird activities and numbers?

Curriculum area:

- Science
- Environmental Education

Suggested Curriculum Level:

Any level

Method

Please note:

- Each activity requires adult supervision
- This can be broken into several shorter field trips

1. Finger Frame
   (a) Each student – find a spot and note down their location.
   (b) Each student – make a frame using their finger.
   (c) Write down as many words as you can of things you see through your frame in one minute (teacher time this).
   (d) List or draw eight of the objects you see through your "finger frame".
2. Students in small groups (pre-organised) complete the Enviro-I-Spy record sheet.
3. As a group identify three specific floating wetland observation points.
4. Take photos of the floating wetland from these observation points.
5. Record these points so the observation can be carried out at regular intervals – weekly/monthly etc.
6. Complete the observation sheet with data collected (all instructions are on the sheets).
7. Transfer data to computer (either during field trip or once back in classroom).
8. Bird watching – complete data collection sheet.

Once back in the classroom

9. Look up any birds, animals and plants that you saw using the online identification sites suggested (see following pages)
10. Reflect using the questions below and complete the Learning Journal Activity 3c (see following pages).
11. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection questions

- What did you learn about the plants and animals that are living on the floating wetland?
- What can you say about the effect is the floating wetland having on its immediate environment?
- How do think the appearance of the floating wetland changes over the seasons?
- What birds did we see?
- What can you say about the patterns of bird activities and numbers?

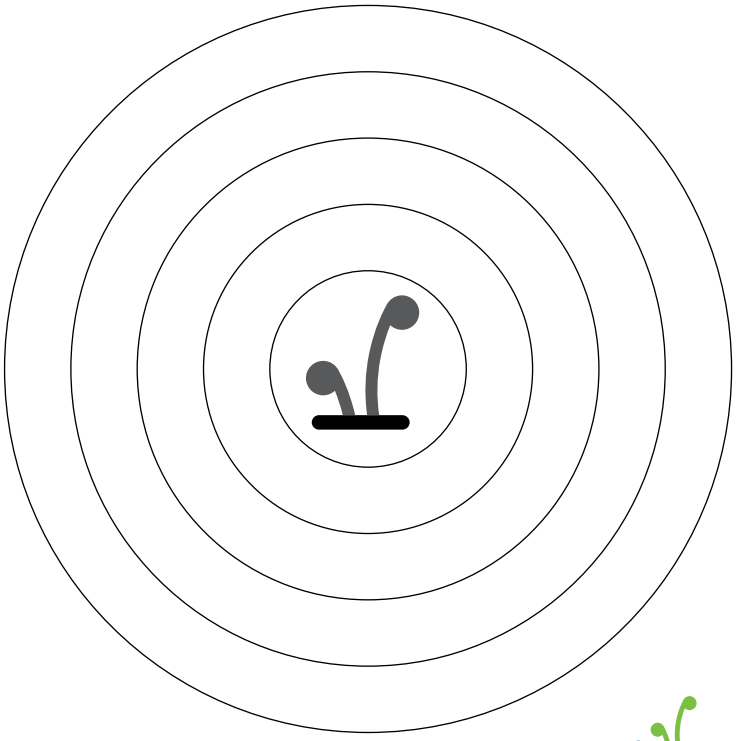
Worksheet
Bird watching

Key	Bird species	Number	Distance	Activity
◆	Swan	2	30 m	Feeding

Birds in the air:

On the grid above record the different bird species you see around the floating wetland. Use a symbol for each species and then enter the key onto the diagram below.

Using the Key, enter the species of birds and their number. Mark on the rings how far the birds were away from the floating wetland. Each ring is 20 m apart.



Worksheet

Enviro-I-Spy record sheet

Look for objects around the floating wetland that start with each letter. Draw or write these objects in.

A	**B**	**C**	**D**	**E**
F	**G**	**H**	**I**	**J**
K	**L**	**M**	**N**	**O**
P	**Q**	**R**	**S**	**T**
U	**V**	**W**	**Y**	**Z**

Worksheet

Finger frame record sheet

Location _____

List or draw 8 of the objects you see

Write down as many words as you can of things you see through your frame in one minute:

PowerPoint

Freshwater Identification ON the floating wetland

Floating Wetlands
Te Kūkūwai Rewa

IDENTIFICATION

Freshwater Invertebrates / Ngā hātaretare ki te waimāori

NOTE: Unless otherwise stated: Images courtesy: Landcare Research / Manaaki Whenua. (n.d).
Images of New Zealand Freshwater Invertebrates – a visual guide.
Landcare Research. Auckland.

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Courtesy: Landcare Research / Manaaki Whenua. (n.d).
Images of New Zealand Freshwater Invertebrates – a visual guide.
Landcare Research. Auckland.

Image: Courtesy of Landcare Research

Dragonfly

2

Courtesy: Landcare Research / Manaaki Whenua. (n.d).
Images of New Zealand Freshwater Invertebrates – a visual guide.
Landcare Research. Auckland.

Image: Courtesy of Landcare Research

Damselfly

3

Courtesy: Landcare Research / Manaaki Whenua. (n.d).
Images of New Zealand Freshwater Invertebrates – a visual guide.
Landcare Research. Auckland.

Image: Courtesy of Landcare Research

Beetle

4

Courtesy: Landcare Research / Manaaki Whenua. (n.d).
Images of New Zealand Freshwater Invertebrates – a visual guide.
Landcare Research. Auckland.

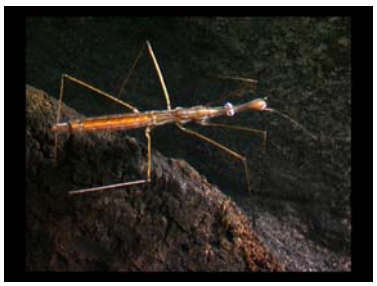

Image: Courtesy of Landcare Research

Water surface bug

5

Courtesy: Landcare Research / Manaaki Whenua. (n.d).
Images of New Zealand Freshwater Invertebrates – a visual guide.
Landcare Research. Auckland.

Image: Courtesy of Landcare Research

Mayfly

6

Courtesy: Landcare Research / Manaaki Whenua. (n.d). *Images of New Zealand Freshwater Invertebrates – a visual guide.* Landcare Research. Auckland.

Image: Courtesy of Landcare Research

Water boatman

7

Floating Wetlands
Te Kūkūwai Rewa

Birds / Ngā manu

IDENTIFICATION

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Image M.F. Soper
Source: Department of Conservation. Retrieved from http://www.doc.govt.nz/conservation/native-animals/birds/wetland-birds/

Scientific name: *Podiceps cristatus australis*
Māori name: Pāteketeke
Common European name: Australasian crested grebe

Order: Podicipediformes

9

Source: Department of Conservation. Retrieved from http://www.doc.govt.nz/conservation/native-animals/birds/wetland-birds/

Scientific name: *Egretta alba*
Māori name: Kōtuku
Common European name: White heron

Order: Ciconiiformes

10

Source: Department of Conservation. Retrieved from http://www.doc.govt.nz/conservation/native-animals/birds/wetland-birds/

Scientific name: *Tadorna variegata*
Māori name: Pūtangitangi
Common European name: Paradise shellduck

Order Anseriformes

11

Tongarewa – Museum of New Zealand. Retrieved from, http://collections.tepapa.govt.nz/Search.aspx?images=only#&advanced=oIC ollectionType%3AHistory

Scientific name: *Porphyrio melanotus*
Māori name: Pūkeko
Common European name: Swamp hen

Order Gruiformes

12

Tongarewa – Museum of New Zealand. Retrieved from: http://collections.tepapa.govt.nz/Search.aspx?imagesonly=off&advanced=on#/collectionTypes%3Ahistory

Scientific name: *Todiramphus sanctus*
Māori name: Kōtare
Common European name: Kingfisher
Order Coraciiformes

13

Image Courtesy: Indigo Pacific Ltd

Scientific name: *Charadrius obscurus*
Māori name: Tūturiwhatu
Common European name: New Zealand dotterel
Order Coraciiformes

14

Source: Department of Conservation. Retrieved from http://www.doc.govt.nz/conservation/native-animals/birds/wetland-birds/

Scientific name: *Hymenolaimus malacorhynchos* Māori name: Whio
Common European name: *Blue duck*
Order Anseriformes

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Floating Wetlands
Te Kūkūwai Rewa

Freshwater Plants / Ngā tipu ki te wai māori

IDENTIFICATION

NOTE: All images courtesy of Microsoft Office clipart unless otherwise stated.

