Introduction

The Stream Health Measurement Assessment Kit (SHMAK) kit has been modified for use by secondary school groups within the Taranaki region. The original kit was designed by NIWA (National Institute of Water and Atmosphere) for use by farmers in New Zealand to monitor the 'health' of the streams that flow across their land. In combination with existing stream assessment techniques already provided to school pupils by Taranaki Regional Council environmental education staff, the modified SHMAK programme provides a more intensive monitoring experience. Secondary school students gain valuable skills and an understanding of the procedures that are involved in stream health monitoring.

- Aquatic invertebrates are valuable indicators of stream 'health' monitoring and their accurate identification will improve the stream health assessment.
- Stream' health' refers to the condition of the whole waterway. Monitoring stream health involves looking at not only the water quality but also the physical features and ecology of streams.
- The SHMAK and its methods are designed to indicate stream health, they are not designed to indicate whether water is safe to drink by humans and animals.
- For school study purposes the section covering land use and farm management information has not been included. The monitoring system is designed to give users a choice about how detailed their monitoring programmes might be and how to determine the usefulness of the results.
- It is suggested that school groups use a site that is safe for all pupils at all times and allows all students to work within sight of each other. The site should be easily accessible.
- The involvement of secondary school students (Yr 12/13) in the SHMAK assessment procedure can provide more consistent, long-term results that will add to the data gathered about the health of Taranaki's regional streams and rivers.

SHMAK Links to the New Zealand Curriculum

SCIENCE

Making sense of the Living World

Achievement Objective Level 4 No 1

- Investigate and classify closely related living things on the basis of easily observable features.

Achievement Objective Level 7 No 2

- Investigate factors that affect a living process.

Achievement Objective Level 8 No 1 and 2

- Carry out an extended investigation, involving a range of techniques into some aspect of, or issue related to the Living World.

SOCIAL STUDIES

Achievement Objective Level 2

- Demonstrate how people's activities influence places and the environment and are influenced by them.

Achievement Objective Level 4

- Demonstrate how places reflect past interactions of people with the environment.

Achievement Level 8

- To show how new technology influences the way people find out about and describe places and environments.

Recent flow conditions

Before contemplating a field exercise using the SHMAK it is important to accurately decide whether the stream flow has been 'stable' over the previous 2 weeks. You can expect this to be the case if the weather over the previous 2 weeks has been relatively dry.

Fine weather on the day of the field trip is only one of the criteria that needs to be considered before the trip is undertaken.

Flooding means unusually high flows particularly if the water becomes discoloured and runs more swiftly than usual. In addition to giving an incorrect assessment such conditions are unsuitable for safety reasons.

Low flows which disrupt stream life are those which lead to unusually sluggish flow velocities, very shallow and warmer water and even drying out of parts of the stream bed over which water usually flows. This is not a feature of Taranaki streams and is more pertinent to South Island streams.

Stream Habitat

This component of the monitoring system requires the user to produce a habitat score that is used in combination with a biological score and transferred into a 'habitat versus invertebrate' graph to give the overall health condition of a stream.

In order to generate a habitat score, certain measurements need to be carried out during field work. These measurements are listed below:

- Water flow velocity.
- Water pH.
- Water temperature.
- Water conductivity.
- Water clarity.
- Stream bed composition.
- Presence and extent of loose, silty deposits on the stream bed.
- Stream bank vegetation at the site.

What the terms mean

- **Monitoring** means making a standard set of measurements and observations at regular intervals and keeping records so comparisons can be made.
- The **assessment** part of SHMAK involves assigning scores to each monitoring result and then using the scores to determine the condition of the stream.

Habitat quality flow velocity

- Affects water temperature, the concentration of chemical pollutants, cloudiness and aquatic habitats.
- Higher than normal flows can flush away macroinvertebrates and you should take this into account when interpreting the results of biological samples.
- Information about the shape, or cross section of a stream will allow you to follow changes to the stream bed and stream banks at each site.

