Stream Monitoring Survey

Environment Canterbury
Your regional council

Name of Waterway: ______________________________

Date and Time of Survey: ______________________________

Class / School: ______________________________

Names of Group: ______________________________

____

(attach stream photo and map)

In-Stream and Riparian Habitat Survey

Walk along the stream banks and investigate the stream bed, answering these questions to describe the quality of the habitat.

Questions	Score 8	Score 6	Score 4	Score 2	Score
1. Stream flow	Variety of water depths, pools, and riffles	Some variety	Little variety	Stream flows straight and at one depth	
2. In-stream cover for fish	Over half the stream has logs, undercut banks, or plant cover	Up to half the stream has cover	Less than a quarter of the stream has cover	Very little or no cover	
3. Sediment on stream bed	Rocks, stones and pebbles visible – little sediment cover	Up to 25% of the bed has fine sediment; tops of rocks clean	25% - 50% of bed is covered in sediment	Over 75% fine sediment cover; few stones visible	
4. Bank stability	No signs of erosion	Some erosion occurring - up to 25% of bank	25% - 50% of stream bank eroding	Very unstable – over half of bank eroding	
5. Riparian zone - width	Over 9 metres	3 - 9 metres	1 - 3 metres	Less than 1m	
6. Riparian zone - plant types	Native trees and shrubs; grasses at water's edge	Non-native trees or shrubs; some grasses at water's edge	Mainly long grass; a few trees or shrubs	Pasture or bare ground	
7. Riparian zone - extent of plant cover	75% - 100 % cover	50% - 75% cover	25% - 50% cover	Less than 25% cover	
				Total Score	

overall rating

48 - 56 Excellent	36 - 46 Good
24 - 34 Fair	14 - 22 Poor

Points for discussion

1. A variety of depths and flow rates provides a greater range of habitat types. Deep pools make good fish-spawning areas. Rapids and riffles help oxygenate the water and make good habitat for invertebrates.
2. Plants, logs and stones in the stream provide hiding places for fish and invertebrates.
3. Near the mouth of a river, it is natural for sediment or silt to occur on the stream bed. Further upstream the bed should be stony. If sediment covers the stones then habitat for fish and invertebrates is drastically reduced.
4. Unstable banks lead to poor water quality due to increased sediment entering the stream. Erosion is caused by wind, rain, and stream flow. It can be made worse by human activities such as building, farming, and clearing of trees and other plants.

5. – 7. **The riparian zone is the area immediately around the waterway** that provides a buffer from activities on the surrounding land. Plants up to 20 metres either side of the stream banks can reduce the impacts of flooding, erosion, and pollutants from run-off. The plants also shade the stream, keeping the water cool and providing habitat for birds and winged insects.

Calculating stream flow

Look at the stream and estimate: How many litres of water are flowing past this point each second? (It may help to know that a bucket holds 10 litres.)

Write your group's estimates here:

Equipment needed:

Tape measure, metre ruler, tennis ball, stopwatch, and calculator.

Step 1 Measure stream width

Width .... metres

Step 2 Calculate average stream depth

Measure the depth at five points across the stream and take the average. Record the measurement in metres; for example 38 cm = 0.38 m

(1) .... m (2) .... m (3) .... m (4) .... m (5) .... m

Total .... m | **Average depth** (divide total by 5) .... m

Step 3 Calculate area of the cross-section

Width x Depth = Area | **Width** (from step 1) .... m x **Depth** (from step 2) .... m | **= Area** .... m²

Step 4 Calculate the velocity (speed) of the water flow

Measure 10 metres along the stream bank, and mark the start and finish points. Use a stopwatch to measure how long a tennis ball takes to travel 10 metres down the stream. Repeat five times across the stream and calculate the average time in seconds.

(1) .... seconds (2) .... seconds (3) .... seconds (4) .... seconds (5) .... seconds

Total .... seconds | **Average time** (divide total by 5) .... seconds

Distance ÷ Time = Velocity | 10 m ÷ .... seconds = ... m/sec (metres per second)

Step 5 Calculate the flow of the stream

Multiply the **area** by the **velocity**. | Area (from step 3) .... m² x Velocity (from step 4) .... m/sec

= Flow .... m³ / sec (cubic metres per second, or cumecs)

One cumec = 1000 litres so multiply by 1000 to convert the flow into litres: .... litres

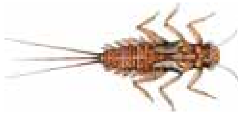
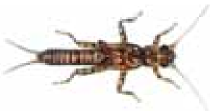
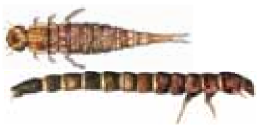
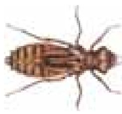
Whose estimate was closest?

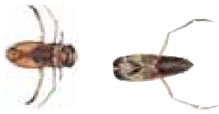
Points for discussion

- Stream flow varies throughout the seasons. In **surface-fed streams** and rivers, snow melt from the mountains increases the flow during springtime. These waterways have lower flows in summer, especially after prolonged periods of low rainfall (drought). **Spring-fed streams** are also affected by drought because of lower recharge of the aquifers and increased abstraction of groundwater for irrigation.
- Low water flows can cause an increase in water temperature and concentration of nutrients and pollutants. In times of low flow, deep pools are important as they provide habitat for fish.
- During high flows, sediment may be removed and pollutants diluted but strong floods can also wash invertebrates away.

Invertebrate Survey

Transfer each invertebrate from the sample tray to the specimen tray, using the plastic spoon and/or dropper. Use the compartments of the specimen tray to separate out each different species for identification and counting.

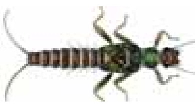
Type of invertebrate		Number of specimens	Sensitivity Score (circle the ones you have)
Large stonefly larvae			4
Mayfly larvae – "spiny-gilled"			4
Mayfly larvae – "swimmer"			4
Smooth-cased caddisfly larvae			4
Dobson fly larvae – "toe-biter"			3
Mayfly larvae – "flat"			3
Free-living caddisfly larvae			3
Stick-cased caddisfly larvae			3
Stony-cased caddisfly larvae			3
Small stonefly larvae			2
Beetle larvae			2
Dragonfly larvae			2
Damselfly larvae			2
Crustaceans			2
Purse caddisfly larvae			1

Type of invertebrate		Number of specimens	Sensitivity Score (circle the ones you have)
Snails			1
Water boatmen			1
Worms			1
Fly larvae			1
Other invertebrates	(name, describe, or draw)		
Fish	(name, describe, or draw)		
		Total Sensitivity Score (add up all circled numbers)	

Identifying different species

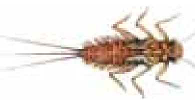
Look carefully at the samples you have found to see how many species you have. The greater variety of species, the healthier your stream, especially if you have a lot of sensitive species.

Here are some clues to help you tell the difference between invertebrate species.



Stonefly larvae have two tails. Large stonefly larvae grow up to 30 mm and indicate very high quality water. They can be green (Stenoperla) or brown with longer antennae (Zelandoperla).

Small stonefly larvae are 6 – 10 mm. Arcoperla have a rounded body with pale markings and tail filaments shorter than their body. Zelandobius have tail filaments shorter than their antennae and a tuft between their tail filaments.



Mayfly larvae have three tails and gills on their abdomen that move to allow them to breathe better. Look carefully to see which of the three types you have: flat, spiny-gilled, or swimmer.

Dobsonfly larvae (toebiters) are distinctive, with six legs at the front and many sets of breathing tubes (gills) along their body. They will vary in size from 10 – 30 mm.

Caddis fly larvae have legs at the front of their bodies. There are over 160 species of caddis.

Cased, stick, and purse caddis carry their home around with them like a hermit crab.

Free-living caddis have a hook at the end of their bodies.

Beetle larvae have a thinner body than uncased caddis fly larvae, with fewer segments. Their tails are tufted rather than hooked.

Crustaceans include any invertebrates with more than six legs, including freshwater crayfish (koura), shrimps, and water fleas, which are tiny and move quickly.

Snails come in a variety of shell shapes and sizes from 3 – 12 mm.

The species you find will be smaller than the pictures. You may need a magnifying glass.

In spring, the larvae will be much smaller because the older, larger larvae have hatched into winged adult insects and flown away to find a mate.

See if you can find any adult mayflies, caddis flies, or other species on the stones and plants beside the stream.

Water Quality Testing

Temperature

Use a thermometer to measure the water temperature. Fill a bucket with water and place the thermometer in the bucket. Take three readings from different parts of the stream and calculate the average.

Reading 1: ______ ° C Reading 2: ______ ° C Reading 3: ______ ° C

Average temperature (total ÷ 3) = : ______ ° C

Stream-dwelling invertebrates and fish have a specific range of temperatures they can live in. In New Zealand, aquatic invertebrates have adapted to cold water (below 12° Celsius), and start to struggle once the water gets over 16° Celsius. High water temperatures reduce the amount of oxygen in the water, which can affect the survival of aquatic insects and fish.

Rating	Excellent	Good	Fair	Poor
	below 15° C	15° C – 18° C	18° C – 20° C	above 20° C

Water Clarity

Use the clarity tube to measure how clear the water is:

- Fill a bucket with water and empty into the clarity tube. Make sure the tube is clean, and get rid of any air bubbles.
- Put the magnet with the black disc on the inside of the tube, the second magnet on the outside, and fit the rubber cap
- Hold and look through the clear end of the tube while a partner holds the other end and slides the magnet towards you
- When you can see the black disc, slide it away from you until it disappears and then back towards you. When the black disc is just in view, take the reading from the side of the tube

Reading 1: ______ cm Reading 2: ______ cm Reading 3: ______ cm

Average clarity (total ÷ 3) = : ______ cm

Clarity is an important aspect of stream health. A low reading on the clarity tube means there are a lot of suspended particles in the water. The particles may be sediment from erosion or run-off, or pieces of algae or decomposing plant matter. Sediment can smother the algae that invertebrates need for food, and can clog fish and insect gills, preventing them from breathing.

Rating	Excellent	Good	Fair	Poor
	80 – 100 cm	60 – 80 cm	40 – 60 cm	0 – 40 cm

Algae

Pick up some stones from the bottom of the stream and look at the slimy layer on the surface. This is algae (tiny plants that live in the water). The amount of algae present in the water can indicate water quality. Look at stones from an unshaded area of the stream bed, as algae don't like the shade.

- A thin layer of algae on the surface of stones provides food for invertebrates.
- Algae can range in colour from dark brown, to brownish-green, to bright green, depending on which types of algae are present.
- The thickness of algal growth is affected by the frequency of flood flows, which clean out the waterway, how much sunlight reaches the stream bed, and the levels of nutrients in the water.
- Long strands (filaments) of algae can also indicate that too many nutrients have entered the water from the surrounding land.
- Too much algal growth (blooms) can clog waterways, depleting oxygen and smothering habitat.

Rating

Excellent	Good
thin film	medium film
	

Fair	Poor
thick mat	long strands
	

Did you know?

Algae form the basis of all aquatic food-chains and make over three-quarters of the oxygen produced on Earth.

Name of stream	Date
School	Class

Below are spaces for you to give a summary of your findings, fill in the gaps and show the rating of each test you did, i.e. excellent, good, fair or poor. At the end of write down suggestions to enhance your stream.

1 Descriptions of stream area, including main land use i.e. farms, houses, native bush, forestry

2 Habitat survey assessment

Score	rating
What is your score rating?	

3 Water flow

Litres/second

4 Water clarity

Disc reading (cm)	rating

5 Water temperature

˚C	rating

6 Invertebrate sensitivity score

rating

7 Algae

Type	rating

8 What factors affected the quality of your stream?

9 What could you do to improve your stream?

When you have completed your stream survey perhaps you could repeat the same investigation in a few months time to see if there have been any changes.

This is a simple stream monitoring survey that school and community groups can be easily taught to use.
A more detailed survey is the Stream Health Monitoring and Assessment Kit (SHMAK). For more details, see: www.landcare.org.nz/shmak