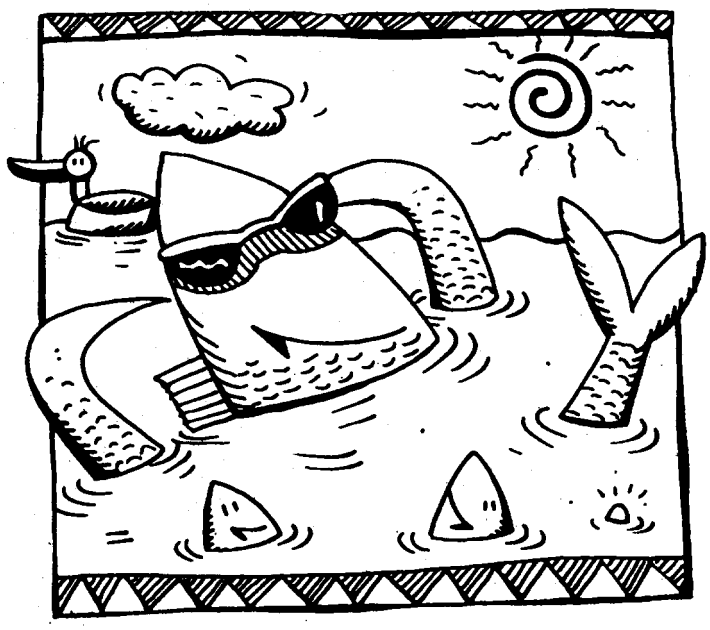
Habitat Assessment



The diversity and abundance of stream life is limited by the health of the stream. Both stream and riparian habitat influence the structure and function of stream life, setting the basic template within which biological communities develop.

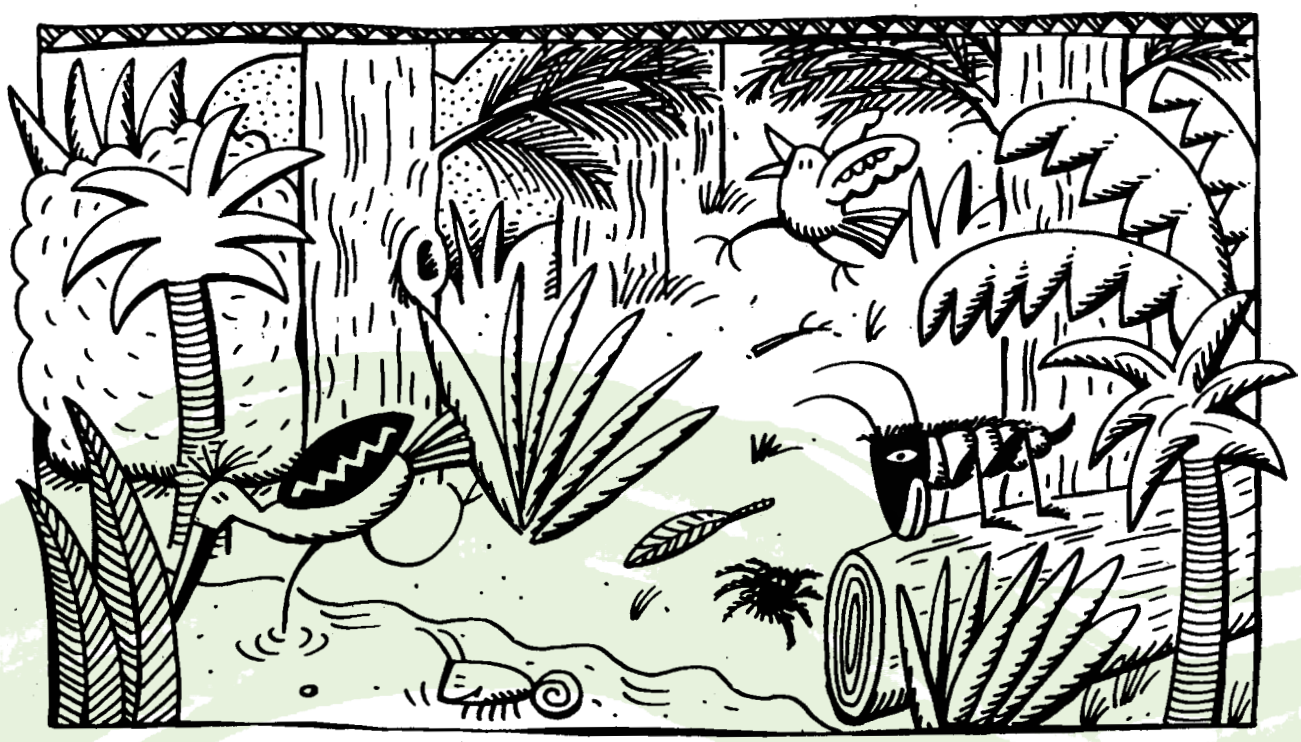
If the habitat is poor this may make it more difficult for you to determine the effects of pollution on the stream. Biological communities will be responding to two different sets of stresses and it is essential in these situations that you use a reference site. Reference sites are selected for their similarity to the study site in all aspects other than the factor/s under investigation, and represent the 'best attainable' situation.

