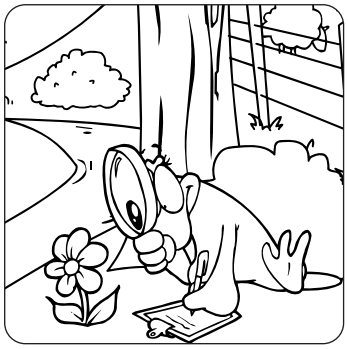


Science - Contents

A Meandering Map

I

FOCUS

- What features exist along our local waterway?
- How is the land adjacent to the waterway used?

OBJECTIVES

- Visit and observe a local waterway
- Complete a bird's-eye sketch of a waterway section

CSF II LINKS

SCIENCE	4.1 Biological
SOSE	4.1 Geography
	4.2 Geography
	4.3 Geography
MATHS	4.4 Space

BACKGROUND

The uses of surrounding land, such as agriculture, industry or urban development can have a negative effect on waterways. These land uses can lead to erosion, pollution (from urban stormwater runoff) and habitat degradation. The vegetation along a stream offers protection from the impact of surrounding land uses. Its condition can often give us a good indication of the health of the waterway.

NOTES

This activity needs to be conducted at a local waterway. The Science activity, *'A Habitat Survey'* and the Maths activity *'Stream Speed'* could also be conducted while at the waterway.

LEARNING TASKS

1 Planning the field trip.

- Visit the waterway prior to the field trip to determine an appropriate stretch to survey.
- The site should demonstrate variety of land uses, and have access to both sides of the bank.
- Invite adult helpers to assist students on the day.

SAFETY When planning a field trip it is essential that you develop a safety plan, which identifies potential hazards the risk of the occurring and implements safety control measures.

2 Prior to the field trip.

- Read and discuss the worksheet to clarify features to be sketched.
- Review your safety plan and reinforce behavioural expectations.
- Distribute a clipboard and sketching paper to each group.

3 During the field trip.

- Mark out 100 metres for students to study.
- Walk the survey area, allowing students to make observations.
- On the return walk, students (groups of 3-4) start their sketches.
- Supervisors can ensure that students make sketches, which include living and non-living components of the site.

4 After the field trip.

- Publish sketches.

MATERIALS

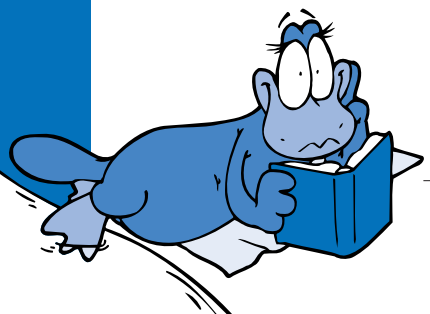
- ***'A Meandering Map'*** **Student Worksheet**
- **Map** of waterway
- **Trundle wheel**
- **Markers**
- **Clipboards**
- **Paper** for sketching
- **Pencils**
- **Large poster paper**
- **Colouring materials**

EXTENSION

Discuss possible changes to land management at the site. Sketch a picture of the site in the future after land use has been improved. Students should discuss the impacts of changed use on the area.

ASSESSMENT

Were students able to visualise and sketch a bird's-eye view of their section of the stream? Could they visually represent vegetation types, river form and adjacent land uses?



A Meandering Map - Student Worksheet

Name _____

The amount and type of vegetation alongside a waterway often tells us about the health of the aquatic environment (such as the water quality) and the types of plants and animals that might live in, on or near it.

Before European settlement, the fertile soil beside streams and rivers would have been covered with native grasses, rushes, shrubs and trees. Nowadays, this land is used for agriculture, industry, housing and recreation. These land uses can pose direct threats to waterway health if not managed properly.

MATERIALS

- Clipboard
- Sketching paper
- Pencil
- Eraser

OBSERVE and sketch the following features from the view of a bird flying overhead as you walk along the waterway.

WRITE short captions about each feature.

FORM
Is the waterway straight?
Is it winding?