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Freshwater Plants: Raupō

- **Māori name: Raupō**
- **Common name: Bulrush**
- **Scientific name: *Typha orientalis***
- **Native to NZ**

Image: raupō. Jeremy Rolfe
Source: NZ Plant Conservation Network. Retrieved from http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

17

Freshwater and Wetland Plants: Harakeke

- **Common name: New Zealand flax**
- **Māori name: Harakeke**
- **Scientific name: *Phormium tenax***
- **Native to NZ**

Image: Harakeke
Jeremy Rolfe
Source: NZ Plant Conservation Network. Retrieved from http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

18

Freshwater and Wetland Plants: Rushes

- **Common name: Giant rush / leafless rush**
- **Māori name: Wīwī**
- **Scientific name: *Juncus pallidus***
- **Native**

Image: Giant rush
Peter de Lange
Source: NZ Plant Conservation Network.
Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

19

Freshwater and Wetland Plants: Rushes

- **Common name: Edgars Rush**
- **Māori name: Wīwī**
- **Scientific name: *Juncus edgariae***
- **Native**

Image: *Juncus edgariae*
John Smith-Dodsworth
Source: NZ Plant Conservation Network. Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

20

Freshwater and Wetland Plants: Sedges

- **Common name: Cutty grass**
- **Māori name: Pūrei / pūkio / makura**
- **Scientific name: *Carex secta***
- **Native**

Image: Carex secta
John Smith-Dodsworth
Source: NZ Plant Conservation Network. Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

21

Freshwater and Wetland Plants: Sedges

- **Common name: Jointed or wire rush**
- **Māori name: Oioi**
- **Scientific name: *Apodasmia similis***
- **Native**

Images: Oioi
Jeremy Rolfe (top)
and John Barkla
Source: NZ Plant Conservation Network.
Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

22

Freshwater and Wetland Plants: Floating leaved

- **Common name: Salvinia**
- **Scientific name: *Salvinia molesta***
- **Introduced (threat)**

Global commons image
retrieved from
www.wikipedia.org.

23

Freshwater and Wetland Plants: Sprawling Emergent

- **Common name: Pacific azolla / red azolla**
- **Māori name: Retoreto, retoretu, kārearea**
- **Scientific name: *Azolla filiculoides***
- **Native**

Image: Red Azolla
Jeremy Rolfe
Source: NZ Plant Conservation Network.
Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

24

Teacher Resource

Freshwater Life

The following is a list of web links that will be useful for you to increase your knowledge and ability to identify freshwater life. You may also wish to look at some of these sites with your students!

Web Pages / Ngā whārangi ipurangi

All freshwater life

Freshwater habitats at Te Ara – http://www.teara.govt.nz/en/life-in-fresh-water/1

Conservation and factors affecting NZ Freshwater life at Te Ara – http://www.teara.govt.nz/en/life-in-fresh-water/5

Ngā tipu ki te waimāori / Freshwater plants

Freshwater plants at Te Ara – http://www.teara.govt.nz/en/life-in-fresh-water/2

Harakeke at Te Ara – http://www.teara.govt.nz/en/flax-and-flax-working/1

Harakeke at Landcare – http://www.landcareresearch.co.nz/research/biosystematics/plants/weaving/harakeke.asp

Ngā hātaretare ki te waimāori / Freshwater invertebrates

Terra Nature, 'Kōura' – http://terranature.org/koura.htm

Department of Conservation scientific report: Ecology and distribution of koura
http://www.doc.govt.nz/upload/documents/science-and-technical/sfc148.pdf

Macroinvertebrate Community indexes as a measure of environmental health
http://www.mfe.govt.nz/publications/water/mci-user-guide-may07/html/index.html

Freshwater invertebrates – Te Ara http://www.teara.govt.nz/en/life-in-fresh-water/3

Auckland Council macroinvertebrates and sensitivity scores
http://www.waitakere.govt.nz/AbtCit/ei/EcoWtr/macroinv/macroinvertebrates.asp#glossiphonia

NIWA - Catching Kōura with traditional Māori fern bundles
http://www.niwa.co.nz/our-science/freshwater/publications/all/wru/freshwater-update-29/traditional-mAori-fern-bundles-a-better-way-to-catch-koura

Freshwater invertebrate ID
http://www.landcareresearch.co.nz/resources/identification/animals/freshwater-invertebrates/guide

Freshwater and estuary invertebrate ID
https://www.niwa.co.nz/freshwater-and-estuaries/nzffd/identification-guides-and-keys

Ngā ika ki te waimāori / Freshwater fish

NIWA freshwater fish atlas – http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Freshwater fish at Te Ara – http://www.teara.govt.nz/en/life-in-fresh-water/4

Īnanga at Te Ara – http://www.teara.govt.nz/en/whitebait-and-whitebaiting

Te hopu tuna at Te Ara – http://www.teara.govt.nz/mi/te-hopu-tuna

Te hopu pirahau at Te Ara – http://www.teara.govt.nz/mi/te-hopu-tuna/6

Freshwater vertebrate ID – https://www.niwa.co.nz/freshwater-and-estuaries/nzffd/identification-guides-and-keys

Ngā manu ki te kūtūwai / Freshwater & Wetland birds

Kāmana / Grebe information sheet by DOC
http://www.doc.govt.nz/upload/documents/about-doc/concessions-and-permits/conservation-revealed/australian-crested-grebe-kamana-lowres.pdf