For example, if you want to determine the effect of a particular stormwater outlet you must carry out habitat and biological surveys upstream where characteristics match your study site, together with a downstream survey. To be confident in your results you must eliminate or control as many of the variables as you can.

If you are simply trying to determine the health of a particular section of the stream using a reference site may not be essential. However, a habitat assessment is still critical for an evaluation of this type. In fact, a comprehensive and integrated picture of stream health is only possible if all the elements of the Stream Sense assessment are combined: the stream reach survey, a habitat assessment, water quality tests and biological surveys.

The habitat features used for this assessment are separated into two groups:

- *within the stream* (stream habitat - instream cover; riffles, pools and bends; embeddedness); and



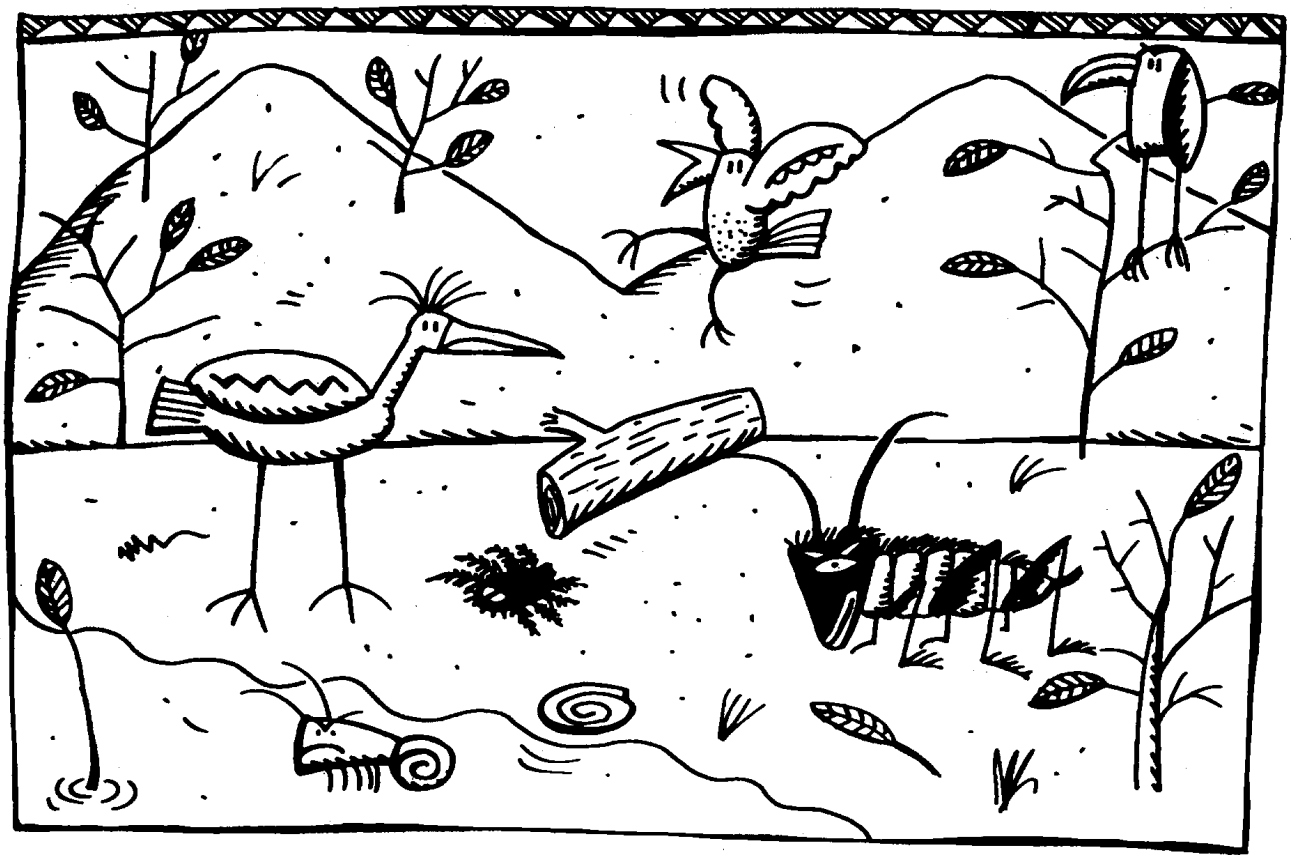
- *next to the stream channel* (stream bank features - bank erosion and stability; riparian zone vegetation).