WIDTH
Estimate the width of the waterway.
Does the width vary?

WATER
Are there any rocks, snags or sandbars visible in or protruding from the water?
Are there any riffles or pools?
Is there any vegetation or pollution?
What colour is the water?

BANK
How wide is the bank?
Is the vegetation sparsely spread or growing close together?
Do any trees or shrubs hang over the water?
Are there any hollows in the trees?
Is the vegetation native or exotic?
Does the bank have natural or man-made features?
Is the bank stable or eroded?

VERGE
Is there any vegetation on the verge?
Is it sparsely spread or growing close together?
Is there a mixture of grasses, shrubs and trees?
Are there any visible hollows in the trees?
Is the vegetation native or exotic?

LAND USE
How is the land on either side of the waterway used?
Is it used for farming (crops or stock)?
Is there fencing to restrict stock access?
Is there evidence of erosion, trampling or over-grazing?
Is the land used for industry?
Is there evidence of run-off or wastewater entering the waterway?
Is the land used for housing?
Are there any other man-made features such as picnic areas, roads or carparks?

Virtual Habitat Survey

I

FOCUS

- How can waterway habitats be evaluated?

OBJECTIVES

- Use an internet site to view a regional waterway
- Assess habitat and submit an online habitat survey

CSF II LINKS

SCIENCE 4.1 Biological
4.2 Biological
SOSE 4.1 Geography
4.3 Geography

BACKGROUND

All necessary information is provided on the website. If internet access is a problem or you find that this website no longer works, see '*Resources – Virtual Habitat Survey'* on the CD and alter the activity accordingly. You could also scan the web for alternate sites and activities prior to the lesson.

NOTES

This activity can be conducted as an introduction or in place of, the Science activity, *'Habitat Survey'*. Students may complete the habitat surveys individually or in groups.

LEARNING TASKS

1 Introduce the task by discussing these points.
- What features are apparent in a healthy / degraded waterway habitat?
- What impacts might these features have on aquatic life?
- What features might exist along a waterway in our local area?
- What events may have affected the way our waterway look?

2 Students go to the website www.vic.waterwatch.org.au

3 Give each student a copy of the *'Virtual Habitat Survey'* worksheet.

4 Students follow the instructions on the worksheet, examining the photograph, completing the online habitat survey, submitting the survey and reading an interpretation of the results.

5 If time permits, students could complete several surveys by selecting other regions of Victoria, this provides an opportunity for students to view waterways from different places and in different conditions.

6 Conclude the activity by discussing it as a whole class.
- What did you find difficult / surprising about the task?
- What did you learn as a result of the task?

MATERIALS

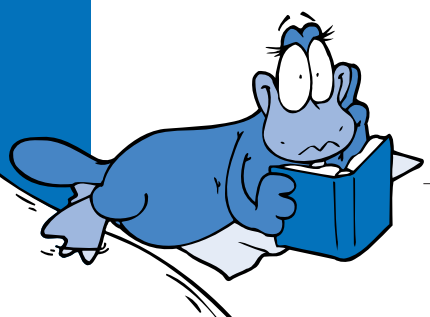
- ***'Virtual Habitat Survey'* Student Worksheet**
- **Computers** with internet access
- ***'Virtual Habitat Survey'* Alternate Resource** (see 'Resources' on the CD) (optional)

EXTENSION

If a field trip is not possible, encourage students to visit a local waterway with an adult and conduct a habitat survey after school or on a weekend and report back to the class.

