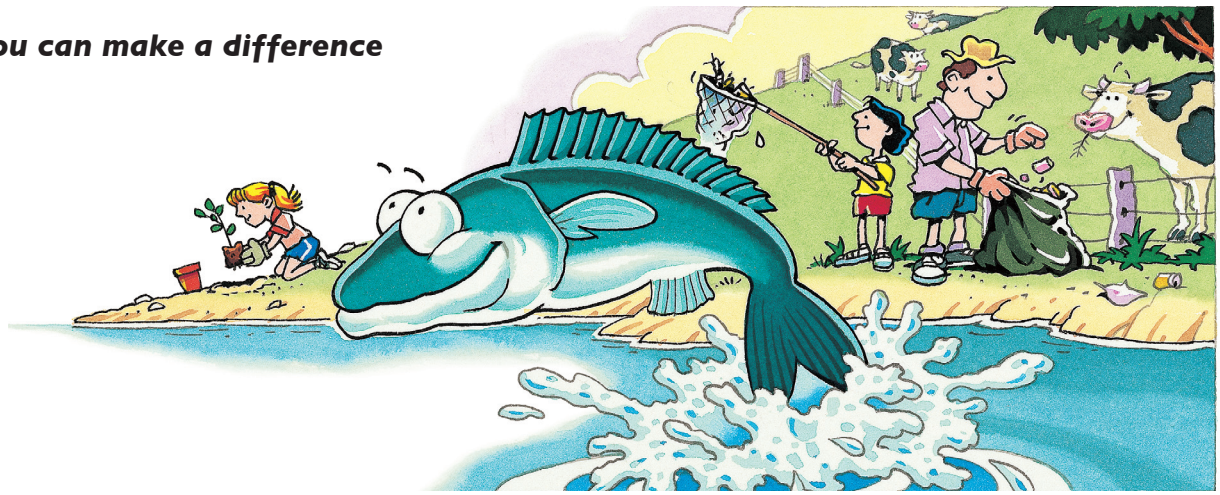
Code 6

Quality catchments equals quality fish

Code 6 Quality catchments equal quality fish Year Level 5/6

You can make a difference



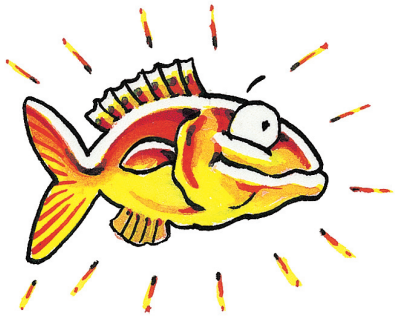
Specific Learning Outcomes

By completing this code a Junior Fisher learns that:

- quality catchments are vital for healthy quality fish
- there are practical ways they can help care for the catchment
- all fish, particularly 'threatened' fish and invertebrates have special habitat needs
- its wiser not to fish in waters that are habitats for threatened species
- if you don't manage an area responsibly, there would be few places to fish and few fish to catch
- introduced aquatic pests may impact on the amount of quality fish in their waterways

These activities and skills support the following NSW Board of Studies Stage 3 syllabus outcomes:

Science & Technology	PDHPE	English	Creative Arts
LTS3.3 INVS3.7	COS3.1 INS3.3 DMS3.2 SLS3.13	TS3.2	DRAS3.3



Good Junior Fishers know that caring for quality catchments equals quality fish

View the background information from the *Get Hooked DVD.*

Δ Background notes

What is a catchment?

'An area of land from which water drains to a common point'[17]

What is a critical habitat and how does it help threatened species to survive?

We all know that animals have special needs that must be met in order to survive. The habitat where they are found normally supplies these needs. However, within your catchment there may be a particular habitat that is vital to the continuing survival or the recovery of a 'threatened' fish or invertebrate. This place is known as the animal's 'critical habitat'.

Threatened species include all animals that are critically endangered, threatened or vulnerable. In NSW, examples of threatened species include trout cod, Macquarie perch, black cod and grey nurse sharks.

A critical habitat is a special place which is vital to the survival of the species.

- It is a place where all the animals' food requirements are met.
- It is a place where they may successfully breed and their genetic diversity is maintained.
- It is a place where they may find shelter from predators.
- It is a place where in times of high stress such as low water volumes, drought or flood they can still survive.

The maintenance of a critical habitat is essential to the long-term future of threatened species in your area.

Erosion...what's the big problem?