Stream habitat has the greatest direct influence on the structure of the stream community. Features of the riparian zone and stream bank are important but have less direct impact on stream life. These factors usually influence the quality of the stream habitat in the long term and this relationship is reflected by the score range (1-4).

Other habitat features can influence stream communities, and some of these have been included in the stream reach survey.

You may find that the score descriptions of excellent, good, fair and poor are difficult to differentiate at times. If in doubt, judge the scoring from the fish and 'stream bug's' perspective; excellent can be interpreted as the best condition for stream life in **your stream system** and the other values as progressively reduced.

To ensure consistency in your evaluations of the various habitat criteria it is best to carry out the



assessments in pairs. Base your judgements on the descriptions included in the habitat record sheets, and the scores given by previous groups.

When you begin to survey streams in your region/district it will soon become apparent that the character of streams changes along their length. Most of the changes can be related to the gradient of the streams. The section on 'Understanding Your Catchment' covers this in more depth.

The entire sampling reach is assessed for each of the habitat factors. A bit of negotiation with your partner may be needed before you settle on a score that gives a fair and accurate rating for the reach. Make sure your assessments are truly representative of the reach. If you are unable to reach consensus, or need more information, you may need to go beyond a straight visual assessment - and get wet. Be sure you carry out these aquatic investigations safely and without interfering with other groups working downstream.

Descriptions of each factor and its relevance to biological communities are provided below. The descriptions should be read in conjunction with the 'Stream Habitat Assessment Sheet' at the end of this section.

Instream Cover

Fish 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. Instream cover is also important for reproduction, particularly spawning and nursery functions.

Stable structures within the stream enable fish to establish territories and provide markers that help them navigate. Large aquatic plants (macrophytes) and undercut banks may also be very important to the fish in your stream, particularly if other forms of cover or refuge are not abundant.

Riffles, Pools & Bends

Riffles are important for aerating the water and providing habitat for many of the more sensitive invertebrates. Streams that have many pools and riffles are able to support more life and a greater variety of species than those that do not.

Slower flowing streams without riffles may provide habitat variety through bends, creating areas with different depths and current speed.

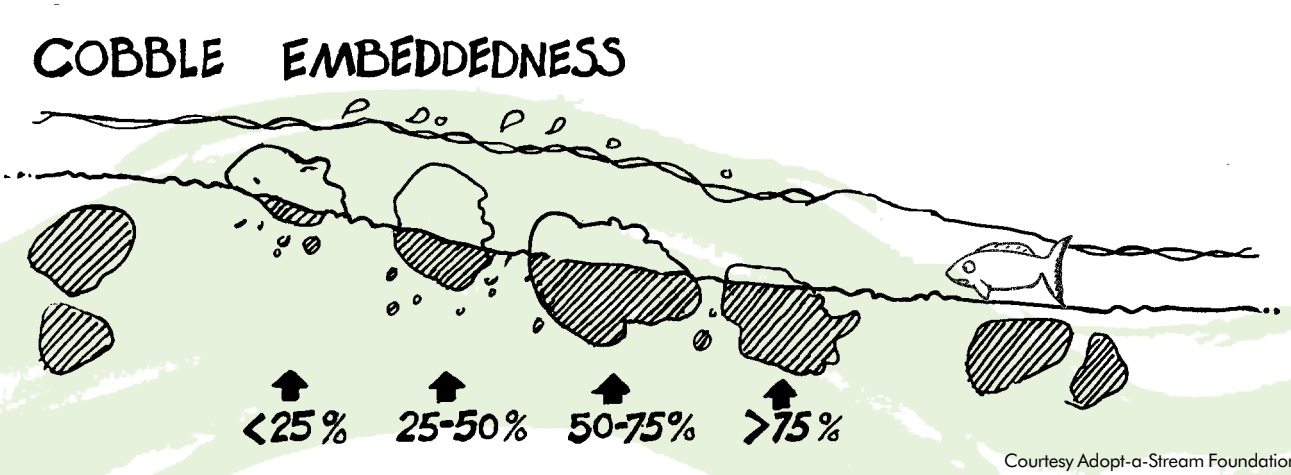
Embeddedness

This is the extent to which rocks (gravel, cobble, and boulders) are buried or surrounded by fine sediment. Rocks may become smothered when large-scale sediment deposits occur upstream. Reduced stream flow may contribute to high deposit rates.