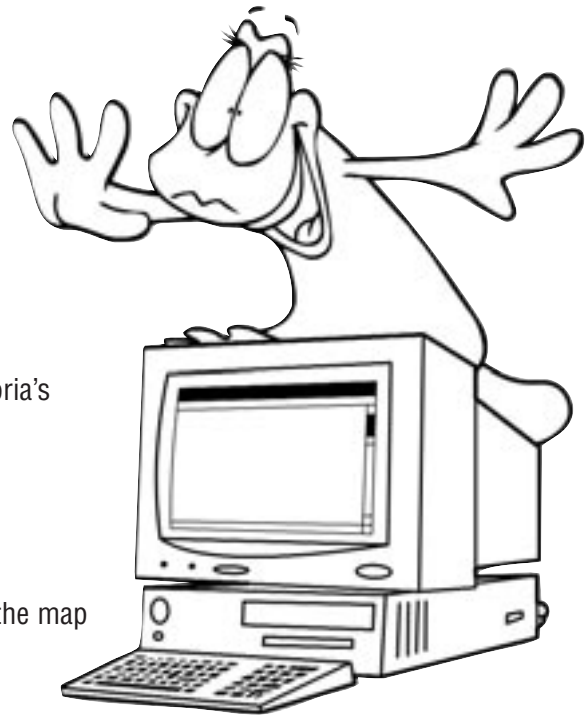
ASSESSMENT

Were students able to rate features appropriately from the photograph? Could they work together and make collaborative decisions using available information?



Virtual Habitat Survey - Student Worksheet

Name _____



LOG ON to the internet.

GO TO www.vic.waterwatch.org.au

CLICK 'Water Fun' (on the left hand side of the screen).

CLICK 'Try your hand at assessing some of Victoria's Rivers'.

READ the background to find out what a habitat survey is.

SELECT the 'North Central Region' by clicking on the map of Victoria or on the written link.

SPEND a few minutes studying and discussing the features of the photo.

FOLLOW the instructions on the page to work through the habitat survey.

NOTE some terms are written in blue. Click on these to read their definition.

READ the five descriptions in each section.

CHOOSE the one you feel is the closest match to the photo by clicking the circle. A black dot should appear inside it.

SUBMIT your assessment form when completed.

COMPARE your score with 'our score' (Waterwatch score).

READ why Waterwatch have given their scores.

READ what the score tells us about the health of the habitat at that waterway.

LOG OFF the internet or complete further online habitat surveys.

Miraculous Minibeasts

M

FOCUS

- How do aquatic creatures walk on water?

OBJECTIVES

- Conduct simple science experiments
- Understand and explain surface tension

CSF II LINKS

SCIENCE 4.1 Biological
4.2 Biological
4.2 Chemical

BACKGROUND

On the still waters of a pond or slow-flowing stream, there are many animals that can walk on water! Water surfaces have an invisible 'skin' created by surface tension. Water striders and spiders can walk on top of this 'skin' because they spread their weight over a relatively large area of water and have millions of tiny hairs on their long legs, which repel water.

NOTES

To involve students in active investigation and promote discovery, two science experiments are suggested below. Students could conduct both experiments, or half the class could conduct each one then report their observations and findings back to the other class members.

LEARNING TASKS

1 **Discuss the aquatic fauna that students have seen living in waterway environments.**

2 **Use pictures to start discussion about surface dwelling insects.**
- Have you seen these creatures before? Where?
- What do you notice about the way they move?
- Can you predict how they walk on water?
- How might those millions of hairs on their legs help them?

3 **Students conduct the two experiments (worksheet 1 & 2).**
- You may like to hide the 'why is it so' section when photocopying.

4 **Ask questions to generate discussion of results.**
'Suspended Sewing Needle'
- Why did the blotting paper sink?
- Why did the needle float?
- Can you explain why the needle will not touch the bowl's edges?

'Psychedelic Milk'
- What did you observe before and after the detergent was added?
- Why do you think the detergent makes a difference?

5 **Students complete the applicable sections of worksheet 3. Allow time to share and draw conclusions.**
- What advantages / disadvantages are there to living on the water?