New Zealand birds – http://nzbirds.com

Shags at Te Ara – http://www.teara.govt.nz/en/shags

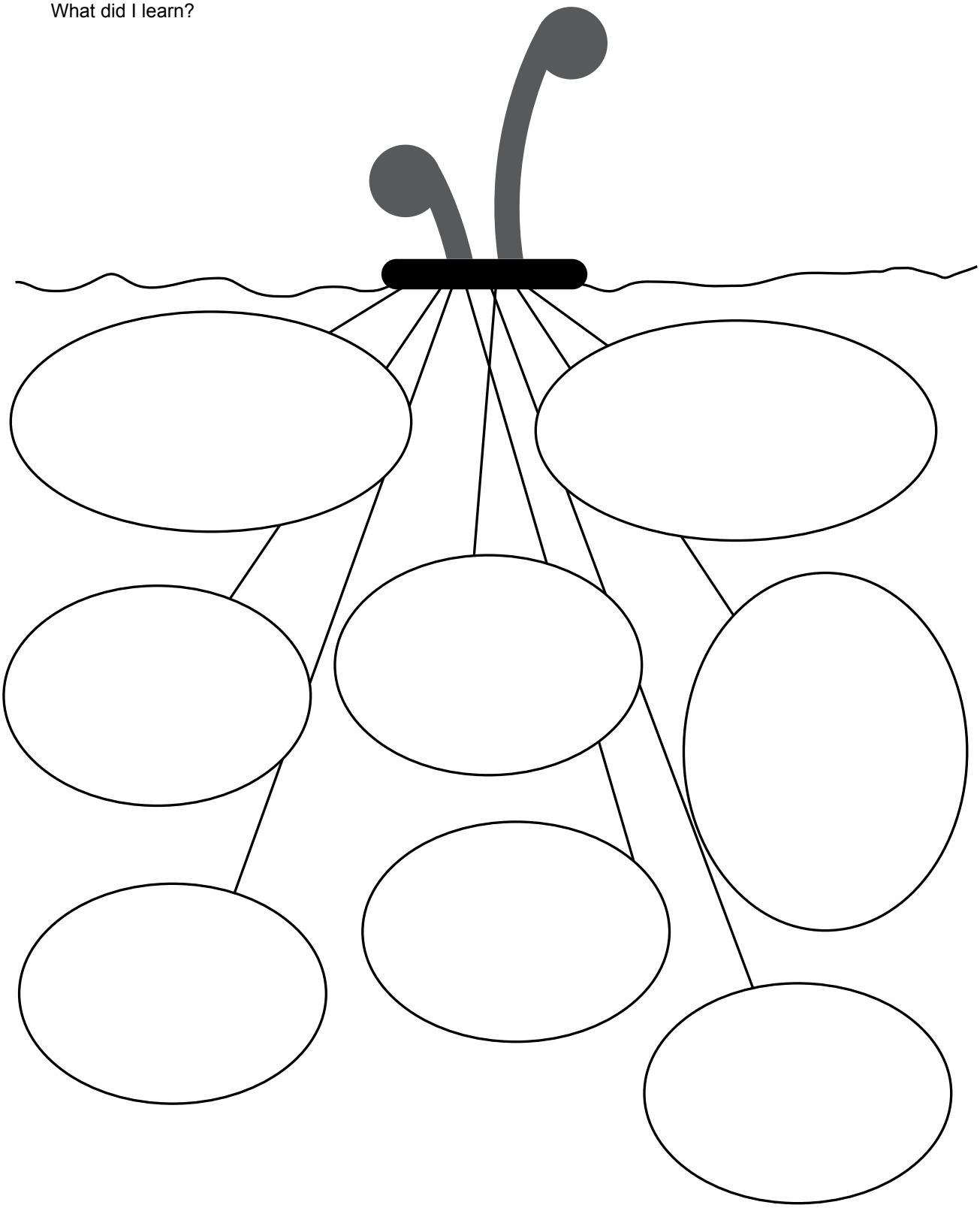
Wetland native birds at Te Ara – http://www.teara.govt.nz/en/wetland-birds

New Zealand Birds ID – http://nzbirdsonline.org.nz/

Activity 3c Learning Journal

Field trip #1 reflection

What did I learn?



Activity 3d

Field trip #2 – what is living under the floating wetland?

Focusing question

What animals and plants are around/under a floating wetland?

Resources required

- Learning Journal Activity 3d (see following pages)
- Teacher Resource: Freshwater Life (see pages following Activity 3c)
- Identification Slides from the PowerPoint: 3d Freshwater Identification UNDER the floating wetland (see following pages for a copy of these slides)
- Teacher Resource: Freshwater Mollusca Key (see following pages)
- Identification guides for birds; plants; weeds (see note below)
- What animals live here? Worksheet 1 (see following pages)
- What plants live here? Worksheet 2 (see following pages)
- Waiora Education Resource pages 125-132 on Waiora healthy water, teacher resource These can be accessed via the following link: http://www.boprc.govt.nz/residents/teachers/teacher-resources/waiora-healthy-water/
- Bay of Plenty Regional Council Water Kit (book by contacting the Community Engagement Advisor). This kit includes the following equipment: net, white sorting tray, magnifying glass, identification guide (Wai Care Invertebrate Field Guide)
- Teacher Resource: Diagram of floating wetlands ecosystems (see following pages)
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).
- Camera
- Each student or small group bring clip board and pen/pencil/eraser

NOTE: Identification Guides: Having some identification guides in the field will be useful to help identify the various plants and animals that you see! There are a range of freshwater identification guides that you will find in your local library or bookshop. There are also online Identification guides (a comprehensive list of these is provided on the pages following Activity 3c). We have also put together a few slides of some of the key plants and animals you might see (see the PowerPoint 3d Freshwater Identification UNDER the floating wetland).

Prior Learning

Some knowledge of what lives on the floating wetland

ACTIVITY 3d

Activity Title:

Field trip #2 – what is living under the floating wetland?

Nature of Activity:

Field trip with a range of field activities and reflective activities for back in the classroom.

Focusing question/s:

What animals and plants are around/ under a floating wetland?

Curriculum area:

- Science
- Environmental Education

Suggested Curriculum Level:

Any level

Method

1. Find a safe area of a pond where all students can be seen.
2. To complete worksheet 1 – What animals live here? Holding the net close, brush the under-surface of the submerged vegetation on the edge of the floating wetland so the invertebrates float into the net or sieve. If unable to get close to the floating wetland, walk knee deep into the lake and take a sample. Empty the sieve or net into the sorting tray and identify what you have found using the guide. Make a drawing of the animals on the worksheets.
3. Take a photo if possible of the invertebrates for identification when back to school (you could use one of the online identification guides listed in Activity 3c).
4. Drag the net through the water at various depths including the lakebed.
5. Try the procedure at several sites for comparison.
6. To complete the worksheet 2 – What plants live here? Look into the water to draw pictures of what you see.

Once back in the classroom

7. Look up any invertebrates or plants that you saw using the online identification sites suggested (see previous page)
8. Reflect using the questions below and then complete the top part of Learning Journal Activity 3d (see following pages). The drawing space at the bottom of this page is for Activity 3e.
9. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection questions

- What kind of animals did you find?
- What does this tell us about the water quality? Why do you think it is like this?
- What plants did you find? Are they native or exotic? What does this tell you about the habitat for native animals?

PowerPoint

Freshwater Identification UNDER the floating wetland

Floating Wetlands
Te Kūkūwai Rewa

Freshwater Invertebrates /
Ngā hātaretare ki te waimāori

IDENTIFICATION

NOTE: Unless otherwise stated: Images courtesy: Landcare Research / Manaaki Whenua. (n.d). *Images of New Zealand Freshwater Invertebrates – a visual guide.* Landcare Research. Auckland.

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Courtesy: New Zealand Native Freshwater Fish Organisation. Retrieved from http://www.nzfreshwater.org/index_wildlife.html

Scientific name: *Paranephorps sp*
Māori name: Kōura
Common European name: Freshwater crayfish

Crustacea

2

Courtesy: Landcare Research / Manaaki Whenua. (n.d). *Images of New Zealand Freshwater Invertebrates – a visual guide.* Landcare Research. Auckland.