As rocks become embedded there is less space between and under rocks for colonisation. Siltation usually results in a loss of sensitive macroinvertebrate species and the stream community will tend to become dominated by silt tolerant species such as worms and midges (chironomids).

Observations of embeddedness should be taken in the upper/middle portions of rocky/cobble

Courtesy Adopt-a-Stream Foundation



Courtesy Adopt-a-Stream Foundation

areas. You can reach into the stream and unplug a few rocks to estimate the covered depth if you find it difficult to estimate by sight alone. Make sure your disturbance doesn't affect other students working downstream.

Bank Erosion and Stability

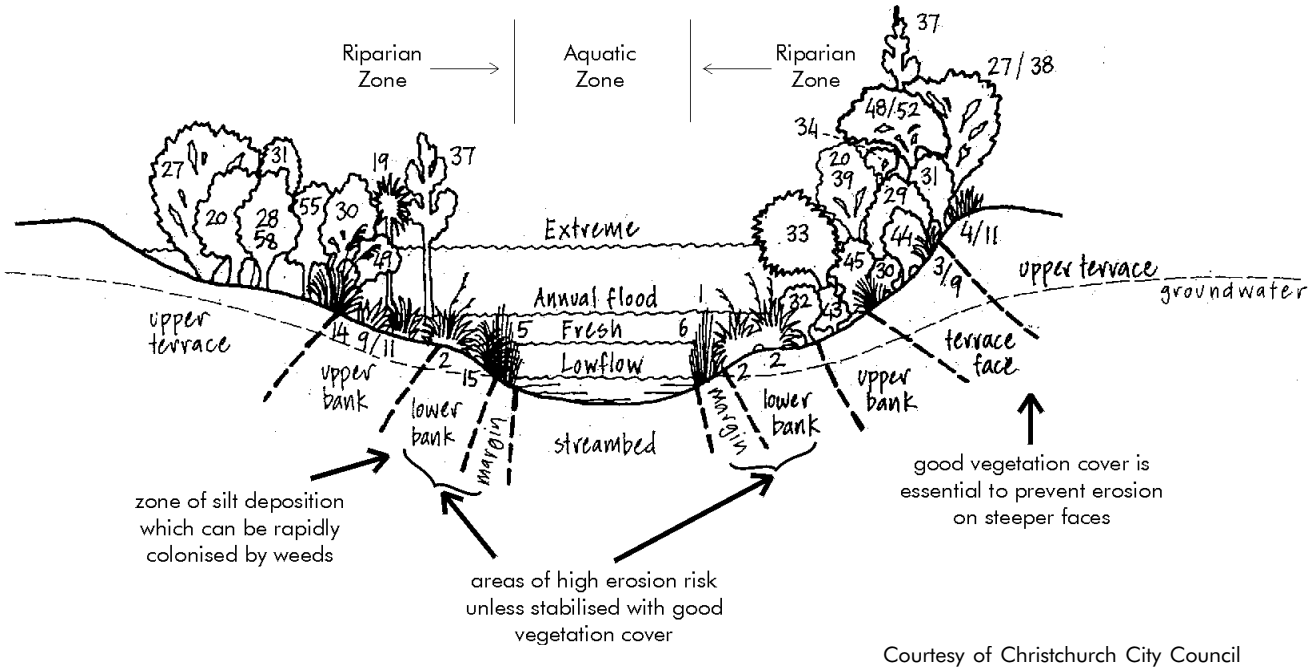
Stream banks naturally erode, particularly on bends. However, changes in adjacent land areas can cause a stream to become unstable, resulting in continuous erosion along its channel. Such changes include increased runoff from impervious surfaces and piped tributaries, stock access, or direct interference such as straightening or channelling the stream.

Steep banks are generally more likely to collapse and suffer from erosion than are gently sloping banks. Streams with banks in poor condition will often have poor instream habitat. Bank erosion introduces sediment into the stream, and eroded banks usually provide less shelter to invertebrates and fish than stable banks.

Look at both banks for evidence of erosion such as exposed banks where vegetation has been removed during floods, or where undercut banks have collapsed leaving obvious bank scars. Select a score that best describes the situation over the length of the reach.

The soil on banks is held in place by plant roots. Deep root systems offer more bank protection than shallow root systems. In addition to the root mat stabilising the bank, stems help reduce the velocity of flood flows by taking some of the energy out of the water. The larger the stems and the greater their density, the more energy is lost.

The more diverse the plant community on the banks the better. Young plants, which grow and reproduce rapidly, are better than old plants. The depth of plant root systems becomes more important as height and slope of the stream bank increases.



Courtesy of Christchurch City Council

Riparian Zone Vegetation

The vegetative zone can serve as a buffer to pollutants entering the stream from runoff, control erosion, provide habitat and contribute nutrients, in the form of plant matter such as leaves and twigs, to the stream. Understorey vegetation such as grasses, herbaceous plants and small shrubs next to the stream will provide escape cover or refuge for fish.

Streams in urban settings often have little or no riparian vegetation. Human activities such as cropping and developments including parking areas, housing and roading are often located near streams. The effectiveness of the riparian zone is diminished as vegetation is removed, and the width reduced.

Keeping A Visual Record - Using Photographs To Record Change

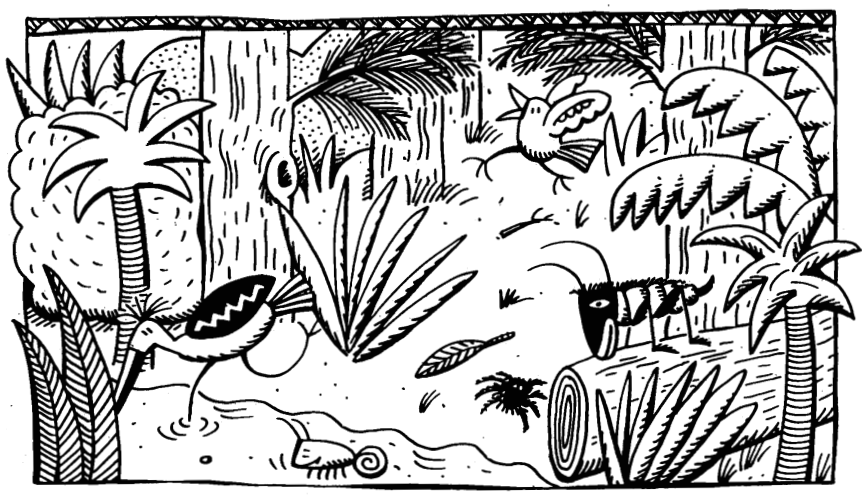
Taking photographs of your habitat survey site is an effective method for keeping track of changes. It is often difficult for students to appreciate how aspects of the stream habitat may have changed over time from simply a collection of archived habitat scores.

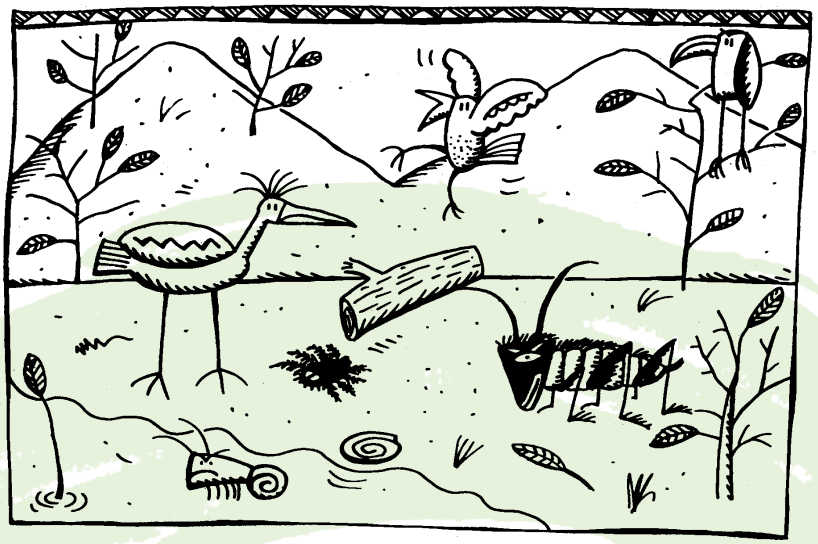
If you are limited to a single shot of the stream reach you may want to highlight an area you expect will change, such as an area of erosion. Ideally, multiple photographs will be used to record features ranging from streambed substrates to the vegetation covering and protecting the stream banks.

Be sure to record details of camera position, elevation, orientation and zoom setting on the site record sheet, so that the camera can be set up the same way next time. Digital cameras have the advantage of allowing you to view and edit shots onsite, particularly helpful if you are using inexperienced photographers. Cameras with about one million pixels provide the resolution needed for detailed habitat comparisons.

As your photographic record grows it will become obvious which features of the stream habitat are changing most quickly. On the basis of this information you may decide to redesign your habitat assessment, emphasising or eliminating different factors.

'Before' and 'after' pictures are very useful for maintaining a record of the action phase of projects, such as tree plantings. The same approach can be applied to event monitoring. For example, photographs may be taken to show how a stream changes in response to different amounts of rainfall in the catchment.





Habitat Record Sheet

Investigating the opportunities for different types of stream life to colonise and live successfully in your stream.

RECORD SHEET

We can find out how good the habitat is in and around a stream by looking at each of the following features.

Score **stream habitat** from 8 to 2, and the **stream bank features** from 4 to 1.

Stream Habitat Features

Stream Habitat Features	Excellent 8	Good 6	Fair 4	Poor 2
1. Instream Cover *Does the stream provide protection and 'cover' to stream life?*	More than half of the stream has cover, including snags and logs under the water, undercut banks, cobbles and rocks of various sizes. Many plants in and overhanging stream.	One half to one third of the stream has cover of snags, logs, cobbles or rocks. Some plants in and overhanging stream.	Less than a third of the stream has cover from snags, logs, cobbles or rocks. Few plants in or overhanging stream.	There is very little or no cover provided in the stream and no plants in or overhanging stream. The stream may have been cleared or altered by humans.
2. Riffles, Pools and Bends *Does stream flow vary?*	Wide variety of flow types: riffles (water running over rocks, cobbles etc.) and pools present of varying depths. Bends present.	Some variety of flow types: e.g., riffles and pools, or bends and pools. Variation in depth of riffle and pool.	Only slight variety in flow: e.g., occasional riffle or bend. Some variation in stream depth.	Uniform depth and flow e.g., channelised stream.
3. Embeddedness *How much of the stream bed is buried by silt or fine sediment?*	The gravel, cobbles and rocks on the bottom of the stream are not surrounded by fine sediments.	The gravel, cobbles and rocks on the bottom of the stream are less than one quarter buried or surrounded by fine sediments.	The gravel, cobbles and rocks on the bottom of the stream are between one quarter and one half buried or surrounded by fine sediments.	The gravel, cobbles and rocks on the bottom of the stream are more than one half buried or surrounded by fine sediments.

Stream Bank Features

Score both sides of the stream, over the entire length of the study area.

Stream Bank Features	Excellent 4	Good 3	Fair 2	Poor 1
4. Bank Erosion and Stability *How stable are the banks of the stream?*	The stream bank is stable with little or no erosion (slips) seen. Banks almost completely covered with different types of trees and shrubs.	Stream bank appears stable, some evidence of past erosion which may now have new plants growing. More than half of the bank is covered with different types of trees and shrubs.	Stream bank unstable and examples of erosion easily seen. Half to one quarter of the bank is covered with different types of trees and shrubs.	Unstable stream bank which may crumble when walked on. Less than one quarter of the bank is covered with larger plants.
5. Riparian Zone Vegetation *Is the stream open to inputs from land users?*	Wide, well-vegetated margin that is undisturbed. No visible human or stock impacts.	Well-vegetated margin but some signs of human disturbance or stock access.	Modified vegetation. Little forest/wetland. Some signs of human activity and/or stock access.	Highly modified or no vegetation. No forest/ wetland. Clear signs of human activity and/ or stock access

Add up your total scores for each of the factors. Compare your score to those in the rating table:

Stream habitat features		
Stream bank features	left bank	
	right bank	
	TOTAL	

SCORE	RATING
40 - 34	Excellent
33 - 26	Good
25 - 17	Fair
16 - 10	Poor

Does it add up? Does the habitat reflect your score/rating? _____ (Y/N)

Comment _____

What factors (if any) act as limiting factors? _____

Before you go - have you:

- ☐ Taken a photo that is representative of your site (position and direction should be the same each time)?
- ☐ Completed a substrate survey (closely linked to this survey)?
- ☐ Made your impairment/impact assessment and identified limiting factors?
- ☐ Updated the stream reach map and survey form?

When you return:

- Map your habitat results on to your catchment map.