MATERIALS

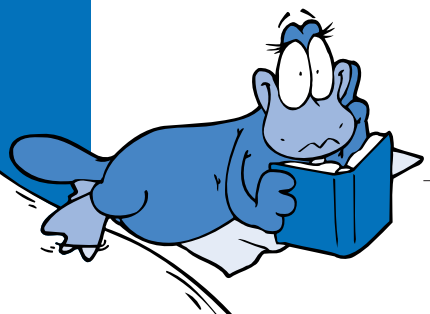
- ***'Miraculous Minibeasts'* Student Worksheets 1, 2 & 3**
- **Pictures** of surface dwelling insects (see 'Illustrations' on the CD)
- **Bowl of water**
- **Blotting paper** / paper toweling
- **Sewing needle** / paperclip
- **Bowl of milk**
- **Food colouring**
- **Detergent**
- **Eye dropper** or straws

EXTENSION

Pose the question ' how can we protect waterways, and their miraculous minibeasts?' Use the internet, library resources or a guest speaker to help students devise management options.

ASSESSMENT

How well did students predict results, conduct experiments and draw conclusions? Could they clearly explain their observations and results to peers?



Miraculous Minibeasts - Student Worksheet 1

Name _____

MATERIALS

- **Bowl of water**
- **Blotting paper**
- **Sewing needle**

Suspended sewing needle

Did you know that some animals can walk on water!

AIM

To use an experiment to help us understand how miraculous minibeasts can walk water.

SAFETY Take care with the sewing needle. Needles are sharp and should not be pointed at others or carried whilst running. Take care not to drop or lose the needle for feet to find later!

METHOD

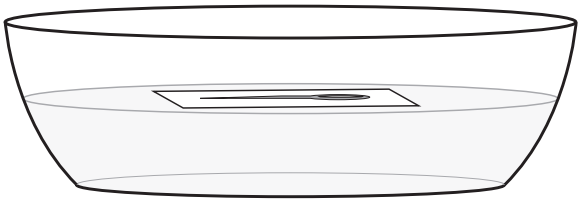
PART A

1 Three-quarter fill your bowl with water.

2 Place a small square of blotting paper on the surface of the water in your bowl.

3 Gently lower a dry sewing needle to lie flat (horizontal) on the blotting paper.

4 Watch closely and observe what happens next.



5 Think about these questions:

- What happened to the blotting paper?
- What happened to the sewing needle?

PART B

6 Gently blow the needle about the bowl and watch closely.

7 Think about these questions:

- Why did the needle move?
- Could you move the needle to all areas of the bowl?
- Did it ever touch the edge?
- Why was it difficult to make the needle touch the edge of the bowl?

WHY IS IT SO?

Water is made up of many tiny parts called 'molecules'. These molecules are attracted to each other, and form strong bonds. This causes the water surface to have an invisible 'skin'. We call this skin 'surface tension'.

Small surface dwelling insects are able to walk on water because their bodies are light and they spread their weight through their long legs. These legs are covered in millions of tiny hairs that repel, or push away, the water. This creates a dip in the water, so the insects don't even get their feet wet!

CHALLENGE Think about why insects live on the water?
What might they feed on?
How do they hunt, detect and catch their prey?

Miraculous Minibeasts - Student Worksheet 2

Name _____

Psychedelic Milk

Have you ever seen insects that walk on water?
By walking on water, they can catch and eat animals that fly down or swim up to the water's surface.

MATERIALS

- **Glass**
- **Milk**
- **Food colouring** (2 Colours)
- **Detergent**
- **Eye dropper** or straw

AIM

To use an experiment to help us understand how miraculous minibeasts can walk water.

METHOD

1 Pour milk into your bowl so that it is half full.

2 Using a straw, drop a little food colouring into the centre of the milk.

> **To use the straw as an eyedropper…** place one end in the liquid, seal the other end with your finger and lift the straw. Now take your finger off momentarily to allow a drop to fall.

3 Take care not to bump or move the bowl.

4 Add a few drops of another colour into the centre of the milk.

5 Carefully add 1 or 2 drops of detergent into the centre of the milk.

6 Watch closely and observe what happens over the next few minutes.

7 Think about these questions.
- What was the food colouring doing before you added the detergent?
- What happened to the food colouring after adding the detergent?