Scientific name: *Hyridella menziesi*
Māori name: Kākahi
Common European name: Freshwater mussel

Mollusca

3

Floating Wetlands
Te Kūkūwai Rewa

Freshwater Fishes /
Ngā ika ki te waimāori

IDENTIFICATION

Unless otherwise stated: Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved February 2011, from

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Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Perca fluviatilis*
Māori name: *Pohuiakaroa*
Common European name: Perch

Family: Percidae

5

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Galaxias maculatus*
Māori name: Īnanga
Common European name: Whitebait

Family: Galaxiidae: Galaxias

6

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Galaxias brevipinnis*
Māori name: Īnanga / Kōaro
Common European name: Whitebait / Kōaro

Family: Galaxiidae: Galaxias

7

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Galaxias argenteus*
Māori name: Īnanga / Kōkopu
Common European name: Giant Kōkopu

Family: Galaxiidae: Galaxias

8

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Galaxias fasciatus*
Māori name: Īnanga / Kōkopu
Common European name: Banded Kōkopu

Family: Galaxiidae: Galaxias

9

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Geotria australis*
Māori name: Pirahau / Korokoro
Common European name: Lamprey

Family: Geotriidae

10

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Grahamina sp*
Māori name:
Common European name: Estuarine triple fin

Family: Tripterygiidae

11

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Scientific name: *Anguilla australis*
Māori name: Tuna / Matamoe
Common European name: Shortfin eel

Family: Anguillidae

12

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Latin name: *Anguilla dieffenbachii*
Māori name: Tuna / kirirua / upokohue
Common European name: Long fin eel

Family: Tripterygiidae

13

Images Courtesy: NIWA. *NIWA Atlas of NZ freshwater fishes.* Retrieved from http://www.niwa.co.nz/our-science/freshwater/tools/fishatlas

Latin name: *Ameiurus nebulosus*
Māori name:
Common European name: Catfish

Family: Ictaluridae

14

Floating Wetlands
Te Kūkūwai Rewa

Freshwater Plants / Ngā tipu ki te wai māori

IDENTIFICATION

NOTE: All images courtesy of Microsoft Office clipart unless otherwise stated.

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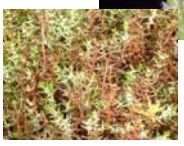
Freshwater and Wetland Plants: Submerged



- **Common name: Oxygen plant / Common water milfoil**
- **Scientific name: *Myriophyllum propinquum***
- **Native to NZ**

Image: *Myriophyllum propinquum*
Top: Jeremy Rolfe
Lower: John Dodsworth Smith
Source:
NZ Plant Conservation Network. Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

16

Freshwater and Wetland Plants: Submerged

- **Common name: Curly leaved pondweed**
- **Scientific name: *Potamogeton crispus***
- **Introduced**

Image: *Potamogeton crispus*
Courtesy –
Top: NIWA; Lower: CCC

17

Freshwater and Wetland Plants: Submerged

- **Common name: Mud pondweed**
- **Maori name: Mānihi, rērēwai, retoreto**
- **Scientific name: *Potamogeton suboblongus***
- **Endemic**

Image: Mud pond weed
Jeremy Rolfe Source: NZ Plant Conservation Network. Retrieved from
http://www.nzpcn.org.nz/flora_search.asp?scfSubmit=1&scfNative_Or_Exotic=1

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Worksheet 1

What animals live here?

Animal name, drawing or description	Where is it living?

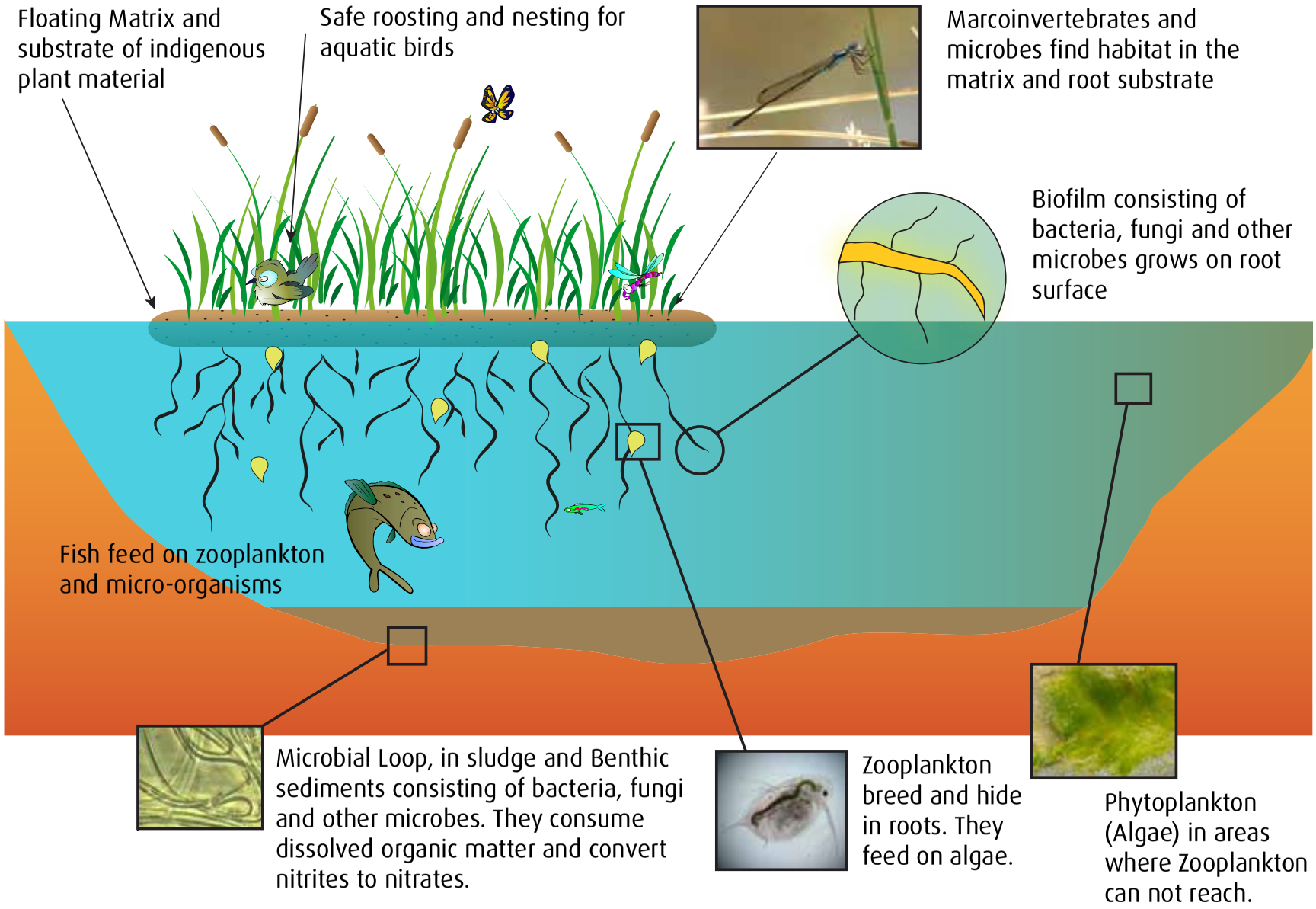
Worksheet 2

What plants live here?

Plant name, drawing or description	Where is it living?
Do the shoots of the plants look healthy? Y/N - explain	
Are there signs of blue-green algae?	