Activity 1

Habitat quality - flow velocity

Task – To measure the water flow velocity of the stream.

Equipment

- A 10 metre cord.
- A stopwatch or a watch with a second hand .
- A floating object eg a tennis ball, half filled with water.

Instructions

Measure the approximate speed at which water flows along the middle (or the fastest flowing part) of your site by timing a floating object.

1. Use the cord to measure the required distance - 10 metres.
2. Have a stopwatch ready on zero.
3. Drop the ball into the centre of the stream and start the stopwatch immediately.
4. Stop the watch as the ball passes the 10 metre mark.
5. Repeat the procedure three times, fill in the scores in the appropriate box and take the average of the three times.
6. Refer to the formula to calculate score ie Average water velocity = distance travelled divided by the average time. Place your answer in the appropriate box and refer to the score line to get the score.
7. Circle the score eg 0.7 to 0.99.
8. Enter the number immediately below your circled score for flow velocity into the “enter score” box.

Habitat quality - water pH

The pH tells us how acidic or alkaline the water is on a scale from 0 to 14. Acids have a low pH (less than 7) while alkalis have a high pH (greater than 7). Pure distilled water has a pH of nearly 7 and is about neutral. In New Zealand most natural water has a pH value between 6.6 and 8.5. The pH can be affected by rocks the water is flowing over,chemicals in the water and biological growths in the stream. It may also vary according to the time of the day of the measurement.

Activity 2

Habitat quality - water pH

Task –To measure the pH of the water using pH indicator strips.

Equipment

- A small container.
- A Merck Neutralit strip.
- Packet of Merck Neutralit strips.

Instructions

1. Use stream water to rinse out the small container (some are provided in the kit), then half fill with stream water taken from the upstream end of the site.
2. Immerse an indicator strip in the water and place the container out of direct sunlight for 10 minutes until the colour change stabilizes.
3. Compare the colour combination with the key provided on the packet and record the pH in the “Measure ph” box.
4. Circle the appropriate rating.
5. Enter the score immediately below your circle in the “enter score” box on the right.
6. Do not reuse the strip.

Please note.

Water pH in streams fluctuates naturally according to season, time of day and weather conditions due to differing relative amounts of photosynthesis and respiration occurring in the stream. It is important to note dates/times etc when recording information at the same site if it is being used for comparative purposes.

Indicator strips do not always provide an accurate score. It is suggested that a water sample is taken from the river (in a full,sealed container) directly to the school’s science laboratory for confirmation of the on-site score using a calibrated pH meter. In the event of a variance being recorded it is suggested that the laboratory value be used.

Habitat quality - water temperature

- The temperature of the water affects the amount of oxygen the water can hold. Many aquatic organisms can only live within a limited temperature range.
- Human activities should not change water temperatures beyond natural seasonal fluctuations. To do so could disrupt aquatic ecosystems. Temperatures vary depending on the type of stream and the position in the catchment of the site you are monitoring.

Activity 3

Habitat quality - water temperature

Task – To measure the temperature of the water.

Equipment
A simple glass spirit thermometer (0 -50 degrees).

Instructions

1. Take the reading at an upstream (undisturbed) end of the site, in the main flow of the water (ie where the water is at its swiftest).
2. Immerse the thermometer in the running water until a stable temperature is registered (this will take at least one minute).
3. Students must read the temperature whilst the thermometer remains submerged. This eliminates the possibility of an incorrect reading.
4. Enter the temperature in the “Measured temperature” box.
5. Circle the appropriate range of temperatures.
6. Place the number immediately below your circle in the “enter score” box on the right.

Habitat quality - water conductivity

- Naturally occurring and artificially introduced chemicals may end up in water as it percolates through soils or rocks, changing its chemistry.
- Conductivity is one way of measuring the total amount of dissolved substances in the water.
- Conductivity can be determined by immersing the meter into a sample of water.
- There are no set guidelines for conductivity as every body of water is different. Meaningful comparisons can only be made from historical data.

Activity 4

Habitat quality - water conductivity

Task – To measure the conductivity of the water.

Equipment

- One medium sized plastic container.
- EUTECH Cybernetics TD scan3.

This hand–held conductivity meter is simple to use, but like all instruments it should be treated with care. It is important that students read carefully all instructions written on the meter. In particular it must be stressed that only the correct part of the instrument be immersed in the water. The teacher should demonstrate its usage on the first few occasions.

It is important that you get the TDSCAN3 checked before use. If you are using a TRC SHMAK, the Taranaki Regional Council Education Officer will have arranged for this to be done prior to you using it. In the event of a school buying its own SHMAK, once again the Taranaki Regional Council Education Officer will be happy to get this done for you from time to time.

Method/Instructions

1. Rinse out a water sample container and fill with stream water.
2. Remove the cap from the bottom of the probe.
3. Switch on the instrument (click on button).
4. Allow the reading on the display unit to settle down at zero.
5. Dip the probe into the stream water sample. Ensure that the water does not go above the grey line, as this could damage the instrument.
6. Allow the reading to stabilise (this should take only a few seconds), then record the conductivity score.
7. Switch off when finished! The batteries are expensive to replace.
8. Record the measured conductivity score in the box provided.
9. Circle the range your score fits into.
10. Enter the number immediately below your circle into the enter score box on the right.

Habitat quality - water clarity

- Reduced water clarity is the result of particles such as clay, silt and industrial wastes staying suspended in the water.
- Water will become warmer as these particles absorb heat from the sun and less light will be able to penetrate.
- Plants are not able to carry out photosynthesis as normal under these conditions.
- The gills of fish and macroinvertebrates can become clogged.
- Water clarity is an indirect measurement of the amount of suspended particles in water, but in New Zealand it is the preferred method for assessing water murkiness.
- The sighting distance is similar to the visual ranges of practical importance in water, for aquatic organisms as well as for people.

Activity 5

Habitat quality - water clarity

Task –To visually assess the clarity of the water

Equipment

- A 1 metre long 50 mm-diameter clear acrylic tube graduated along its length
- One pipe cap
- 20 mm diameter fixed black semicircle onto a two sided magnet

Instructions

1. To fill the tube use other containers filled with water. Do not fill the tube directly from the stream as this may cause scratching of the glass.
2. Place the black disc magnet inside, held by the external magnet.
3. Place the tube cap firmly on the end.
4. Try to take your reading out of direct sunlight if possible.
5. Check the viewing window is clear of condensation before viewing. If not, wipe it clean with a clean cloth or handkerchief.
6. Have one student hold the end of the tube in a horizontal position whilst a second student looks through the viewing end.
7. The viewer at the beginning moves the magnet away from herself as she continues to clearly see the black disc.
8. When movement of the disc becomes difficult the holder at the end of the tube takes over.
9. Slowly move the disc until it disappears completely from view.
10. Do three more readings with a different student doing the viewing each time.
11. Record all three scores in the measured clarity boxes on the left.
12. Work out the average of the three by adding the scores and dividing by three. Record the average score in the Average cm box on the right.
13. Circle the appropriate rating.
14. Take the number immediately below the circle and place in the enter score box on the right.

Note. Water that gives a '**clear to the end**' reading is still far from crystal clear. The NZ clarity standard for recreational use of fresh water (eg swimming) is a conventional black disc measurement of 1.6 metres.

Habitat quality - composition of the stream bed

- Invertebrates and other aquatic organisms need stable natural structures such as snags, logs and rock or cobble areas where they can shelter from predators and swift currents. Stream bed cover is also important for reproduction, particularly spawning and nursery functions.
- Stable structures within the stream enable aquatic organisms to establish territories and provide markers that help them navigate. Large aquatic plants and undercut banks may also be very important to the living organisms in your stream, particularly if other forms of cover or refuge are not abundant.

Activity 6

Habitat quality - composition of the stream bed

Task – to describe the material on the bed of the stream

Your description will consist of an estimate of the percentage of the stream bed at the site which is covered by the listed categories of stream-bed material. The idea is to get an overall picture of the make-up of the bed so your estimates need not be totally precise and can be rounded to the nearest 10%.

Stone definitions refer to the stone breadth. Use the scale provided to help in the assessment

Please note: it is imperative that students have a clear understanding of what is required for this activity. Although this would have been covered in a general way at the pre-field trip lesson further clarification will be required at the field trip site.

Bedrock refers to continuous rock that my be fully or partly submerged
Boulders are separate, often embedded and over 25 cm across
Large cobbles are 12-25 cm across (approximately)
Small cobbles are 6-12 cm across (approximately)
Gravel is 0.2 -6 cm across
Sand is 0.1-0.2 cm across
Mud/silt is fine and smooth, not gritty
Man-made refers to structures covering the natural stream bottom
Woody debris includes fallen trees/branches which are too large to be washed away, as well as smaller material such as twigs and entrapped leaves
Water plants are areas of the stream bed covered by leafy water plants that are rooted into the stream bottom or the stream sides.

Instructions

- Working in pairs, place the approximate percentages in the appropriate top line boxes. **Note**-these scores must add up to 100.
- Multiply the percentage score by the number above it eg 10 times 5=50 which is placed in the second line.
- Add all the second line scores and place in the box on the bottom left hand side.
- Divide this score by 100 and enter in the appropriate box on the right. Note the maximum score is 20

As mentioned above most students will require some close guidance with this activity. Students can either make the estimates by eye which is relatively straightforward if the stream bed is broken into clearly defined areas. However an estimate 'by eye' can be quite difficult where the stream bed comprises assorted different material covering a range of sizes. Different people can come up with a totally different set of answers for the same area of a river. In this case it is suggested that students are divided into pairs, one being a walker and the other being a recorder. The walker walks in a zigzag manner up the 10 metre length of the site. At each step the walker bends down and looks at the bed particles at the end of his or her right foot. He/she may choose to pick up the particle if this is easier. The walker decides what category the particle belongs to and calls it out to the recorder who notes it down and so on. This can be done about 100 times and the categories grouped from the data gathered.

Examples

right:
50% large cobbles;
20% small cobbles;
10% gravel;
20% sand

below:
10% boulders;
25% large cobbles;
30% small cobbles;
25% gravel;
10% sand

right, upper:
10% large cobbles; 40% gravel;
50% water plants

right, lower:
20% gravel;40% sand; 30% silt;
10% water plants

Activity 7

Habitat quality - deposits

Task– To check for the presence of recent deposits on the stream bottom.

Instructions

Students may need guidance for this section.

1. Look for fine, silty, woolly like material that looks as if it is settled recently on the stones, sand, water plants etc that make up the stream bed. Recent deposits brush off easily if disturbed and are usually patchy. Sometimes it is difficult to distinguish between periphyton and deposits.
2. Clues
   - Silty material may have been settling over a long period of stable flows and may be consolidated by periphyton growth. These deposits should be described as 'moderate'.
   - The covering also qualifies as a light brown algal mat. By registering both these measures you are recording the fact that silt is being deposited from the water and the nutrient content and physical characteristics of the site are suitable for periphyton growth.
   - A stream bottom that is already mostly silty material may also be recorded as having 'thick deposits' if any water plants carry deposits on their leaves, or if the bed material shifts very easily with a slight disturbance.
3. Record findings according to the ratings on the record sheet
4. Enter the appropriate score in the box on the right.

Habitat quality - bank vegetation

- This indicator will describe the percentage of metres (within a 10 metre stretch), of stream that are lined with trees, shrubs, and other plants.
- The amount of vegetation along a stream bank strongly affects both water quality and the living organisms that live in and along the stream. Plants lining a stream bank shade the stream, making it cooler in summer, and they serve as habitat for animals.
- Plants drop leaves and branches into the stream, providing food and habitat for stream animals; they also trap sediments and pollutants washing in from adjacent areas, preventing them from reaching the water and helping to maintain good water quality.

Activity 8

Habitat quality - bank vegetation

Task – To describe the vegetation on the banks of the 10 metre stretch of your site.

Equipment - Nil

Instructions

Important

Many students will not have any idea about how to do this activity with accuracy. It is important that the teacher discusses each of the definitions listed below and identifies examples of them on the stream bank before the students are asked to do their assessments.

Native trees - Evergreen, more than two metres tall. They provide shade and resting sites for adult stream insects.

Wetland vegetation - Includes flaxes, rushes; mostly native. Provides some shade and resting sites for adult stream invertebrates; effective nutrient filters.

Long tussock grassland (*not improved*) - Provides some shade along stream margins, good nutrient filters.

Exotic hardwood trees - Includes deciduous types such as willows, poplars, oaks etc, they add much organic material to the system in autumn. Provide shade, nutrient filtering.

Other exotics *eg conifers* - Provide shade.

Scrub - Weedy species such as gorse/broom – looks neglected. Also includes regenerating trees less than two metres tall. It provides some shade and resting sites for adult stream invertebrates.

Short tussock grassland (*improved*) - A mixture of native and exotic grasses, provides patchy shade along stream margins.

Rock, gravel - The natural margin of many gravel-bedded streams.

Pasture grasses/weeds - Improved pasture. Provides patchy shade along stream margins.

Bare ground (soil and clay) - Liable to increase silt input to stream.

Buildings, yards, roads - Structures within five metres of the stream edge that may increase run-off into the stream.

- Inform students that 'true left' means the left hand side of the stream as you look **downstream** and 'true right' means the right hand side of the stream as you look **downstream**.
- Enter the percentages for true left on the top line. Note the percentages must add up to 100.
- Enter the percentages for true right on the second line. Note the percentages must add up to 100.
- Add the figures together from the top two lines to get the total for both true left and true right.
- Multiply the sums in five with the score each vegetation area has been allocated and place this figure on the bottom line.
- Add all the pluses and minuses together to get the score which goes in the box on the bottom left.
- Divide this score by 100 which is recorded in the "enter score" box on the right.

Add up all the scores for all questions and place in the "total score" box for habitat quality.

Examples

top left:
Right bank: 100% pasture grasses and weeds
Left bank: 100% pasture grasses and weeds

top right:
Right bank: 90% pasture grasses and weeds; 10% wetland vegetation
Left bank: 100% short tussock grassland, improved

above:
Right bank: 100% scrub; *Left bank:* 100% scrub

above right:
Right bank: 80% introduced trees; 20% scrub
Left bank: 80% pasture grasses and weeds; 20% introduced trees

right:
Right bank: 60% pasture grasses and weeds; 20% wetland vegetation; 20% gravels
Left bank: 50% wetland vegetation; 50% short tussock grassland, improved

Biological sampling

Biological data gathering involves:

- types of invertebrates (eg mayflies, snails).
- types of periphyton (algae/slimes on the bed of the stream).
- Samples, both biological and non biological are brought back to the laboratory for more precise identifications of invertebrate taxa and measurements of water pH and conductivity.

Using the Bugbox

Each cell in the Bugbox corresponds to a diagram of types of invertebrate(taxa) to show what should be placed in each cell. For assessment purposes one example of a taxon is all that is required as quantity is not an issue. The Bugbox and "A photographic Guide to Freshwater Invertebrates of Taranaki" are important resources to assist students and teachers to correctly identify most of the different taxa found in Taranaki waterways.

- You will be using fine mesh nets and sieves to capture the invertebrates using both kick sampling and brushing the underside of rocks with a scrubbing brush.
- At the completion of the identification on the stream bank, boxes will be returned to the lab to confirm identification, and other samples will be collected from the white trays for identification under the microscope.
- Level 3 invertebrate identification is an extension of level 2 and has been introduced to provide more precise data than was possible using the kit in its original form. This SHMAK biological assessment level includes laboratory processing of both Bugbox and other samples to overcome any limitations in simple field techniques. There are many macroinvertebrates that are impossible to identify with just a naked eye. With the help of a microscope the user can obtain a wider range of invertebrate taxa by carrying out careful laboratory identifications. However it is important that users use the sensitivity scores provided by SHMAK, not those used by TRC biologists. The assessment graphs are specifically designed to be used with SHMAK sensitivity scores only.

Macroinvertebrates

Task –To find and identify macroinvertebrates and use the data they provide to form an accurate picture of stream health.

It is recommended that students work in groups of 3-4 for this activity. Each group will need its own set of equipment. The Taranaki Regional Council Education Officer can provide all equipment on request.

Equipment-per group

- White tray.
- Bug box with an attached pair of tweezers or fine paintbrush.
- Scrubbing brush.
- Magnifying glass.
- Long handled fine meshed net.
- Identification booklet.
- Identification sheet.

Information

Macroinvertebrate taxa are 'scored' according to their sensitivity to organic pollution in New Zealand streams. 'Highly sensitive' macroinvertebrate taxa are assigned the highest scores of 9 or 10, while the most 'tolerant' taxa are assigned a score of 1 or 2.

Many macroinvertebrates prefer to live in riffles which are shallow parts of streams where water flows over rocks. Invertebrates are a vital part of the freshwater ecosystem. Many of them feed on plant matter such as algae, leaf litter and 'aquatic weeds' and in turn they provide the most important food source to almost all of the freshwater fish found in NZ.

Method

1. Each group needs to have its equipment together in one place on the stream bank.
2. One person takes the white tray and half fills it with water and transfers some of the water into each cubicle in the bugbox.
3. The students work in pairs in the river. One uses the scrubbing brush and the other holds the net. The student with the scrubbing brush quickly turns over a rock from a riffle (preferably) and scrubs the underside whilst the net holder holds the net downstream with the open end facing the rock.
4. The students then return to the stream bank and by inverting the net, empty the 'catch' into the white tray.
5. Members of the group then sort and endeavour to identify the various macroinvertebrates which include groups (taxa) such as worms, snails, flies etc whilst another pair collect another sample. On identifying a particular taxon the students transfer **one or two** (but no more) of each of the invertebrates into the corresponding cell in the bug box (use the identification diagram on the lid of the bug box).
6. As more samples are collected the students need to be encouraged to look more closely (using their magnifying glass) for different, often smaller taxa which are often overlooked in the initial excitement of discovery!

Students can refer to the SHMAK scores listed below to work out the macroinvertebrate score at the site. However to ensure a more accurate score the students will need to:

1. Half fill one of the kit's plastic containers with water and by using the small blue sieve, students collect another sample from the white tray by pouring the water through the sieve. The 'catch' can then be placed into the container for laboratory observation at TRC along with the related bugbox sample.
2. Date and label the container (use inside labels as well).

The TRC Education Officer will take the sample in the container and the related bugbox to the Taranaki Regional Council laboratory for identification and email the results back to the school at the earliest opportunity.

Invertebrate scores using SHMAK

Name	Score
Worms (eg thin brown/red)	1
Flatworms, leeches	3
Snails (1-3mm across, pointed end)	4
Snails (4-6mm across, rounded)	3
Small bivalves(snails) (up to 4mm across)	3
Limpet - like snails (up to 8mm)	7
Freshwater crustaceans (amphipods, water fleas)	5
Ostracopds	1
Beetles (larvae and adults)	6
Midge larvae (3-7 mm long, white-red)	2
Craneflies	3
Caddisflies (rough, stony cases, or cases in sticks and free living)	6
Smooth-cased caddisfly (,up to 10mm long, chestnut brown colour)	9
Spiral caddis (up to 3mm wide)	10
Mayflies	9
Stoneflies	10

Assessment using SHMAK sensitivity scores

Add up the scores according to each taxa by using one score for each taxa regardless of the number of examples. Divide the total score by the number of 'different' taxa identified.

An example:Taxa identified

Snails (1-3mm across pointed end)	4
Crustacean	5
Beetle larvae	6
Midge larvae (3-7mm long, white/red)	2
Stony caddisfly	6
Crane fly	5
Worms	1
Mayfly 1	9
Mayfly 2	9
Stonefly	10

Total of scores = 57
Taxa identified = 10
Invertebrate score is 57 divided by 10 = 5.7

New Zealand Stream Health Monitoring and Assessment Kit

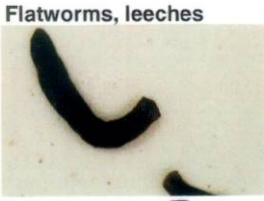
Indicator invertebrates: identification guide

(For more information on each invertebrate type, see pages 9.14 to 9.18 in the Stream Monitoring Manual.)

Worms

typical size:

Flatworms, leeches



typical size:

Snails, pointed end

typical size: to

Snails, rounded

typical size: to

Small bivalves

typical size:

Limpet-like molluscs

typical size: to

Freshwater crustaceans

typical size: to

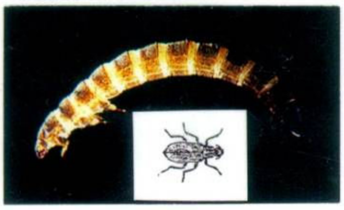
Ostracods (seed shrimps)

typical size:

Midge larvae

typical size: to

Beetle larvae/adults



typical size:

Axehead caddis (photo of pupae)

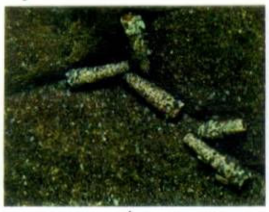
typical size:

Cranefly larvae

typical size:

Caddisfly larvae (several types)

Pycnocentrodes



typical size: to

Stony pupal house

typical size: (varies)

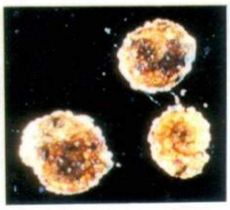
Green caddis

typical size:

Smooth-cased caddisfly larvae

typical size: to

Spiral caddis



typical size:

Mayfly larvae

typical size: to

Stonefly larvae

typical size:

Carrying out a stream assessment

Step 1. Determine your stream type from the stream-bed composition data:

- Look at the stream monitoring Form C. Habitat Quality, Composition of the stream bed (see page 3,7) in the manual.
- Add together the percentage scores under sand, mud/silt, and water plants.
- This total percentage defines the stream type. Circle the category on the stream assessment worksheet.

The stream types are as follows

- Stony – less than 25% of fine substrates on bed.
- Stony/aandy – between 25% and 50% of fine substrates on bed.
- Sandy (silty) stony – between 50% and 75% of fine substrates on bed.
- Sandy/silty –more than 75% of fine substrates on bed.

Plotting your biological/habitat scores on the graph for your stream type

- Refer to the Monitoring record for the invertebrate and habitat scores you calculated earlier.
- Locate the appropriate graph for the type of a stream you identified.
- On the graph count up the left-hand scale until you get your calculated invertebrate score, then move out horizontally until you reach your total habitat score.
- Mark this point on the graph.
- This point will give you your assessment for the stream.
- Please note
    1. Stony streams can be assessed as very poor, poor, moderate, good-very good and excellent.
    2. Stony/sandy and sandy/stony streams have the same assessment ratings as stony streams.
    3. Sandy/silty streams do not have an excellent rating.

Periphyton

SHMAK biological sampling also requires the examination of rock samples to identify any periphyton present.

It is recommended that periphyton identification be used only when the invertebrate score indicates that the stream is anything less than moderate. However as this is unlikely, information on how to do this is not included in this unit. In the event of this happening the school will need to refer to the TRC Education Officer for guidance involving periphyton identification.