Maintaining a natural balance

Heavy rains and floods can cause erosion. The water can wash away banks of soil which line rivers, streams and inlets. This soil is usually held together by the roots of native vegetation such as native grasses, sedges, shrubs, trees and woody debris (snags) that line the riverbank. The vegetation that lines the banks of rivers, streams, lakes and inlets is known as riparian vegetation.

Human impact

When native vegetation is directly removed or altered by human activities, the soil is much more likely to erode and wash away into the nearest stream or river.

Impacts for fish and other aquatic animals

Turbidity

Turbidity is a measure of how cloudy or muddy the water is and erosion of soil causes the water to become more turbid. The more muddy or turbid the water, the less light can reach the plants in the river. Aquatic plants need to receive enough light to produce food for themselves and to grow. Fish and other aquatic animals feed upon these plants and then other animals feed upon these animals. Plants also produce oxygen which is released into the water and allows fish and other aquatic animals to breathe.

Increased erosion and so increased turbidity can kill aquatic plants, or at least decrease their growth, because they cannot receive enough light to survive. Then the aquatic animals that rely on these plants will also die or, if they can, will move away to other areas. Excess turbidity in water can also cause fish gills to become clogged with sediment.

[17] Definition sourced from p.5, YarraCare Land Management Series, Soil erosion in the Yarra Catchment

Sediment

The heavier soil particles from the land (sediment) will fall to the bottom of the waterway and can smother plants and suffocate animals such as invertebrates living on the bottom of the waterway.

The sediment can cover the stream bed, filling pools, covering gravel beds and removing spaces that are normally used as habitat by juvenile fish, small fish species and stream invertebrates. These areas are also used by adult fish and invertebrates to deposit eggs. For example, Macquarie perch deposits its eggs in gravel where they are vulnerable to smothering by sediment.

Temperature

The type and amount of aquatic plants, fish and invertebrates can be highly affected by changing temperature. Water temperature is affected by the following factors:

- Depth of the water.
- The season of the year.
- Time of the day.
- Vegetation overhanging the waterway (shade).
- Suspended sediment (turbidity) in the waterway due to erosion or runoff.

Particularly in summer and during droughts, deep pools and shading vegetation are important for aquatic plants and animals to survive. Clearing of shading vegetation and removing water from deep pools will increase temperatures and reduce oxygen levels making it more difficult for plants and animals to survive.

What's the problem with increased nutrients entering the water?

An increase in nutrients causes eutrophication, the harmful excessive growth of algae. This algae may reduce the light available to other aquatic plants and may smother and/or clog the gills of fish and invertebrates. It may also diminish oxygen levels produced by the plants it is actively smothering. Examples of what is known as algal blooms are becoming increasingly common in estuaries, bays and lakes due to elevated levels of nutrients entering the water.

They can be particularly harmful for slow growing estuarine seagrass beds, which are important fish nursery areas for many different species, including many recreational and commercial species.

What does pH mean and how can it affect fish?

pH is the measure of how acid or alkaline a river, lake, estuary, wetland, rockpool or sea is, on a scale of 0 –14.

Extremely high or low ph values can result in the death of fish and most other life in a waterway.

7 indicates neutral pH

0	7	14
indicates acidic water	neutral	indicates alkaline water

pH can be affected by sewage, rural, urban and industrial run off and dog droppings.

Salinity

Salinity is the measure of the salt concentration of water. Higher salinity means more dissolved salts.

All freshwater rivers and oceans need a certain amount of salt. However, many species of aquatic animals and plants can only survive within a certain salinity range.[18]

Salinity problems can arise for the land and waterways and all the animals and plants in these areas when deep rooted plants such as trees are removed. These trees use water from the watertable underneath the ground and when the trees are removed the watertable rises, bringing to the surface salts that were in underground rocks.[19] See graphic overleaf.

Simple ways we can help

1. Plant native, locally found vegetation along rivers, lakes and estuaries to help balance the temperature of the water and to prevent erosion of banks.

If you live near a man-made park, consider the benefits for fish and birdlife in your lake by replacing mown grass on the verge of the lake by planting filtering plants such as reeds and sedges.

Native is best. Plant only native vegetation that occurs naturally in that area (this is endemic vegetation), as non-native or even native vegetation that doesn't normally occur in your region can alter physical factors such as the temperature of the water.

[18] Source: p.34 Barwon River Environmental Trail, A Resource for Schools, Barwon Water.

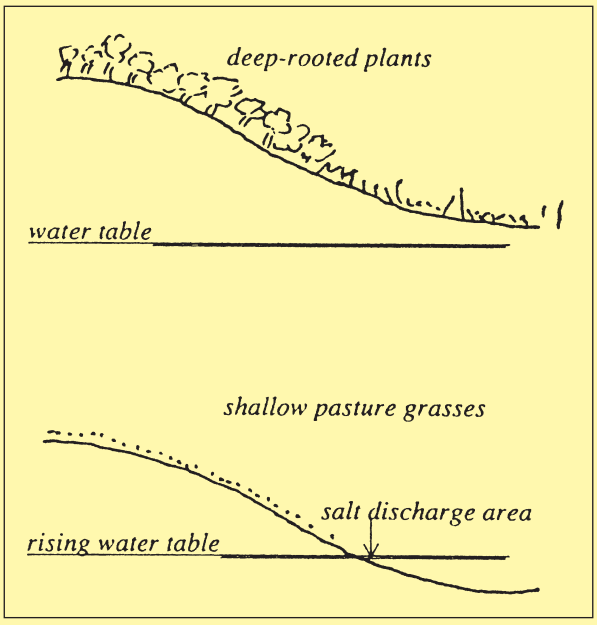
An example of this is where you see willows planted along streamside banks. These can be detrimental to fish when they shed their leaves in winter, altering the temperature of the water. Their dead leaves will also smother invertebrates living on the bottom of the river and the decaying leaves cause an unnatural increase in nutrients and a decrease in oxygen levels.

2. Leave woody debris (snags) in rivers and wetlands as they are used as fish nursery areas and provide shelter from fast flowing waters. They also help to protect banks from erosion.

3. When fishing or looking for animal life replace all upturned rocks as they are an important habitat for animal life.

4. Use boardwalks or designated tracks to access sand dunes or rivers and wetlands, so that riparian vegetation is not trampled.

5. If you live in a town or suburb, think that everything you put down the sink drains to a bay or river:



- Don't pour milk or oil down the sink. Make sure the cleaning products you use, such as washing up liquid, laundry detergent and bathroom cleaning products will break down naturally (biodegradable).

- Wash your car on the lawn, rather than in the street.

- Spray plant pests with naturally biodegradable pesticides or investigate companion plants that act as natural 'bug' deterrents. (eg. certain species of geraniums for mosquitoes).

6. If you live in a rural or semi-rural area, try to use biodegradable fertilisers instead of non-biodegradable products on vegetables, market gardens and wineries

7. Pick up your dog droppings as you walk your dog, as when these wash into a waterway they rapidly increase the amounts of nutrients in the water and alter its pH.

8. If you live on a farm, fence your river or lake, so that cattle, sheep or horses don't damage stream banks or defecate near the waters edge. Increased erosion or the stream bank and animal droppings will increase turbidity, nutrients and pH. If animals need the water from the river to drink, divert some water to a paddock where they can't access the waters edge.

[19] Source: p.32 Barwon River Environment Trail, A Resource for schools, Barwon Water

Fishy activities: 'Care for your catchment' programs —Alternative 1 (Fishcare, Waterwatch, Beachwatch, Streamwatch programs)

Activity will be motivated by the suggested following oral tale.

'Sam's tale'

(Name may be referred in masculine or feminine tense, as appropriate)
Props: nil

This is a tale of a boy or girl, just like yourselves who lived not far from a river that flowed down to the sea.

Sam was his/her name. He/she used to like to take his/her old three seater canoe and tie up to a snag to go fishing. The canoe was great, because there was enough room for all his/her gear and a couple of his/her friends too. They always had a fantastic time, whether they caught anything or not.

One day they decided to explore further down the river. Suddenly, instead of the twists and turns in the river, they entered a clear wide muddy patch of water. His/her friends turned to each other screwing up their noses in distaste. 'Phew…what's up with the water?' they asked each other questioningly. 'Look' said Sam and pointed to the bank. There was a small group of cattle/sheep/ stormwater or outfall pipes (whatever is applicable to your area).

Discuss: What do you think happens next in the story. Make up your own ending as a large group.

'Sight unseen'.

Props:

- Torch
- Glass jar containing turbid water
- Underwater plantlife
- Local catchment water
- Coffee percolator filter
- Paper and pencils

Activity

Group 1: Collect some of the catchment water in a glass jar.

Using a torch shine the beam of light through the sides containing turbid water.

- What do you notice about the amount of light passing through the water?
- How could this affect the plants growing in the water that need light for manufacturing food and producing oxygen?

Group 2: Collect some of the catchment water in a glass jar.

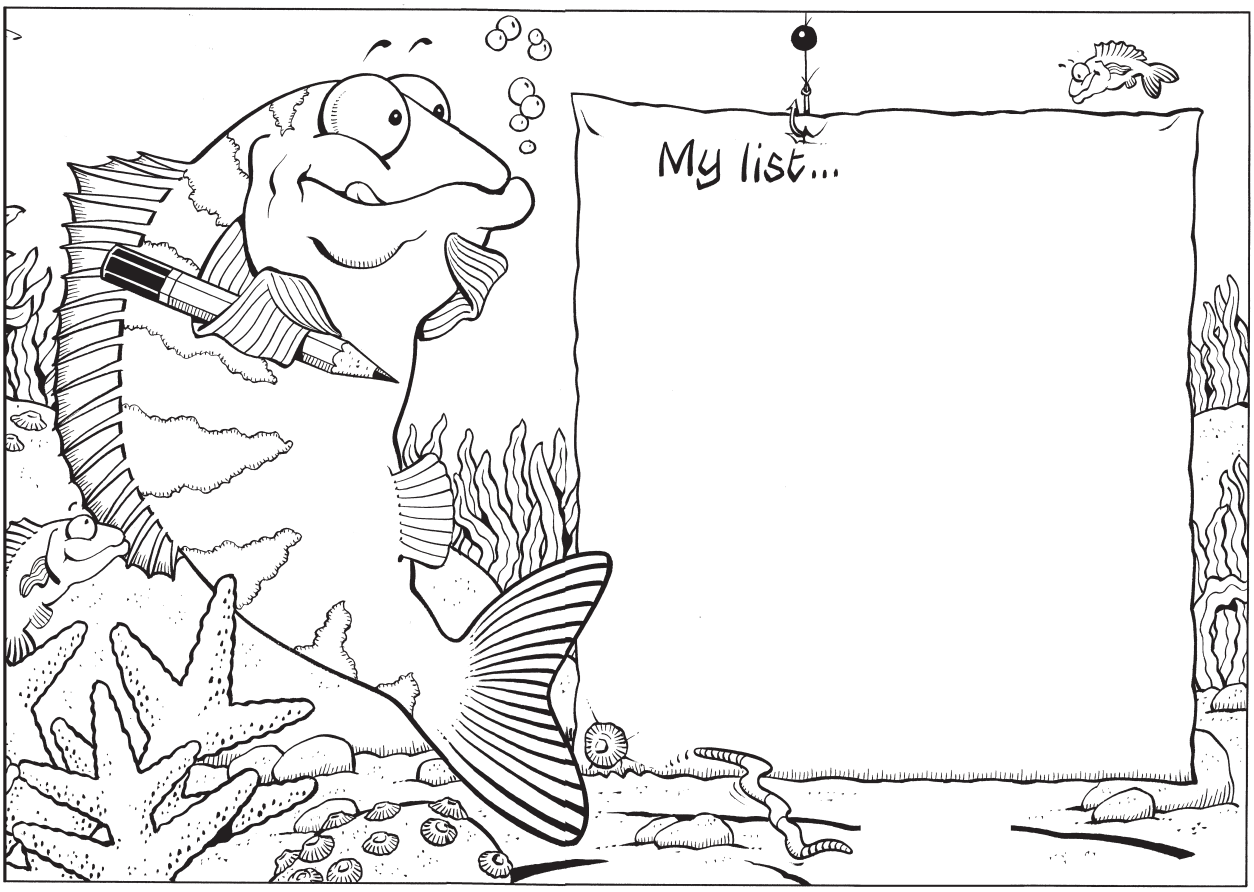
- Pour a sample of this water through a coffee percolator filter.
- What has happened to the filter? If this filter is similar to a fish's gills, how will this build up of sediment on the gills affect the fish's ability to breathe oxygen in the water?

Draw an underwater scene, complete with fish, plants and insects skimming around on the surface. With a brown or yellow crayon depict what the water would look like after heavy rain in a catchment area.

Write a caption underneath:
ie. "I'm hungry, it's getting hard to see my lunch". (Learning concept: Decreased visibility)

"All the plants are dying, there's nowhere to hide…" (Learning concept: Loss of quality habitat)

"Cough, cough, YUK! It's getting murky down here, can you breathe?"(Learning concept: Decreased oxygen level)



Evaluation activity:

'Moving house'.

Props:

- Wilbur the Wise Fish whiteboard
- Whiteboard markers

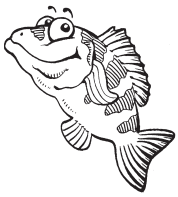
Activity

Using the concepts developed above concerning water quality, students brainstorm and draw on the whiteboard Wilbur's reasons for moving to your local body of water.

Example

- Wilbur the Wrasse: Why would I move HERE? Mmmm…well for the pleasure of my company I would want…
- List 5 needs for life: ie. Sedges, rocks, snags, shady trees, native aquatic plants, overhanging banks, low pollution levels, low sediment levels, etc.

Suggested follow-up class activities for teacher.



'Help is at hand'

Investigate if there are any local groups of people just like you who are making an effort to make your river/lake/sea system a quality catchment.

- Are there any local Fishcare, Rivercare, Bushcare, Landcare, Saltwatch, Coast-Action groups in your local area?
- What Friends groups operate in your suburb or town?
- What sort of activities are these groups involved in?
- What areas have been improved since that group first began in your local area?

Write a letter and nominate any future sites you think need attention from one of these groups.

Fishy activities: 'Fish friendly' water programs— Alternative 2 (Fishcare, Waterwatch, Beachwatch, Streamwatch programs)

Oral tale: 'Sam's tale'

Use the same version of the interactive drama 'Sam's Tale' as your introduction to the following activities. This time, the emphasis will be more on liquid wastes if that is appropriate to your region.

'Water sleuths'

Props:

- Copy of freshwater or marine life keys
- Pencils & erasers. (see Activity Sheet)

Special note. Refer to Appendix 4, Essential care considerations for field trips.

Activity

Become a water sleuth: One of the ways we can discover if the local pond, lake, river, estuary or bay is '*fish friendly*' to see who lives in the water with them.

Investigate: Your mission is to discover just how '*fish friendly*' your local waterway really is.

Special Note: This activity would ideally be conducted in the field in an area near the school. Alternatively, use samples of water collected from nearby waterways in order to increase student relevance.

If in the field:

Look at the water surface…

Look amongst the reeds and grasses…

Look in the mud…

Leave no stone unturned…but remember to turn them back

If in the classroom use an appropriate poster to discuss the above sampling areas.

- Are there a large number of insects, snails, crustaceans and worms or a small number? Many insects may indicate that there is a substantial amount of food.

Don't be tricked: If organisms are all the same type, this may indicate that the water is unbalanced, as certain species of water creatures are more sensitive to water pollution than others.

- Are the types of insects the same, or are there many types?
  If there are lots of different types of water invertebrates, this may mean that the water is in the right balance. The greater the diversity, the cleaner and healthier the waterway is.

Discuss

- Why might fish wish to have many different species of water insects, worms, snails and crustaceans in the water?
- If there are only a few water invertebrate species found in the water, what impacts does this have on the number and the range (diversity) of fish you will find?

Activity continued

- Identify the types found using the key detailed in the activity section.
- Judging by the animals you have found, how polluted do you think this waterway is?
  In the absence of the ability by the volunteer to obtain a water sample, use the poster to discuss appropriate sampling areas and methods. Present students with appropriate water species key, the leader then sticks pictures of a group of unidentified organisms on the whiteboard and asks the students to use their keys to identify the organisms and then decide the quality of the water.

Just how Fish friendly is our water?

Fish friendly water: Unpolluted water

- Lots of different kinds of water insects: amphipods, caddisfly larvae, dragonfly larvae, stonefly and mayfly nymphs, backswimmers, cyclops, damselfly nymphs, dodsonfly larvae, water boatman, leech, water snails, water spiders, whirligig beetle, mussels, mosquito wriggler/pupa, planaria, ostracod, water mite, water strider.

Tough for fish: Slight pollution

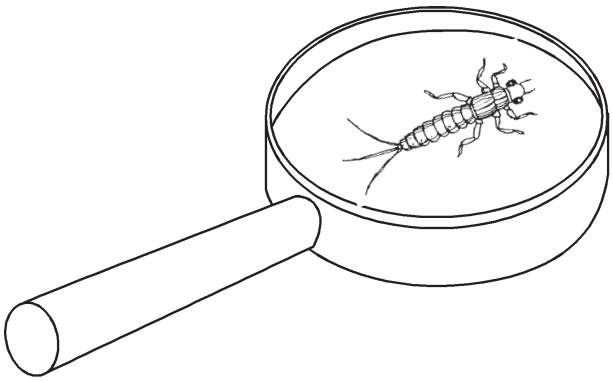
- Fewer water insects are present
- Stonefly and mayfly nymphs are rare
- Many snails ie. small black water snail
- Worms ie. chironimic bloodworms

No fun for fish: Moderate pollution

- Contains less than 5 species
- eg. psychodid worm, large brown water snail

Fish unfriendly water: Heavy pollution

- Contains less than 3 species
- Worms common



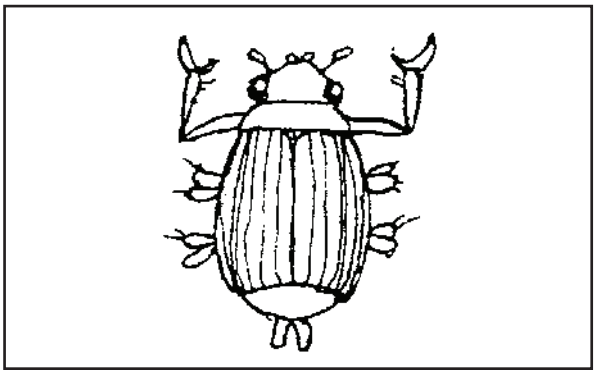
[20] Graphics Key: Sourced from p.47 ***Lets Clean up the Water*** A Workbook on Water Pollution.

Evaluation activity:

'Aquatic heads'

Props:

Series of picture cards with a diagram and the common name of an aquatic invertebrate (use the picture cards in the activity section or develop your own cards for your local area).



- Headbands

Activity

- A panel of 3 students have headbands placed on their heads with a picture card secured to the top.
- Panel students are not allowed to see the picture card and face the audience
- Panel students take it in turns to ask the audience a series of 'yes' or 'no' questions in an attempt to work out which aquatic invertebrate is on their head.
- Suggested questions could include:

  Do I like dirty water?

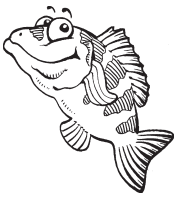
  Do I like unpolluted water?

  Have I got a shell?

  Am I slimy?...and so on

The first person to work out their invertebrate wins and ends the round. A new panel is chosen and the game begins again.

Suggested follow-up class activities for teachers



'Vanishing vegetation'

Props:

- Magnifying glasses
- Large sheets of paper
- Pencils and textas/paint

Local field trip:
Walk along the side of a road or a riverbank, if you have one nearby.

Often roadsides and rivers can show examples of the type of native riparian vegetation that may have originally existed in a region before it was cleared for housing or land.

- Look closely at the different heads of the grasses with a magnifying glass…are they all the same?
- Observe: Can you see any with 'hooks', or 'spears' on them? Why would the grass have these features? (ie: Spear grass, Wallaby grass, Plume grass, Weeping grass, Austral Saltgrass, Windmill grass, etc.)
- Comment on: In some areas of Australia over 90% of original grasslands have disappeared or been altered. We didn't realise just how valuable they are to fish and fish habitat. If you were a junior fisher why would you want to conserve grass lands?

(Place in your own state's or territory's figure if known)

Design a poster promoting grasslands for junior fishers.

'Mysterious micro-habitats'

Props:

- Several hoops for sampling vegetation
- Pad and pencils for note taking

Local field trip

Explore life on the edge of a waterway.

Leaves, leaf litter and other plant materials such as seaweeds, are valuable microhabitats for invertebrates.

These invertebrates have a vital role to play in either breaking down the plant material and releasing nutrients into the surrounding area or else may be part of the direct foodchain to fish.

Randomly throw a hoop alongside the edge of a pond, river or rockpool. Sample three different areas.

Micro munchers:

Can you see any chewed leaves or seaweed?
Are there lumps on the leaves?
Have any of the leaves been recycled as spider traps?
Draw your results.

Food for fish:

How could these leaves and their inhabitants be vital for the survival of healthy fish?

Draw one link between each of your discoveries and how it could benefit a fish.

Props:

- One 'Catchment Report' worksheet for each student (see activity sheet)