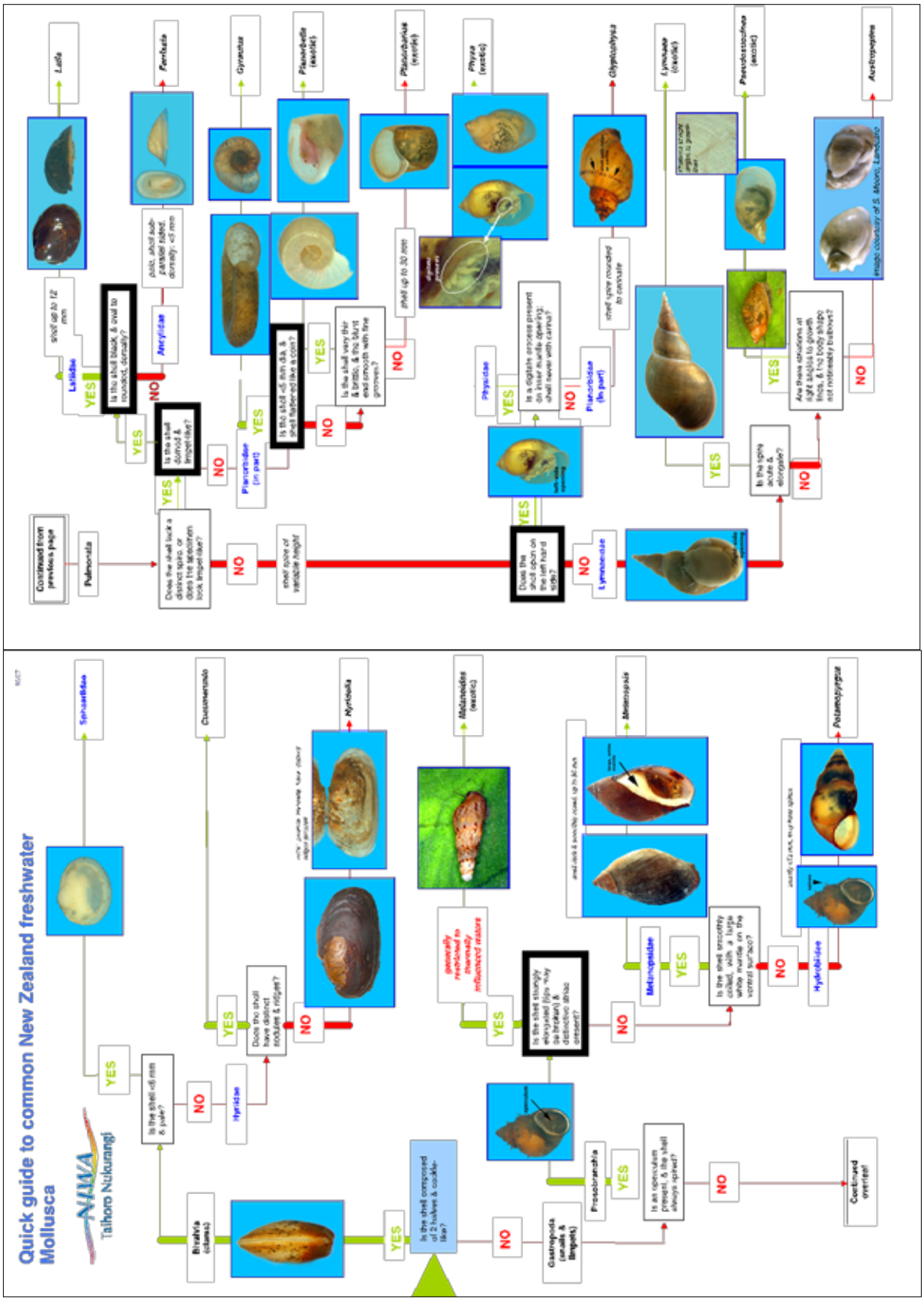
Teacher Resource

Diagram of floating wetland ecosystem



Teacher Resource

Freshwater Mollusca Key



Source: NIWA. (n.d). Quick guide to common New Zealand freshwater Mollusca. Retrieved from www.niwa.co.nz

Activity 3d Learning Journal
Field trip #2 reflection

While I was on the field trip:

I was surprised to find _____

_____

I really liked _____

_____

I thought that _____

_____

I felt happy when _____

_____

I learned that _____

_____

Observations made of field trips (sketch of my drawing for classroom mural):

Activity 3e

Evaluating the field trips

Focusing question

What did I see when I went to the floating wetlands?

Resources

- Drawing materials, pens, felts, paints etc
- Learning Journal Activity 3d (see previous pages)
- Roll of newsprint
- Art paper
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Prior learning

Observations made on the field trip

Method

This is a method of evaluation to help students express what they have learned about floating wetlands and to help them integrate and reflect on their field trip learning. This art activity can be done individually across two pages of an exercise book or on a piece of paper (landscape format). Or it could also be done as a group mural across a long classroom wall. This activity could also be done using a range of art media.

1. Colour a section across the entire length of the wall with blue to represent the water. This can be done with paint or crayon or dye. If completing a large mural this could be done on the floor or directly onto the paper attached to the wall.
2. The next step is to add the illustrations of islands, plants, animals, rocks etc
3. Add labels, captions or speech bubbles to show new knowledge of floating wetlands.
4. Students can also use collage or prints on the mural.
5. Complete the bottom part of the Learning Journal 3d.
6. Do a round robin where everyone gets to talk about one thing that they drew.
7. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Activity Title:

Evaluating the field trips

Nature of Activity:

Individual or class mural illustrating learning from the field trips

Focusing question/s:

What did I see when I went to the floating wetlands?

Curriculum area:

- Science
- Environmental Education
- The Arts

Suggested Curriculum Level:

Any level

Activity 3f

What did we learn? Comic strip

Focusing question

What have we learnt about floating wetlands?

Resources

- Blank comic strip (for students to fill in the words) (see following pages)
- Learning Journal Activity 3f (see following pages)
- Teacher Resource: Completed comic strips in English and te reo Māori (see following pages)
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Method (individual/small group)

1. Individually, make your own story on what the koura (asking the questions) and the trout are discussing. If necessary use the first and /or last frame from the teacher's copy as a starter (see method below).
2. Either cut out the frames and make a booklet or make them into flash cards before telling your story to the class.

Method (teacher lead)

1. Have the class look at the first frame (from the completed version).
2. Using the blank comic strip, brainstorm: What is the story about – frame by frame? OR divide class into groups and give a frame each to discuss, and then regroup and report back.
3. Complete the blank comic strip.
4. Have a discussion as a class to decide if the story makes sense and all content has been included.
5. Make it into a book and add to the class library.

Method (After the activity)

1. Discuss the reflection questions and then complete the Learning Journal Activity 3f.
2. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection questions

1. Compare the original comic strip with your version – are they similar?
2. What is the main message being told in both these strips?
3. How can you help look after the lakes (list five things)?

Activity Title:

What did we learn? Comic strip

Nature of Activity:

Create the text for a comic strip about floating wetlands

Focusing question/s:

What have we learnt about floating wetlands?