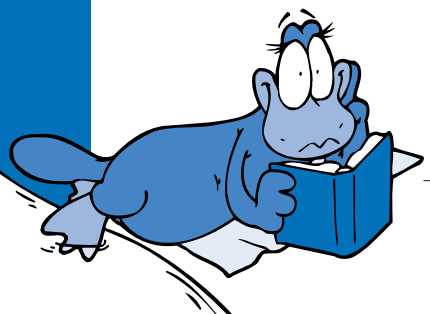
8 Can you come up with an explanation of the results?

WHY IS IT SO?

The surface of the milk has an invisible 'skin', known as 'surface tension'. This skin enabled the food colouring to sit on the water's surface rather than sink and mix with the milk.

Detergents and oils break this skin and disturb the surface tension, causing the milk to move around. By adding colour, you were able to see this process happening.

CHALLENGE When might the surface tension in our local waterways be disturbed?
What substances might cause this and how might they find their way into our rivers?
How can we protect surface tension and surface dwelling minibeasts?



Miraculous Minibeasts - Student Worksheet 3

Name _____

1 What did you observe in Experiment 1, 'Suspended Sewing Needle'?

2 Can you explain the results in your own words?

3 From what you have learnt so far, think about the features a surface dwelling insect must have to be able to walk on water. Draw your creature below.

4 What would your creature eat?

5 How would it catch its prey?

6 What did you observe in Experiment 2, 'Psychedelic Milk'?

7 Can you explain the results in your own words?

8 What products in your home might disturb the surface tension of water? Draw them below.

9 If surface dwelling insects cannot live on the water's surface, what other aquatic creatures might be affected and why?

Feathery Friends

M

FOCUS

- How are bird's beaks and feet adapted?
- How do these adaptations relate to the environment?

CSF II LINKS:

SCIENCE 4.1 Biological
4.2 Biological

OBJECTIVES

- Understand bird adaptations to waterway environments
- Match species with diet and habit

BACKGROUND

Waterways are havens for many birds. Diverse vegetation and water provide shelter, protection, nesting, breeding and roosting sites, and a wide variety of food. Each and every species has adapted to its dietary and habitat requirements. Birds capture their share of the food supply because they target different food sources and locations.

NOTES

Collect posters, pictures, photos, non-fiction books and field guides of native Australian birds and display them around the classroom throughout Water Week. Organisations such as the Bird Observer's Club of Australia or Birds Australia may be able to assist you.

LEARNING TASKS

1 Discuss how humans adapt to a variety of environments.
- How do people cope with living in hot, dry, arid desert areas?
- How do they cope in areas that experience sub-zero temperatures?
- How do they live in areas that flood periodically?

2 Relate the discussion to the animal world.
- Focus on identifying adaptations to body shapes, body coverings, movement, hunting techniques and breeding.

3 Brainstorm to make a list of as many different animals as possible, and their adaptation techniques.
- Do not limit the discussion to only Australian waterway environments.

4 Students complete the worksheet.

5 Discuss the results.
- Where would you expect to see each bird feeding at waterways?
- What animals or actions might pose threats to each bird?
- How can we help preserve each different bird pictured?

6 Play 'Who Am I?' or 'Celebrity Head' with the bird species discussed.

MATERIALS

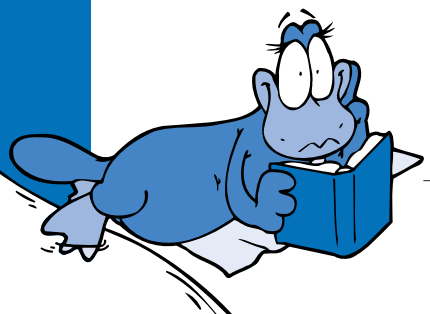
- **Posters**, pictures, photos, books and field guides of Australian birds
- ***'Feathery Friends'* Student Worksheet**
- **Dictionaries**

EXTENSION

Using posters and field guides, challenge students to sketch bird species into the appropriate place on the Extras sheet, *'Waterway Birds'*. Students could make models of a bird or draw birds and label their features.

ASSESSMENT

Were students able to classify bird species according to beak and feet adaptations? Could they identify other bird species with similar characteristics?



Feathery Friends - Student Worksheet

Name _____

CHOOSE a different colour for each box and shade them lightly.
SELECT birds that match the description in each box and circle them the same colour.
NOTE that each bird will end up with more than one coloured circle around them.

Dietary adaptions

Large, strong beaks can grab fish, insects and even lizards

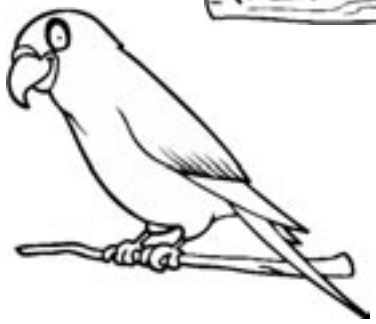
Small beaks catch insects as the bird flies through the air

Short, sharp, strong beaks nip off plants and eat molluscs

Long, thin beaks spear and hold fish and frogs

Small, sharp, curved beaks open and crush seeds

Fine, pointed beaks reach into flowers to feed on nectar



Habitat adaptions

Webbed feet for swimming and diving underwater

Long legs for wading in shallows and among weeds

Long toes to walk on mud and floating leaves

Strong feet for gripping branches

Sharp claws for holding prey or scraping leaf litter

Habitat Survey

C

FOCUS

- Does our local waterway provide quality habitat?

OBJECTIVES

- Conduct a habitat survey along a local waterway
- Determine a stream habitat rating

CSF II LINKS

SCIENCE 4.1 Biological
4.2 Biological
SOSE 4.1 Geography
4.3 Geography

BACKGROUND

The condition of the vegetation in and around a stream provides a good indication of the health of the waterway. When streamside vegetation is degraded, it provides less protection against land use impacts, deteriorates water quality and directly impacts upon aquatic plants and animals.

NOTES

This activity needs to be conducted at a local waterway. The Science activity, *'A Meandering Map'* and the Maths activity, '*Stream Speed'* could also be conducted. If a field trip is not possible, complete the Science activity, *'Virtual Habitat Survey'* as an alternate activity.

LEARNING TASKS

1 Planning the field trip.

- Visit the waterway to determine an appropriate stretch to survey. Consider an area that might result in a variety of habitat ratings, and where there is access to the opposite bank.
- Invite adult helpers to assist students on the day.

SAFETY: When planning a field trip it is essential that you develop a safety plan, which identifies potential hazards the risk of the occurring and implements safety control measures.

2 Prior to the field trip.

- Read and discuss worksheet 1 to clarify definition of terms.
- Review safety considerations and reinforce behavioural expectations.
- Distribute a clipboard and copies of each worksheet to each group.

3 During the field trip.

- Mark out 100 metres for students to study.
- Walk the length of the survey area, allowing students to make observations.
- On the return walk, students (in groups of 3-4) conduct their habitat surveys.
- Circle each rating on the record sheet and obtain a total score.
- Discuss the findings as a class.

MATERIALS

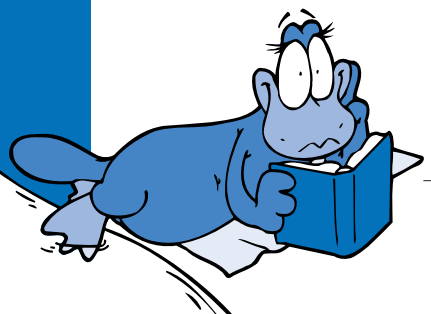
- ***'Habitat Survey'* Student Worksheets 1, 2 & 3** (one for each group)
- **Map** of waterway
- **Trundle wheel**
- **Markers**
- **Clipboards**
- **Pencils**
- **Paper** for sketching

EXTENSION

Compile a list of positive actions that could be carried out to maintain or restore waterway habitats. Communicate them via the school newsletter.

ASSESSMENT

Were students able to rank habitats appropriately at their allocated site? Could they work together in small groups and make collaborative decisions?



Habitat Survey - Student Worksheet 1

Name _____

READ the following definitions.

Definition of Terms

Habitat survey
A Habitat Survey involves visually assessing (1) the vegetation along each side and in the waterway, (2) the condition of the banks and the streambed.

A habitat survey is completed by looking at a number of criteria and rating their function.

Bank vegetation
Bank vegetation refers to the trees, shrubs, rushes and grasses growing on the bank. This vegetation provides food and shelter for aquatic creatures by shedding leaves, twigs and branches into the water. Bank vegetation also stabilises banks, reducing the risk of erosion.

Instream cover
Instream cover includes the snags, logs, rocks and plants that exist in the water. It provides aquatic animals with food, and shelters them from predators and fast moving water. Plants are important because they produce oxygen for aquatic animals. Protruding snags provide roosting sites for birds.

Verge vegetation
The stream verge is different from the bank. It is the section of land up to 30 metres from the water's edge. Verge vegetation consists of trees, shrubs and grasses growing on this area of land, it provides protection for the waterway by reducing the impact that surrounding land uses may have.

Bank erosion and stability
Streams erode naturally, usually on bends. However, an unstable stream results in erosion right along its channel. Banks are kept stable by the roots of bank vegetation. If the bank is bare, it is more likely to erode.

If a stream has been channeled or stabilised with concrete, it will be less prone to erosion. However, it would not be ranked highly, as it will have little or no vegetation.

Riffles, pools and bends
Rocks and debris in the stream may create shallow areas over which the water rushes quickly, forming a rapid. This is called a riffle. Riffles are important for aerating the water with oxygen and providing habitat for many invertebrates. Upstream of a riffle, the water is often quiet and still, forming a pool. Pools are important in providing refuge areas for aquatic animals when water levels drop, and deeper areas for fish to swim.

Habitat Survey - Student Worksheet 2

Name _____

USE this reference sheet to assist you in completing worksheet 3.

Reference sheet

Bank Vegetation

(10)	(8)	(6)	(4)	(2)
Mainly undisturbed native vegetation. No signs of site alteration	Mainly native vegetation. Little disturbance or no recent disturbance	Medium cover of native / exotic. Or one side cleared, other not	Little native vegetation, mostly exotic species	Exotic ground cover with lots of bare ground, few trees

Verge Vegetation

(10)	(8)	(6)	(4)	(2)
Mainly undisturbed native ve.g. on both sides of stream. Verge > 30 m wide	Well vegetated wide verge. Mostly undisturbed native / some exotic veg.	Wide corridor of mixed native and exotics	Very narrow corridor of native or introduced vegetation	Bare cover or introduced grass cover such as pasture land

Instream Cover

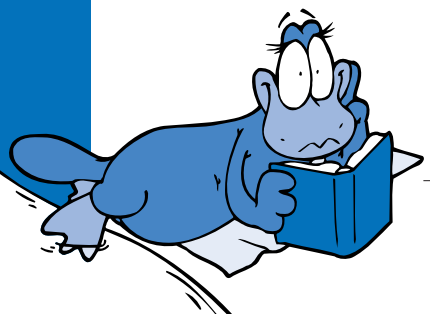
(10)	(8)	(6)	(4)	(2)
Frequent snags, rocks or logs with many plants in the water and an overhanging bank	A good cover of snags, logs or rocks with considerable plant life and overhanging veg.	Some snags or rocks. Occasional areas of instream plants or overhanging veg.	Largely cleared stream with few snags, little stream plant life and no overhanging veg.	No cover, no snags rocks or overhanging veg. Site may have rock or concrete lining

Bank Erosion and Stability

(10)	(8)	(6)	(4)	(2)
Stable; no erosion. No undercutting of banks, gentle bank slopes covered with roots / grasses etc	A little erosion and bank undercutting. Gentle bank slopes with good cover and little damage	Localised erosion. Relatively good vegetation cover. No continuous damage to bank	Signs of active erosion, especially during high flows. Unstable bare banks, little veg.	Extensive erosion – over 50% of banks have erosion. Very unstable with little vegetation cover

Riffles, Pools and Bends (flowing water only)

(10)	(8)	(6)	(4)	(2)
Wide variety of habitats. Riffles and pools present of varying depths. Bends in the stream	Good variety of habitats – riffles & pools or bends & pools. Variation in depths of all three	Some habitat variety – occasional riffle or bend. Some variation in depth	Only slight variety of habitat. All riffle or pool with only slight variation in depth	Uniform habitat. Straight stream, all shallow riffle or pool of uniform depth e.g. channel



Habitat Survey - Student Worksheet 3

Name _____

COMPETE this record sheet.

Record Sheet

Waterway name and location _____

Group members names _____

Survey date _____

CIRCLE your rating for the stream in the table below

Rating	Bank Vegetation	Verge Vegetation	In-Stream Cover	Erosion and Stability	Pools, Riffles and Bends
Excellent	10	10	10	5	5
Good	8	8	8	4	4
Fair	6	6	6	3	3
Poor	4	4	4	2	2
Very Poor	2	2	2	1	1

ADD all the numbers you circled for a total score (The minimum score is 8 and the maximum is 40)

Total Score _____

COMPARE your waterway's total score with the range of scores below to assess the stream habitat rating

Rating	Scores
Excellent	36-40
Good	29-35
Fair	20-28
Poor	12-19
Very Poor	8-11

Waterway Habitat Rating _____

What changes could we make at this site to improve the Waterway Habitat Rating?

_____

_____

_____

Involve Me And I Will Understand

A

FOCUS

- How can I improve waterway health?
- What effect does my behaviour have?

OBJECTIVES

- Plant native vegetation within the catchment
- Get dirty to discover how to make a difference

CSF II LINKS

SCIENCE	4.1 Biological
SOSE	4.3 Geography
HPE	4.2 Health of Individuals and Populations

BACKGROUND

Planting vegetation is a great way to increase the health reparian zones and waterways. Taking students out of the classroom and into the environment can improve their understanding of waterways. Many farmers, Landcare groups and organisations are 'revegetating' sites to help lower the watertable. Each tree, shrub or grass planted makes a difference to our environment.

NOTES

It is recommended that you contact the North Central Catchment Management Authority to organise assistance in your revegetation project. They can help with choosing a site, trees, funding or staff.

LEARNING TASKS

1 **Contact the North Central Catchment Management Authority to obtain equipment and select a location for planting.**
   - Ask for staff assistance to help you on the day.

2 **Send home permission forms.**
   - Include requests for parent helpers, appropriate fieldwork attire and resources to assist e.g. shovels, gloves, digging fork.

3 **Divide class into working parties.**
   - Assign each group plants, tools and an area.
   - Demonstrate the planting process including getting the plant out of the container, digging a good-sized hole, replacing soil and erecting the tree guard (and watering if applicable).

4 **Revegetate your site.**
   - Make sure students take turns at each of the jobs

SAFETY Make sure that students take regular breaks and share the work. Ensure students receive regular fluids and have adequate sun protection. Students must remain at least 2 metres away from the waterway at all times.

5 **End the planting session well before you need to leave the site.**
   - Take time to discuss the achievements of the day
   - Discuss what you might do to maintain the site in the future
   - Put a marker in the ground. Take a photo from this point

MATERIALS

- **Protective clothing** including sturdy shoes or gumboots, weatherproof jacket, hat, sunscreen, gloves
- **Shovel**
- **Plants**
- **Tree guards**
- **Stakes**
- **Food and drinks**
- **Buckets** (optional)

EXTENSION

Regularly return to weed, replace dead vegetation and take a photo. Complete a mathematics activity on plant survival rate. Continue the school's work with the environment through Junior Landcare.

ASSESSMENT

Did students participate actively in the revegetation exercise? Did they use due care in planting? How did they work with classmates? Did students participate in discussions?