Curriculum area:

- Science
- Environmental Education
- English / te reo Māori

Suggested Curriculum Level:

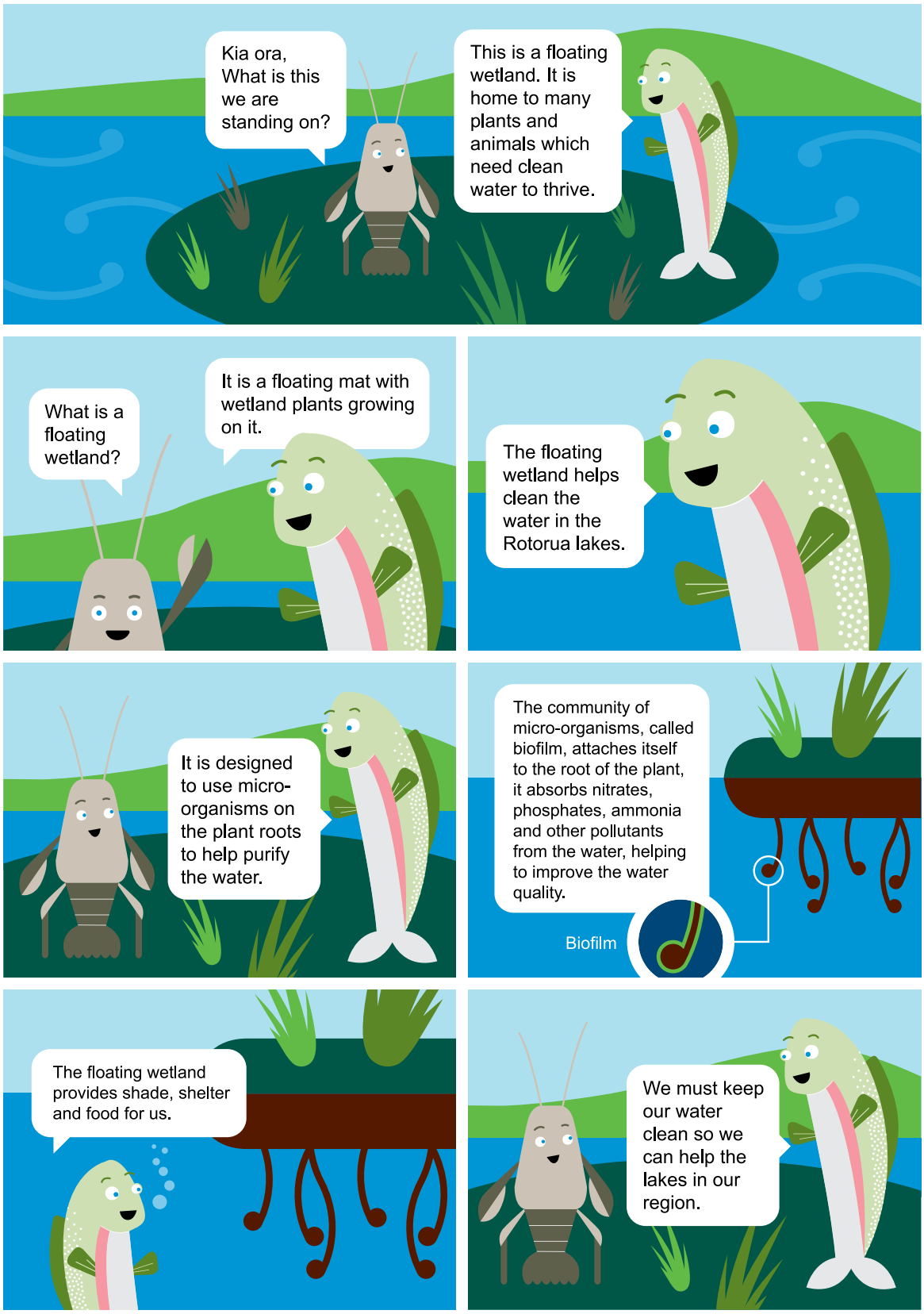
Any level

Teacher Resource

Comic strip English version

Floating wetlands provide a natural habitat for fish, birds and insects. Floating wetlands also improve the quality of water in our lakes.

Floating Wetlands

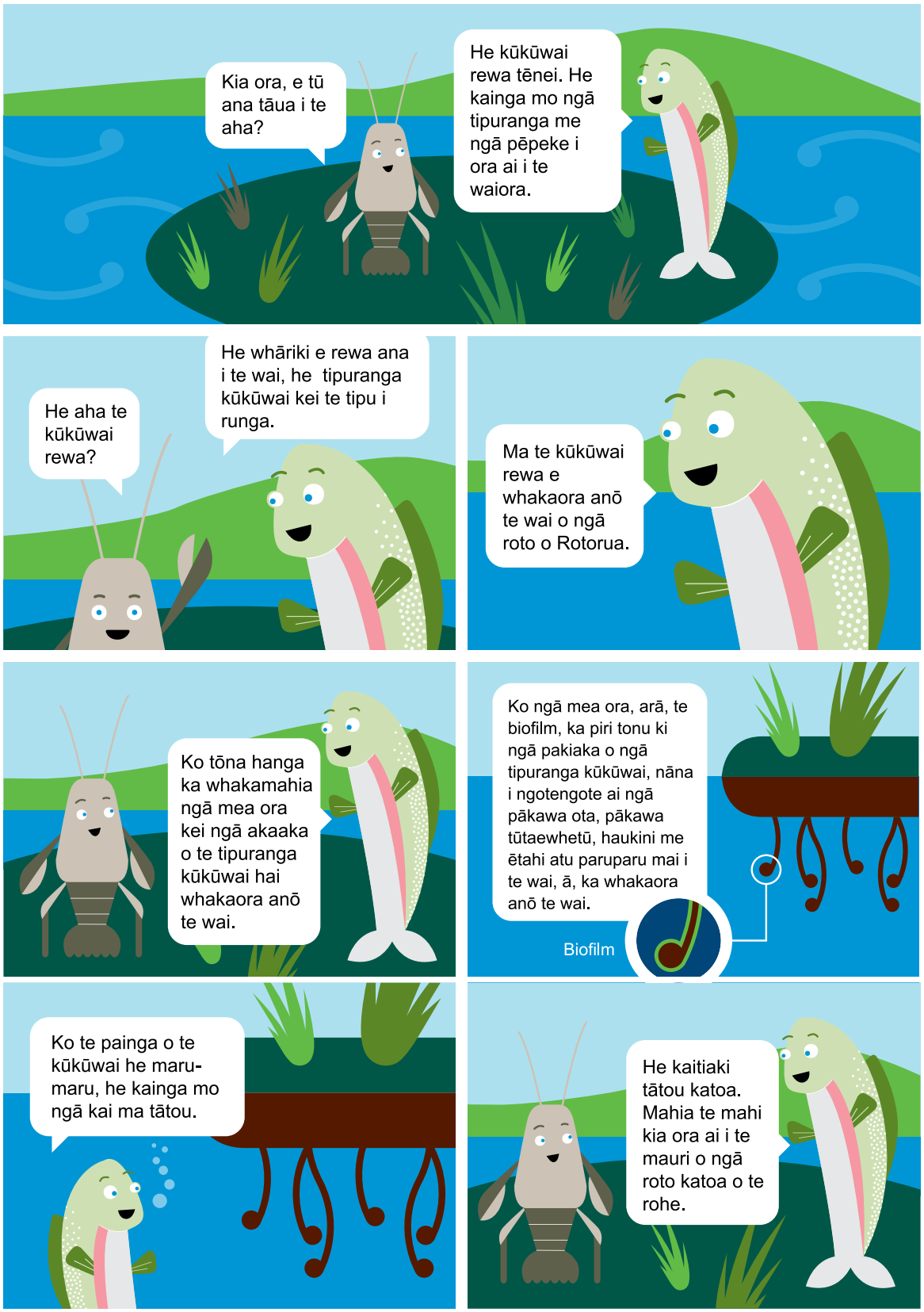


Teacher Resource

Comic strip te reo Māori version

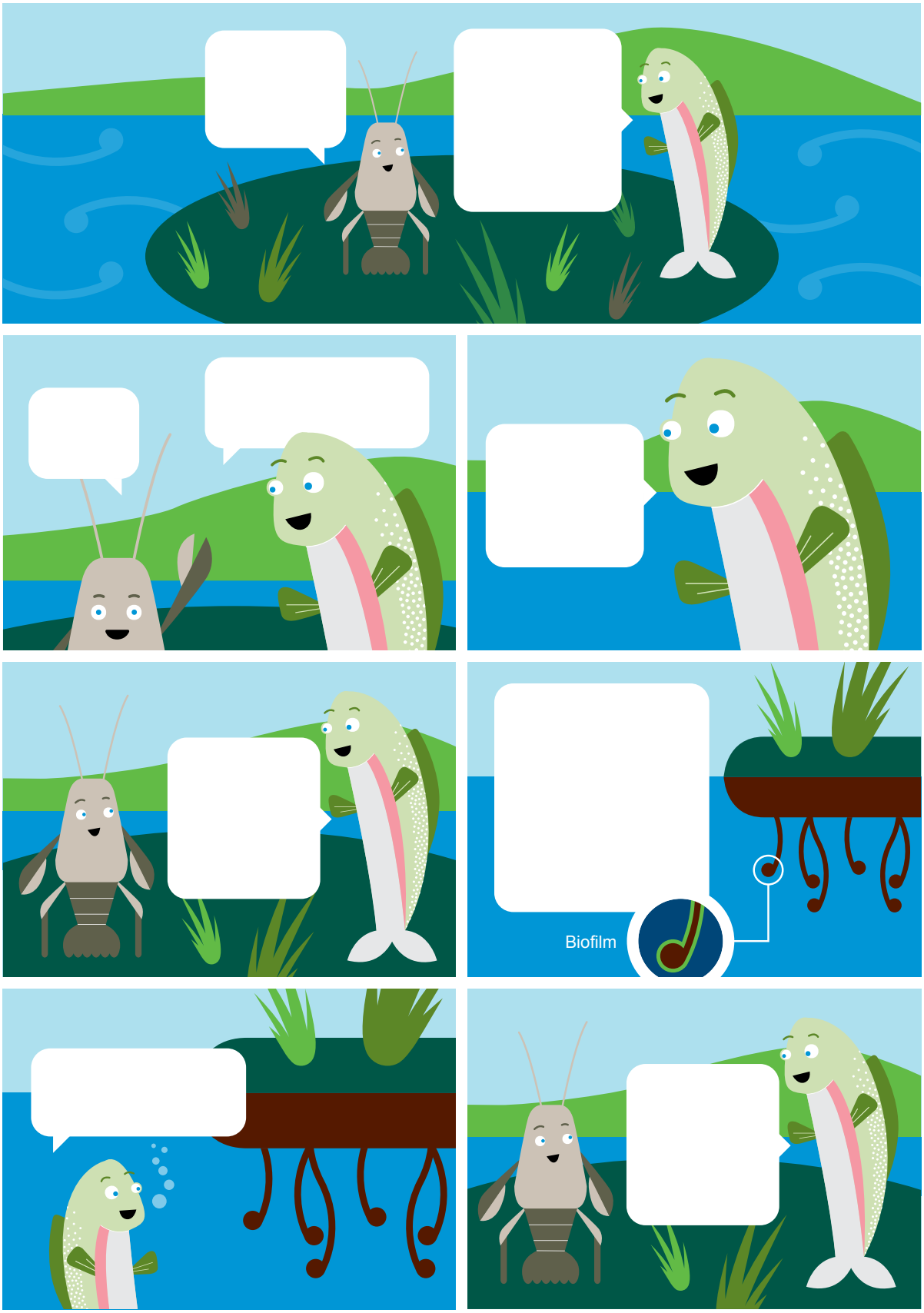
He kāinga tūturu te kūkūwai rewa mo ngā ika, manu me te aitanga-a-pēpeke. Ko tōna mahi anō ko te whakaora i te wai a ō tātou roto.

Te Kūkūwai Rewa



Floating wetlands provide a natural habitat for fish, birds and insects. Floating wetlands also improve the quality of water in our lakes.

Floating Wetlands



Activity 3f Learning Journal

Comic strip

Compare the original with the class's version – are they similar? _____

What is the main message being told?

_____

_____

How can you help look after the lakes (list five things)?

1. _____
2. _____
3. _____
4. _____
5. _____

Copy the comic you like best:

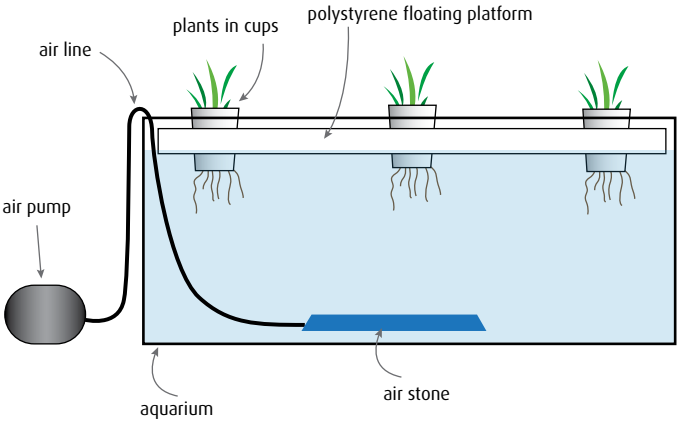
ACTIVITY 3g

Activity 3g

Building a prototype floating wetland

Focusing question

How do we build a simple floating wetland for the classroom?



Resources

- Learning Journal Activity 3g (see following pages)
- Materials for a simple floating wetland for the classroom (see below)
- Powerpoint slide show 'How a floating wetland is made' (see following pages)

Materials to build a simple floating wetland for the classroom:

- AQUARIUM - Any water-tight container with fairly vertical sides will work. Light breaks down the nutrient solution and encourages algae growth so if you use an aquarium you will need to construct a light shield out of cardboard or aluminium foil to keep light out of the aquarium. If you wish to view the roots make the light shield (or part of it) removable.
- FLOATING PLATFORM - You will need a piece of styrofoam about 5 cm thick. Cut styrofoam to fit loosely inside the aquarium (or whatever you are using for a reservoir).
- PLASTIC CUPS - Use several small plastic or styrofoam cups to hold the plants on the floating platform. You can use any small plastic cup as long as it has tapered sides.
- GROWING MEDIUM - You will need a small amount of growing medium, enough to fill the plastic cups.
- AIR PUMP AND AIR STONE - You need to use an air pump and air stone to oxygenate the nutrient solution. A regular air pump designed for an aquarium is all that is required.

Prior learning

How to take care of an aquarium (there are a whole heap of articles available on this on the internet. For example, try http://www.bestfish.com/articles/dailyaquariumcare.php.

Method

This activity aims to convert an aquarium into a simple floating wetland. The plants are suspended on a floating styrofoam platform. This system is popular for classrooms because the roots of the plants are visible hanging below the floating platform.

Activity Title:

Building a prototype floating wetland

Nature of Activity:

Construct and monitor a floating wetland in the classroom

Focusing question/s:

How do we build a simple floating wetland for the classroom?

Curriculum area:

- Technology
- Science
- Environmental Education

Suggested Curriculum Level:

Any level

1. Review the PowerPoint slide show – How a floating wetland is made.
2. Assemble as shown in the diagram above.
3. Change where it sits – by a window; in a dark room; outside under cover; outside with no cover etc. and observe the changes!
4. Answer the following pre-results questions:
   (a) Where do you think it will grow best?
   (b) What do you think will limit its growth?
   (c) How do you think this compares to an actual floating wetland in the freshwater environment?
   (d) What changes do you think will occur over time?
5. Discuss the reflection questions and then complete the Learning Journal Activity 3g.
6. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection questions

1. Was it easy or difficult to make? Why?
2. What time of year did the wetlands grow better?
3. Where did it grow better – why do you think this happened?

Activity 3g Learning Journal
Prototype floating wetland

Pre-result questions _____

_____

Draw prototype and label

Results table

Date and time	Observations	Position of floating wetland	Any maintenance

Was it easy or difficult to make? Why? _____

_____

What time of year did the wetlands grow better? _____

_____

Where did it grow better – why do you think this happened?

_____

_____

PowerPoint

How a floating wetland is made

Floating Wetlands
Te Kūkūwai Rewa

How a floating wetland is made

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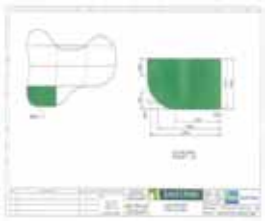
How a floating wetland is made

The beginning…

- Polyethylene terephthalate (PET) rolls imported from US by Kauri Park Nurseries, Kaiwaka
- US is the only country able to recycle the quantities needed to produce matrix of the floating wetland.

Measuring and cutting

- PET rolls laid out, measured into modules 4m x 1.55m, 200m thick
- Cut into shapes

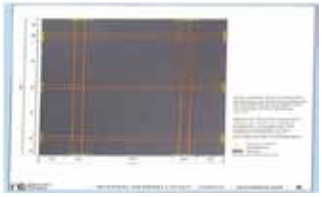


Module construction

- Four layers for each module
- First two layers have joiner plates put in place

Internal webbing

- Each module has an internal webbing to increase strength and durability

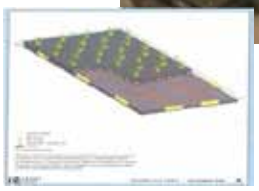


Polystyrene injected

- Buoyancy - liquid polystyrene injected at regular intervals
- Polystyrene hardens in air

Plant holes cut

- Specially designed cutter punches out holes for the plants

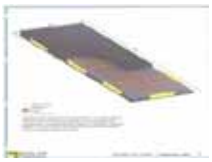


Coconut fibre matting

- Layer of coconut fibre laid across the top

Ready for transporting

- Modules pre-cut for each lake
- Modules transported directly to their destination



Transport

- Small floating wetlands taken by trailer, larger ones by truck

Unloading

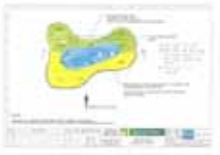
- Modules light enough to be moved by hand

Putting the jigsaw together

- Modules laid out to plan
- Individually numbered
- Modules bolted together at corners
- Floating wetland ready to be planted

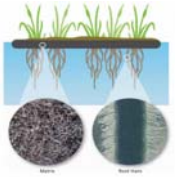
Planting

- Planting to a plan
- Where possible local plant species
- Natives used:
  - Purie (*Carex virgata*)
  - Swamp sedge, Toitoi (*Carex secta*)
  - Kāpūngāwhā (*Schoenoplectus tabernaemontani*)
- Students can plant on land - wetland launched from shore



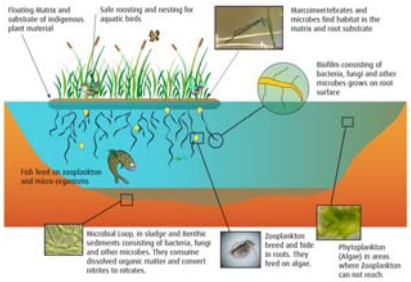
Underneath the water

- Plant roots grow through matrix into water
- Matrix fibres, wetland plant hair provide surface area - colonisation by nitrogen and phosphorous microbes



Floating wetland ecosystem

- Variety of life forms
- Food chains and food webs above and below water line



Launch and celebrate

Rotoehu floating wetland

- Helps reduce phosphorus and nitrogen that enter the lake in runoff from surrounding farms
- Took approx 370,000 PET bottles

Activity 3h

What else is affecting the quality of our lakes? (Extension)

Focusing questions

- What are aquatic pest animals and plants?
- What damage do they cause our lakes?
- How can we help prevent the spread of aquatic pest animals and plants?

Resources

- Fish and Game New Zealand Video called New Zealand's Introduction to Didymo (You can download this from from www.biosecurity.govt.nz or click on the link http://www.biosecurity.govt.nz/video/didymo-fish-and-game)
- The Big Fish Book (this can be booked by contacting the Community Engagement Advisor, Bay of Plenty Regional Council Rotorua office)
- Learning Journal Activity 3h (see following pages)
- Stationary for group posters
- Glossary template. (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Prior Learning

Understanding of the key distinction between a native and introduced species

Method

1. Discuss the impact that introduced species can have on lakes. You might like to use one or more of the examples provided under possible next steps (see below).
2. Watch the Fish and Game Didymo video.
   (a) Have students note down main points (at least three) on the Learning Journal page)
   (b) Pair share
   (c) As a class put all points onto a big piece of paper
   (d) Note any extra points on the Learning Journal page
3. Read the book The Big Fish Book and do the experiment (follow instructions on the book). Add any extra messages from the Big Fish Book to Learning Journal.
4. In groups of three or four have students choose one to three point(s) made in either the DVD or the Book and:
   (a) Make a campaign to get the message across to a chosen audience (classmates, school, community etc). Medium may be: poster, skit, radio/TV advertisement, using social media etc
5. Finally, in groups of two to three have students design a poster to inform either/or the students in school and local community about an issue that is affecting the lakes. Use the Learning Journal to brainstorm ideas for poster.

ACTIVITY 3h

Activity Title:

What else is affecting the quality of our lakes? (Extension)

Nature of Activity:

Watch a DVD and summarise the key points

Find the key messages from a fish book and create a poster to help protect the lakes

Focusing question/s:

What are aquatic pest animals and plants?

What damage do they cause our lakes?

How can we help prevent the spread of aquatic pest animals and plants?

Curriculum area:

- Science
- Environmental Education
- Social science

Suggested Curriculum Level:

Any level

6. Reflect on learning, using the questions below.
7. When new words are encountered, record the word(s) in the glossary template (See the glossary for student use, in the Learning Journal template supplied within the 'Resources' section of this document).

Reflection

- What are aquatic pest animals and plants?
- What damage do they cause our lakes?
- How do aquatic pests spread from lake to lake?
- How can we help prevent the spread of aquatic pest animals and plants?

Possible next steps

- Investigate the introduction of two aquatic weeds to Lake Rotoma by reading the following news Daily Post paper article: 'Aquatic weeds found in lake' (February, 8, 2013). You can download this article from the following link: http://www.nzherald.co.nz/rotorua-daily-post/news/article.cfm?c_id=1503438&objectid=11090003
- Explore how lake users put our waterways at risk by reading this (January 2014) article from the Rotorua Te Arawa Lakes Programme website, see http://www.rotorualakes.co.nz/latest_news/id/249/Lake%20users%20putting%20waterways%20at%20risk
- Review the Bay of Plenty Regional Council's Aquatic Pest Survey from 2013. You can download thjs from the Regional Council's website or click on the following link: http://www.boprc.govt.nz/media/285476/aquatic-pest-survey-2013.pdf

Activity 3h Learning Journal

What else is affecting the quality of our lakes?

Watch the video: http://www.biosecurity.govt.nz/video/didymo-fish-and-game.

List the main points:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

The Big Fish Book - messages:

- _____
- _____
- _____
- _____

Brainstorm messages for poster: