

# STATE OF THE RIVERS PROJECT

## FIELD MANUAL

**PREPARED BY: LAND AND ENVIRONMENT ASSESSMENT**

In consultation with Dr John Anderson

**NATURAL RESOURCE SCIENCES CENTRE**

**DEPARTMENT OF NATURAL RESOURCES AND MINES**

**JULY 2003**

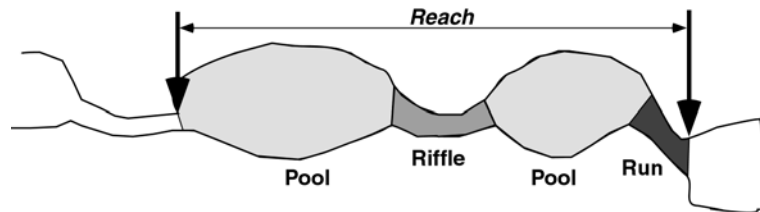


**Queensland  
Government**  
**Natural Resources  
and Mines**

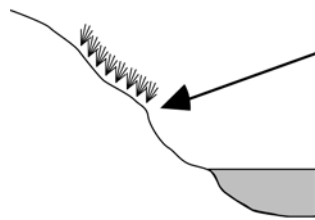


## At the Site

- When you have located the site fill in Sheet 3 if it has not already been done in a Reconnoitre Survey.
- Determine the 'Reach' with your team member. This is a length of stream that is representative of the stream section and the range and relative size of the channel habitats present.



- Together determine where the water mark is and where measurements will be taken from.



The "Water Mark" is left at the normal inundation level in the stream. It's location is shown by the edge of the terrestrial grasses etc., which can not tolerate more frequent inundation, or by an area or erosion or the boundary between different types of sediment on the bank.

- Divide datasheets and determine who will do what sheets. You may like to fill out the same sheets at all the sites or swap them around.
- Fill out all the datasheets except the cross-section sheets.
- Together complete the cross-section sheets. Two people are required to conduct the cross-section – one for taking the measurements and the other for recording the results.
- Check that all parts of the datasheets have been completed and re-staple the sheets together.
- Mark site on the topographic map to indicate that the site has been completed.

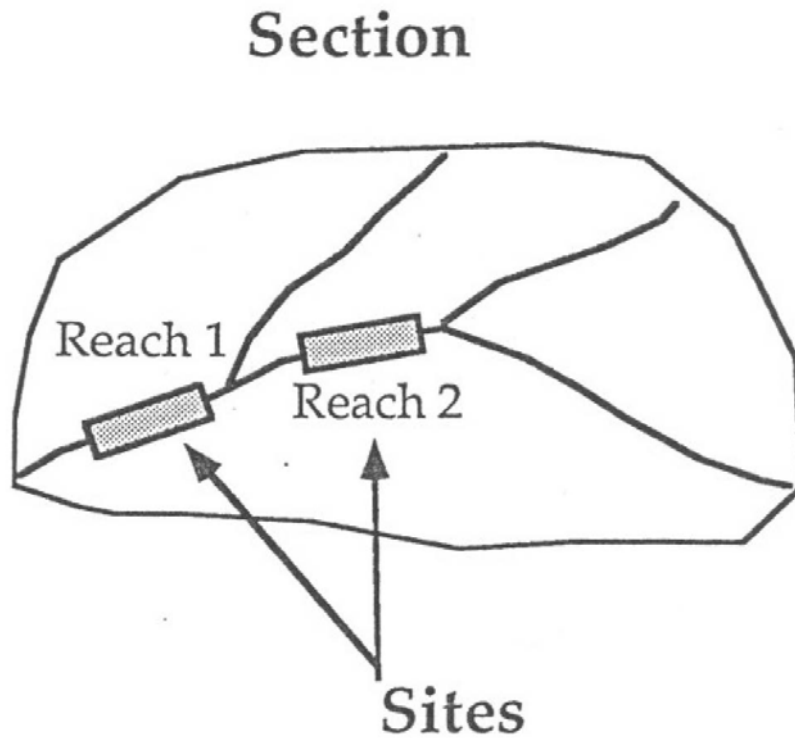
**\*\*It is IMPORTANT that ALL the information is completed at each site. It is hard to distinguish between a real zero and a failure to complete the data sheets. Therefore we ask, if you have assessed an attribute and there is nothing to record place a slash through the section to indicate that it has been assessed and not merely forgotten. Thank-you!**

State of the Rivers

**NOTES:**

## Site Description

The aim here is to provide a description of the location of the site using a grid reference or a lat/long (GPS preferred), and using local land marks. The description should be adequate for precisely relocating the site for follow-up surveys. A standard set of photographs is taken of the site.



## Site Description – Sheet 3

1. Assign Site Number, Tributary Name, Date, Recorder/Assistant
2. Flows Into – name of stream Tributary flows into, e.g. Seven Mile Creek flows into Granite Creek, which flows into Baffle Creek.
3. **Site Description** – broad description on how to get to the site, e.g. Turn left into Three Mile Ck Rd, 500m after Bruce Highway crossing of Granite Creek. Go along 4km to low level crossing.
4. **Location Description** – the location of the site on the actual stream, e.g. 200m upstream of the low level crossing.
5. **Sketch** – Draw mud map to aid in finding the site. Adding any distinguishing features to make it easier to find.
6. **Type of Site** – mark the box corresponding to the type of site it is. In most cases it will be a ‘Full Survey Site’.
7. **Map Number** – number of topographic Map where site is located, e.g. 9248
8. **Grid Reference** – Eastings and Northings read off Topographic Map
9. **Latitude and Longitude** – coordinates given by GPS in Degrees, Minutes, Seconds.
10. **GPS** – mark this box if the Latitude and Longitude were from a GPS unit. If not mark the ‘Other’ box.
11. **Map Scale** – scale of Topographic Map, e.g. 1:100 000
12. **Tidal/Non-Tidal** – mark the relevant box whether the site is ‘Tidal’ or ‘Non-tidal’.
13. **Photographs** – For each new film a number should be allocated to it and written on the film canister. That number is the ‘Film No’. Take photos Upstream, Downstream, Lateral Left and Lateral Right, Reach Environs and any distinguishing feature or activity at the site.  
Please Note: to determine left and right bank you must be facing downstream. Place the Shot No’s off the camera in the appropriate box to correspond with the photo you have taken.

	Film No.		Shot	
Upstream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Downstream	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lateral Left	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lateral Right	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reach Environs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Distant View	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feature <u>Logjam</u>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feature _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**Notes:**



## Reach Environs

The aim here is to record local information about the land immediately adjacent to the reach. This includes information about the flow and water level conditions prevailing at the time of the survey.

It also includes:

*local land use*

*local disturbance*

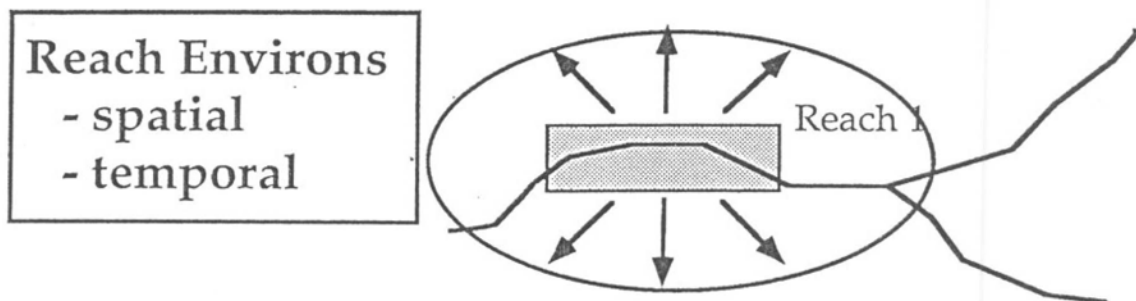
*local vegetation type*

*floodplain features (billabongs etc.)*

*local land tenure*

An overall disturbance rating also made in relation to the extent of clearing and replacement of vegetation by exotic species in the riparian zone and adjacent land.

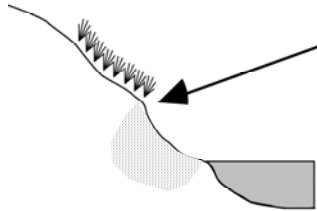
This local data complements the broader data available from the GIS (spatial) and flow conditions at the gauges (temporal).



## Reach Environs – Sheet 4

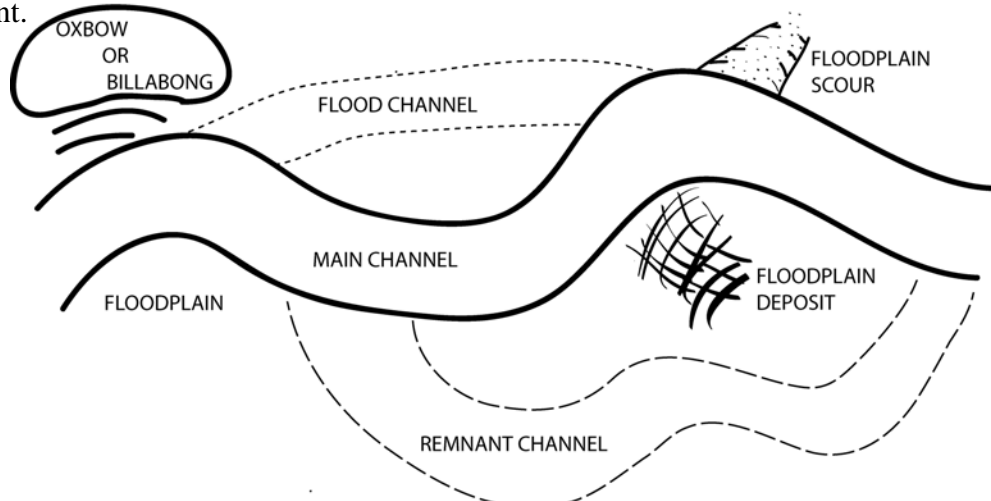
\*\*Site Number, Tributary Name, Date, Recorder

1. **Water Level at Sampling Time** – mark **1** box corresponding to the current water level in the stream. See below for definition of ‘Water Mark’



The "Water Mark" is left at the normal inundation level in the stream. It's location is shown by the edge of the terrestrial grasses etc., which can not tolerate more frequent inundation, or by an area or erosion or the boundary between different types of sediment on the bank.

3. **Channel Pattern** – mark **1** box for ‘Map Scale’ (channel pattern on Topographic Map) and **1** box for ‘Local Scale’ (channel pattern on the ground). If either Map Scale or Local Scale are not determined mark the ‘Not Determined’ box.
4. **Local Land Use** – mark as many boxes as relevant to the types of land use occurring on both sides of the stream. If a land use is not listed then mark the ‘Other’ box and indicate what it is.
5. **Local Disturbance** - mark as many boxes as relevant to the types of disturbance occurring on both sides of the stream. If a disturbance is not listed then mark the ‘Other’ box and indicate what it is.
6. **Present Vegetation in Local Vicinity** – mark as many boxes as relevant to the types of vegetation that occurs at present on both sides of the stream. If a vegetation type is not listed then mark the ‘Other’ box and indicate what it is.
7. **Floodplain Features** – mark as many boxes as relevant to the types of floodplain features present.



8. **Local Land Tenure** – mark as many boxes as relevant to the types of Land tenure present on both sides of stream. May need to refer to map. If a Land Tenure is not listed or it is unknown then mark the ‘Other/Unknown’ box.
9. **Overall Disturbance Rating** – mark **1** box that best describes the overall disturbance of the site. Use the diagrams and explanations to choose the “Best Fit”.



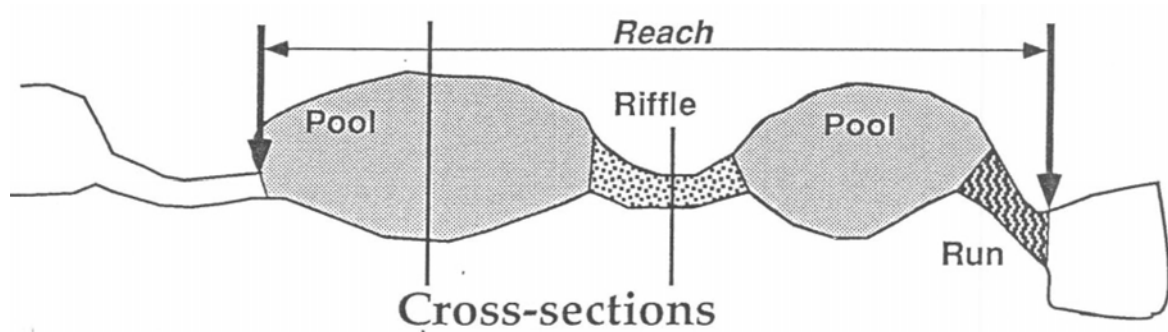
**Notes:**

## Channel Habitat Classification

The aim here is to classify the segments of the reach into the following broad types:

waterfall  
cascade  
rapid  
riffle  
glide  
run  
pool  
backwater

These represent the broad range of aquatic habitats present and the range of sediments, flows and depths present in the reach. This classification is important for both the physical and environmental condition of the stream.



Cross-sections are taken at the point of maximum thalweg depth (pool) and at the point of minimum thalweg depth (max. bed height)(riffle) in the reach.

# Channel Habitat – Sheet 5

\*\*Site Number, Tributary Name, Date, Recorder

\*Select your Reach see data sheet for guidelines

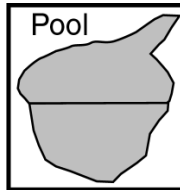
NB: You may find it easier to do this one back to front.

3. **Sketch** – draw the reach including all habitat types, widths, lengths, direction of flow and any other key features. TIP: Use diagrams and descriptions on data sheet to help you identify habitat types.
2. **Total Length of Reach** - in metres
1. **Channel Habitat Types** – for each habitat you have identified in the reach indicate what proportion of that reach is made up of those habitats out of 100% and place this percentage in the ‘% of section’ box. For each habitat estimate the AVERAGE length, depth, width and height and gradient (where applicable). Please note it is the Average, therefore if you have two pool habitats and one is 15 m long and the other is 23 m long, then the average is 19m.

## EXAMPLE

Total Length of Reach = 50m

Depth > 0.5 m  
where stream  
widens or deepens  
and current  
declines



	7	6
	1	9
	0	5
	3	6

% of section

Est. Av. length (m)

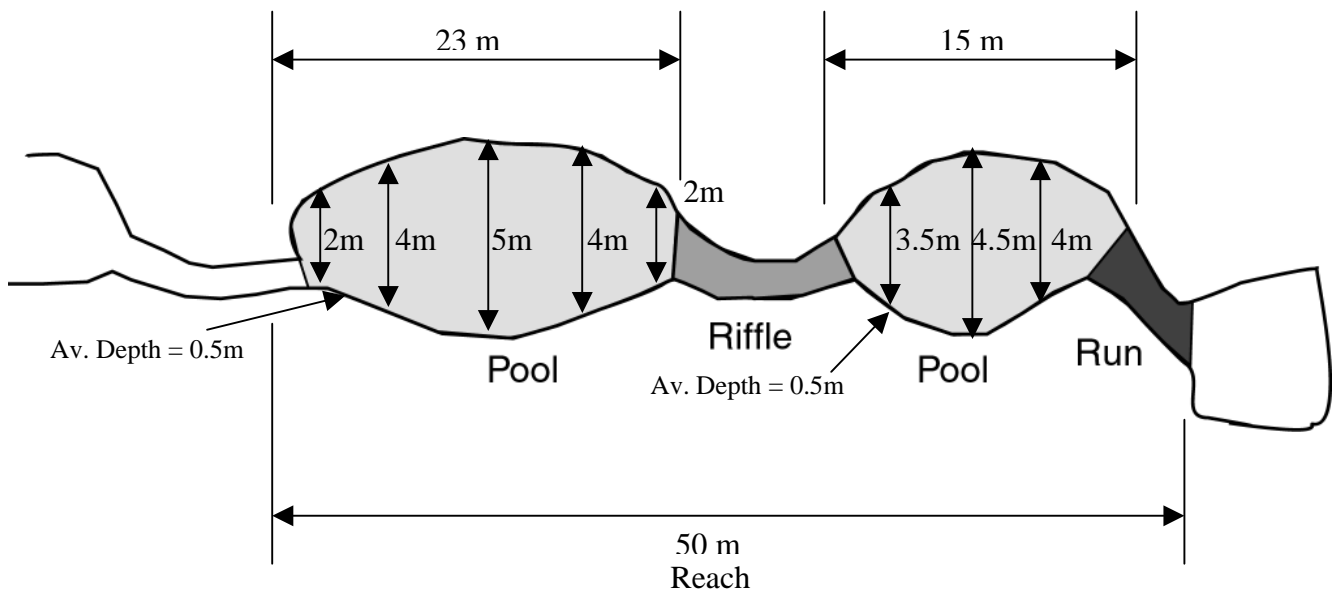
Est. Av. depth (m)

Est. Av. Width (m)

$$\% \text{ of Section} = \frac{23 + 15}{50}$$

$$\text{Av Length} = \frac{23 + 15}{2}$$

$$\text{Av Width} = \frac{2 + 4 + 5 + 4 + 2 + 3.5 + 4.5 + 4}{8}$$



## Planform View



**Notes:**

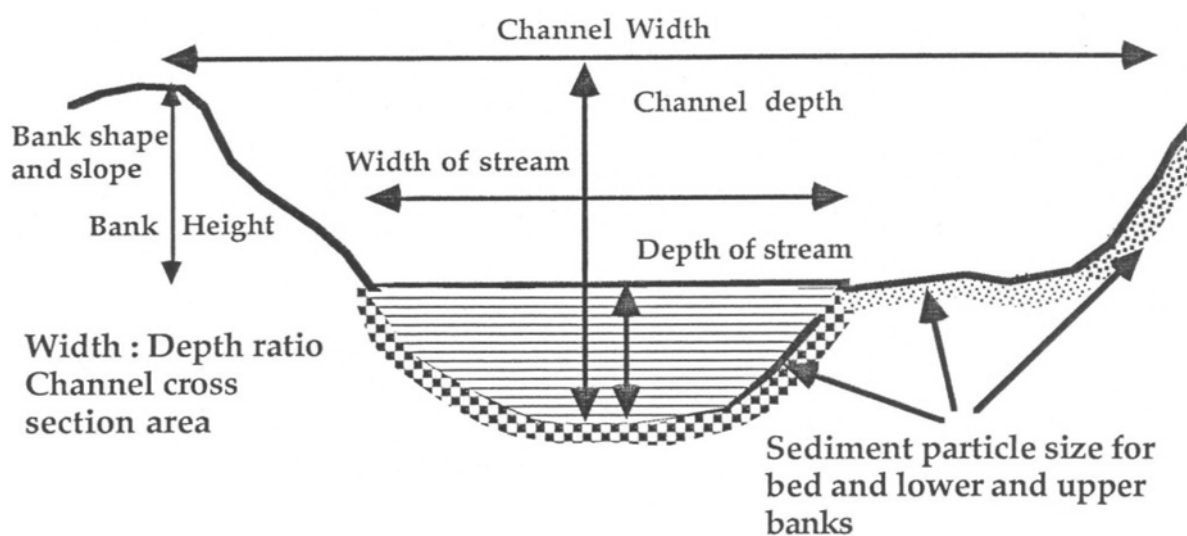


## Cross-sections

Cross-sections are taken to provide a basic picture of the channel size, shape and form. A series of sediment samples are taken across the bed and also on the banks.

The particle-size composition of the sediments is determined. This is fundamentally important for classifying the aquatic habitat as stream invertebrate distribution and abundance is very much influenced by the type of substrate present.

The cross-sections also provide base-line information for follow-up surveys and also for understanding the processes affecting the channel e.g. headward erosion of the bed.



## Cross-sections – Sheet 6

\*\*Site Number, Tributary Name, Date, Recorder

\*\*Do at least 2 cross-sections where possible – preferably 2 different habitat types.

1. **Type** – mark **1** box to indicate which habitat type you are doing the cross-section on.
2. **Dimensions** – insert the length, average width and average depth for just the habitat you are doing the cross-section in.
3. **Bed Dry/Watermark** – If the bed is dry you need to take your measurements from the watermark. If this is the case, mark the ‘Bed Dry’ box. If the water level covers the watermark there is no lower bank. If this is the case, mark the ‘Water Mark covered’ box. If the water level is below watermark leave these boxes blank and take measurements from the actual water level.
4. **The Cross-section** – Starting from Left Bank, at each reading record the distance from bank, depth and sediment and organic matter proportions. The Sediment proportions must **add up to 100%** (not including the organic matter). The Organic Matter proportion is also **out of 100%**.

To do this you take a hand full of surface sediment. Out of that handful, what percentage is made up of Organic Matter (out of 100%)? Now remove/ignore that portion of organic matter and you are now starting with a full 100% again to do the sediment. Work out how much of that handful is made up of fines, sands, cobbles, etc., to add up to 100%. If a sediment size is present but not enough to provide 5% cover, simply mark it as present by placing ‘X’ in the ‘Presence’ box. TIP: Use Sediment Classification guide on the top right hand corner of the data sheet to help determine sediment sizes!

5. **Total Width** – record Total Width of cross-section in metres.
6. & 7. **Bank Dimensions** – take the width, height and slope of both the upper and lower banks on the Left Bank. Slope is determined by using a Clinometer. The overall dominant slope of the bank is what is required here. There may be many steps/slopes in a bank and this is why the dominant slope is what is recorded. TIP: if you have marked either the ‘Bed Dry’ or the ‘Water Mark covered’ boxes at 3. then there is no lower bank!
8. **Bank Sediments** – Determine the proportion of Organic Matter and Sediments in the lower and upper banks on the Left Bank using the same method for bed sediments in the cross-section 4. TIP: if you have marked either the ‘Bed Dry’ or the ‘Water Mark covered’ boxes at 3. then there is no lower bank!
9. & 10. **Bank Dimensions** – same as 6. & 7. but for the Right Bank.
11. **Bank Sediments** – same as 8. but for the Right Bank.
12. **Rock Outcrops** – mark as many boxes according to where rock outcrop is present in the bed and banks. If there is no rock outcrop present mark the ‘None’ box. TIP: submerged boulders are not classed as rock outcrop.

**STATE OF THE RIVERS --- SHEET 6 Cross- Sections**

Basin  Sub-section  Site  Section Number for This reach

One or more cross-sections (separate sheets) are required for each channel habitat type within the reach. Begin at the water's margin on the left bank and take a series of distance and depth measurements. A minimum of 3 measurements is required for each cross-section including the width of stream. Also measure the width, height and slope for the left and right banks. Lower bank = surface to water mark. If bed dry measure depth at water mark level. Upper bank = water mark to inflexion point on the bank

1 TYPE

Pool 1  
Riffle 2  
Run 3  
Glide 4  
Cascade 5  
Rapid 6  
Backwater 7  
Other

2 Length of Type (m)

Av. Width of Type (m)

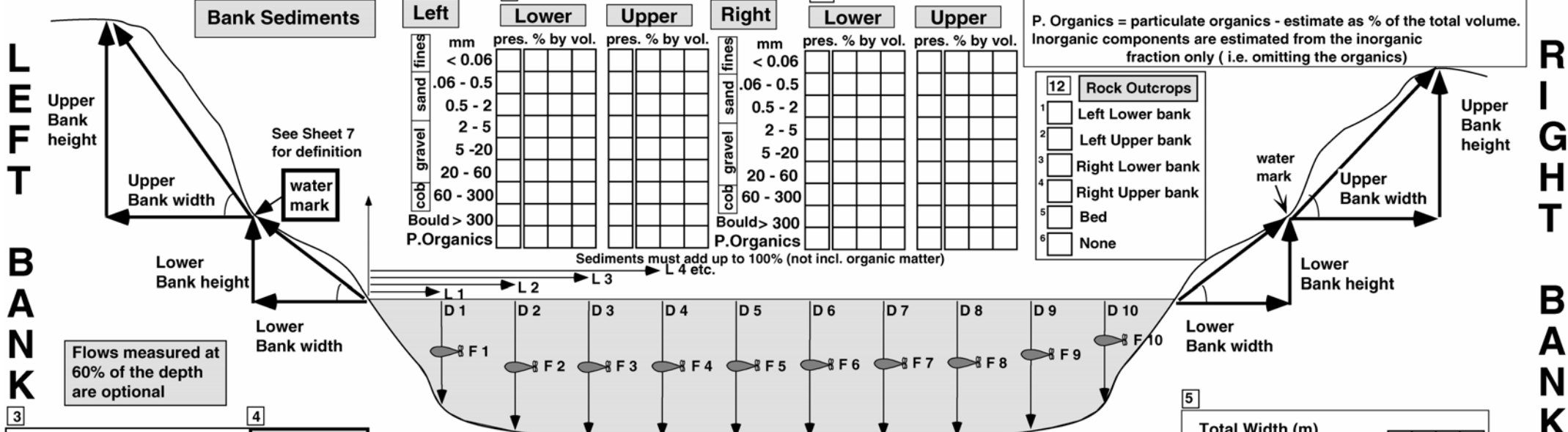
Av. Depth of Type (m)

**Sediment Classification**

Sediment classes are those of the SAA which are easier to estimate visually - estimate % of total inorganic volume occupied by each category. Estimate organics as % of total vol. Record presence of each type (esp. max. and min. sizes) and % vols for major fractions.

Fines	Sand	Gravel	Cobbles	Boulder+Rock
0.1mm	fine medium	fine medium course	10 cent coin	tennis ball
salt	sugar grain	raw sugar	pea	Head
	0.5mm	2mm	5mm	300 mm

P. Organics = particulate organics - estimate as % of the total volume. Inorganic components are estimated from the inorganic fraction only (i.e. omitting the organics)



3 Bed Dry - Depths @ water mark  Water Mark covered - no lower bank

4 CROSS-SECTION AT SURFACE

6 LEFT LOWER BANK

Width (m)

Height (m)

Slope (deg.)

7 LEFT UPPER BANK

Width (m)

Height (m)

Slope (deg.)

5 Total Width (m) at the water surface or where transect taken

8

	Reading 1	Reading 2	Reading 3	Reading 4	Reading 5	Reading 6	Reading 7	Reading 8	
Dist (m)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Depth (m)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Sediments must add up to 100% (not incl. organic matter)									
mm	pres. % by vol.	pres. % by vol.	pres. % by vol.	pres. % by vol.	pres. % by vol.	pres. % by vol.	pres. % by vol.	pres. % by vol.	
< 0.06	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
.06 - 0.5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
0.5 - 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
2 - 5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
5 - 20	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
20 - 60	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
60 - 300	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Bould > 300	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
P.Organics (out of 100%)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	

9 RIGHT LOWER BANK

Width (m)

Height (m)

Slope (deg.)

10 RIGHT UPPER BANK

Width (m)

Height (m)

Slope (deg.)

LEFT BANK

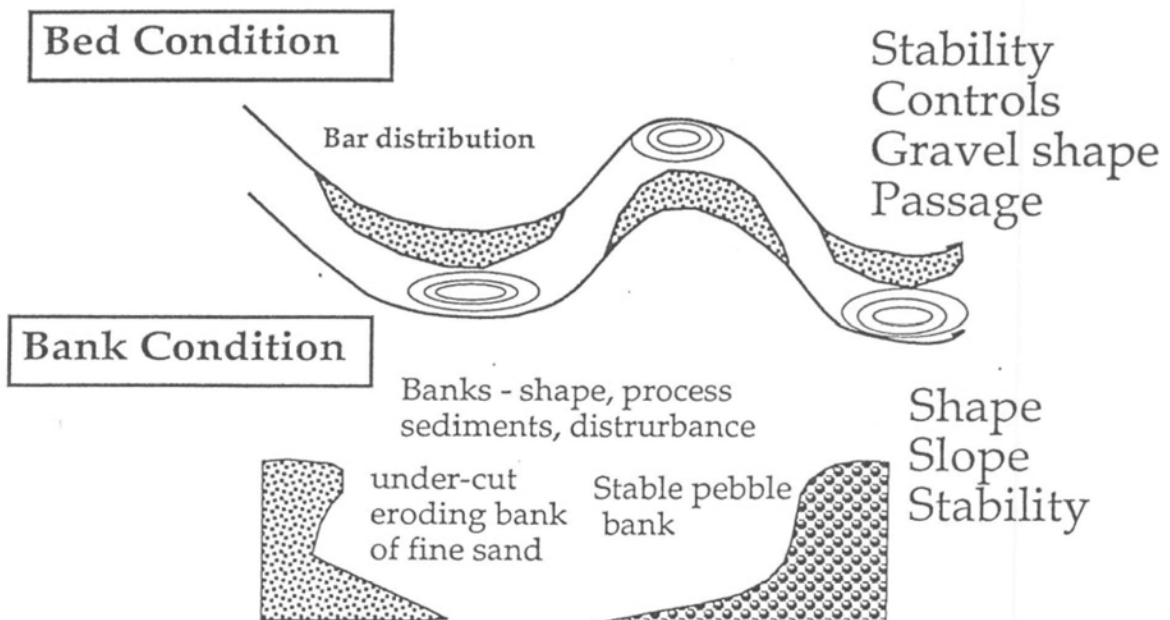
RIGHT BANK

**Notes:**

## Bed, Bar and Bank Condition

Two data sheets are used to assess the condition of the bed bar and banks. The assessment is made in terms of the percentage of the bank length, and surface area of the bed, which is stable, eroding or aggrading. The location of the instability (bends, obstacles etc.) and the local factors affecting stability are also assessed to identify the processes involved. Overall ratings of the bed and bank stability are made.

The suitability of the site for general fish passage and for specific barriers at the site is also assessed in relation to the stage at the time the survey is made and of the stage required for the barrier to be effectively by-passed or over-topped.



## Bank Condition – Sheet 7

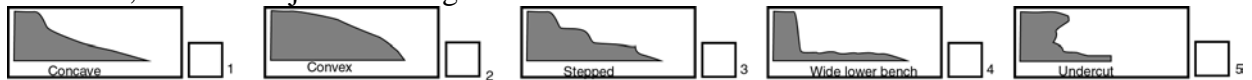
\*\*Site Number, Tributary Name, Date, Recorder

**1. & 2. Bank Stability** – For the Lower Left Bank assess what proportion of the bank length is bare of vegetation, **out of 100%**. Assess what proportion of the Lower Bank length that is Stable, Eroding (loss of material), Aggrading (deposition of material), Slumping (material slip/slides down bank). These four figures must **add up to 100%**. Mark as many boxes to indicate the locations where Erosion, Aggradation and Slumping is occurring on Lower Bank, using the diagrams as a guide. **Repeat** for Upper Left Bank.

**3. Bank Slope** – For the Left Bank **RANK** the boxes according to what bank slope is present. There may be many steps/slopes in a bank this is why the bank slope types should be ranked from 1 being most dominant to 2, 3, or 4 being present /least dominant, rather than just selecting one of them.



**4. Bank Shape** – For the Left Bank **RANK** the boxes according to what bank shape is present. Bank shapes should be ranked from 1 being most dominant to 2, 3, or 4 being present /least dominant, rather than just selecting one of them.



**5. Overall Condition of the Left Bank** – Mark **1** box for ‘Overall Instability’ and **1** box for ‘Susceptibility to erosion’.

**6. & 7. Bank Stability** – Same as **1. & 2.** but for Right Bank.

**8. Bank Slope** – Same as **3.** but for Right Bank.

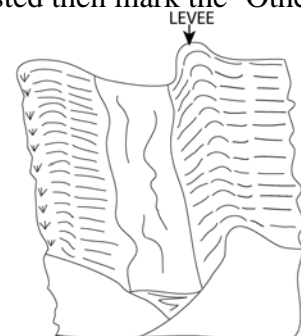
**9. Bank Shape** – Same as **4.** but for Right Bank.

**10. Overall Condition of the Right Bank** - Mark **1** box for ‘Overall Instability’ and **1** box for ‘Susceptibility to erosion’.

**11. Factors Affecting Stability** – **RANK** as many boxes relevant as to what you consider to be affecting the stability of the banks. 1 being most dominant to 2, 3, or 4 being present /least dominant. If a Factor is not listed then mark the ‘Other’ box and indicate what it is.

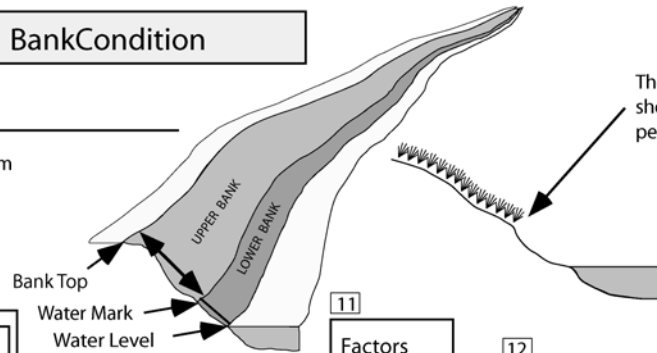
**12. Artificial Bank Protection Measures** - **RANK** as many boxes relevant to indicate what Bank Protection Measures have been installed. 1 being most dominant to 2, 3, or 4 being present /least dominant. If a Bank Protection Measure is not listed then mark the ‘Other’ box and indicate what it is.

**13. Levee Banks** – Mark **1** of the boxes to indicate whether Levee Banks are present or ‘Absent’ and whether they are ‘Natural’ or ‘Manmade’. If present, note the height and width of the levee bank for the appropriate Bank.



Basin  Sub-section  Site  Tributary Name

Assess the condition of the banks on the left and right side of the stream (facing downstream). Identify the major types of instability (eroding, slumping & aggrading) and mark the location where they occur on the lower and upper banks. Also record and the slope and shape of the banks, and make an overall assessment of instability.



The "Water Mark" is left at the normal inundation level in the stream. It's location is shown by the limit of the terrestrial grasses etc. which can only withstand short periods of inundation, or by an eroded area or boundary in the bank sediment types.

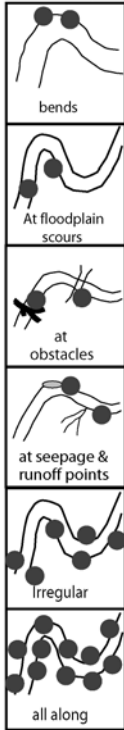
13 Levee Banks

1 Natural	LEFT		RIGHT	
	Height	Width	Height	Width
2 Man-made	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3 Absent	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

LEFT BANK

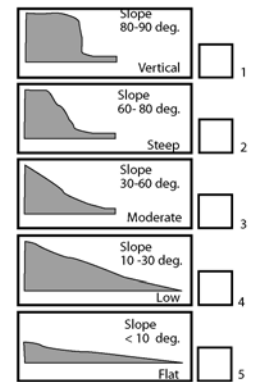
Record % of bank length

LOCATION for Instability

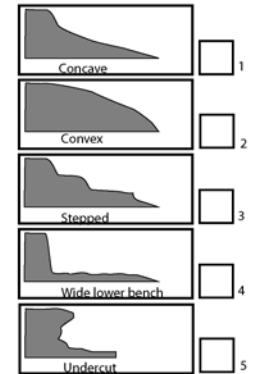


1 LOWER BANK	2 UPPER BANK
Bare of Veg <input type="text"/>	Bare of Veg <input type="text"/>
NOTE: The 4 % figures below must = 100%	NOTE: The 4 % figures below must = 100%
Stable <input type="text"/>	Stable <input type="text"/>
Eroding <input type="text"/> Aggrading <input type="text"/>	Eroding <input type="text"/> Aggrading <input type="text"/>
Slumping <input type="text"/>	Slumping <input type="text"/>
where <input type="text"/> where <input type="text"/>	where <input type="text"/> where <input type="text"/>
bends <input type="checkbox"/>	<input type="checkbox"/>
At floodplain scours <input type="checkbox"/>	<input type="checkbox"/>
at obstacles <input type="checkbox"/>	<input type="checkbox"/>
at seepage & runoff points <input type="checkbox"/>	<input type="checkbox"/>
Irregular <input type="checkbox"/>	<input type="checkbox"/>
all along <input type="checkbox"/>	<input type="checkbox"/>

3 LEFT BANK Slope (RANK types)



4 LEFT BANK Shape (RANK types)



11 Factors Affecting Stability

Flow & Waves	<input type="checkbox"/>
Seepage	<input type="checkbox"/>
Runoff	<input type="checkbox"/>
Floodplain Scours	<input type="checkbox"/>
Stock	<input type="checkbox"/>
People tracks	<input type="checkbox"/>
Vermin, Ferals	<input type="checkbox"/>
Ford, road culvert, bridge, Weir	<input type="checkbox"/>
Clearing of Vegetation	<input type="checkbox"/>
Gravel/sand extraction	<input type="checkbox"/>
Mining	<input type="checkbox"/>
Other	<input type="checkbox"/>

\* RANKS \*

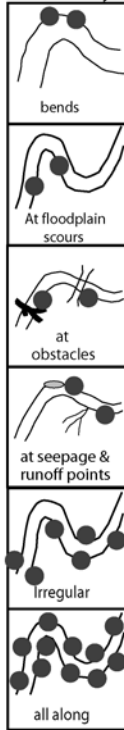
12 Artificial Bank Protection Measures

Trees & Other Plants	<input type="checkbox"/>
Rock wall or layer	<input type="checkbox"/>
Fence Structures	<input type="checkbox"/>
Fenced watering points	<input type="checkbox"/>
Fenced human access	<input type="checkbox"/>
Logs strapped to bank	<input type="checkbox"/>
Concrete Wall	<input type="checkbox"/>
Break-water	<input type="checkbox"/>
Other	<input type="checkbox"/>
Other	<input type="checkbox"/>
None	<input type="checkbox"/>

RIGHT BANK

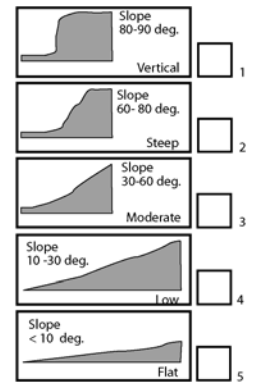
Record % of bank length

LOCATION for Instability

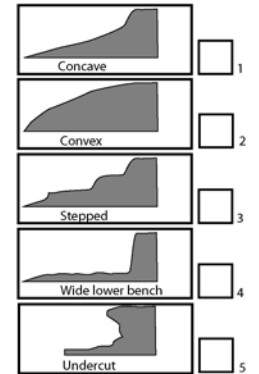


6 LOWER BANK	7 UPPER BANK
Bare of Veg <input type="text"/>	Bare of Veg <input type="text"/>
NOTE: The 4 % figures below must = 100%	NOTE: The 4 % figures below must = 100%
Stable <input type="text"/>	Stable <input type="text"/>
Eroding <input type="text"/> Aggrading <input type="text"/>	Eroding <input type="text"/> Aggrading <input type="text"/>
Slumping <input type="text"/>	Slumping <input type="text"/>
where <input type="text"/> where <input type="text"/>	where <input type="text"/> where <input type="text"/>
bends <input type="checkbox"/>	<input type="checkbox"/>
At floodplain scours <input type="checkbox"/>	<input type="checkbox"/>
at obstacles <input type="checkbox"/>	<input type="checkbox"/>
at seepage & runoff points <input type="checkbox"/>	<input type="checkbox"/>
Irregular <input type="checkbox"/>	<input type="checkbox"/>
all along <input type="checkbox"/>	<input type="checkbox"/>

8 RIGHT BANK Slope (RANK types)



9 RIGHT BANK Shape (RANK types)



5 Rate the Overall Condition of the Left Bank

Overall Instability	High <input type="checkbox"/>	Mod <input type="checkbox"/>	Low <input type="checkbox"/>	Min <input type="checkbox"/>
Susceptibility to erosion	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>

10 Rate the Overall Condition of the Right Bank

Overall Instability	High <input type="checkbox"/>	Mod <input type="checkbox"/>	Low <input type="checkbox"/>	Min <input type="checkbox"/>
Susceptibility to erosion	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>





STATE OF THE RIVERS --- SHEET 8 Bed and Bar Condition

Basin  Sub-section  Site  Tributary Name

SITE CODE

Record the total % of bed surface along the reach protruding out of the water mark and forming a bar. Identify its type, the features of the bed & gravel if present, the overall stability of the bed and the controls and factors affecting the stability of the bed. at the water

**1 BAR TYPE**

Bars Absent

Point

Alternate / side Irregular

Mid-channel Island

Encroaching Vegetation

Around Obstructions

Channel bar plain

Low flow Meander infilled channel

High Flow deposits

**2 BAR SIZE**

**3 Bed Features** (Only if dominant particle size > 2mm)

Most Common Substrate Type & Size: (e.g fine sand, medium gravel, large boulders)

**Angularity**

Very Angular

Angular

Sub Angular

Rounded

Well Rounded

**Shape**

Sphere

Disc

Blade

Rod

**4 Bed Surface**

Gravel covered by algae / silt

Gravel - 'clean'

**5 Bed Compaction**

Tightly packed, armoured

Packed, but not armoured

Moderate Compaction

Low Compaction

Loose Compaction

**6 Factors Affecting Stability**

Sand & Gravel extraction

Bed deepening

Bank Erosion

Channelisation

Cut-off of supply of alluvial materials

Mining

Grazing

Other

**7 Controls Stabilising the Bed**

Bridge Ford or Culvert

Rock Outcrops

Fallen Trees

Vegetation

Bed stabilising structures

Laid Stone

Concrete Lining

Other

None

Date (dd/mm/yy)  /  /

Recorder

**9 PASSAGE FOR FISH AND OTHER ORGANISMS**

1. Score the general passage for the prevailing conditions (now) and for the stage equivalent to the water mark.

2. For Obstructions give type, height from bed level and stage when by-passed or over-topped.

Obstruction Type	WM	1/3	2/3	bank full	flood	extreme flood	never
High dam weir, or waterfall	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cascade rapid or log jam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low weir, pipe culvert, ford, bridge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Single log branch pile, rock	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low feature easily by-passed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
None	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**8 Overall Bed Stability Rating**

Unstable / Eroding ← Stable → Unstable / Aggrading

Severe Erosion	Moderate Erosion	Bed Stable	Mod. Aggradation	Severe Aggrad.
Bed scoured of sand Signs of deepening Bare eroded banks Erosion heads Erosion causes Steep bed	Little alluvium Signs of deepening Eroded banks Bed deep & narrow Steep bed Unconsolidated	Bed consolidated algae covered Bed & bar material the same size Alluvium balanced Banks stable	Mod. build-up at obstructions & bars Bed flat and uniform Bed wide & shallow Some minor over-bank siltation	Flat bed, channel blocked & wide but shallow. Bars large, covering most of bed / bank bed loose, unconsolidated
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Notes:**

# Vegetation

Riparian and aquatic vegetation is becoming recognised as one of the most important features for assessing the condition of streams.

Riparian Vegetation acts to:

*Stabilise the banks*

*Provide shade and shelter*

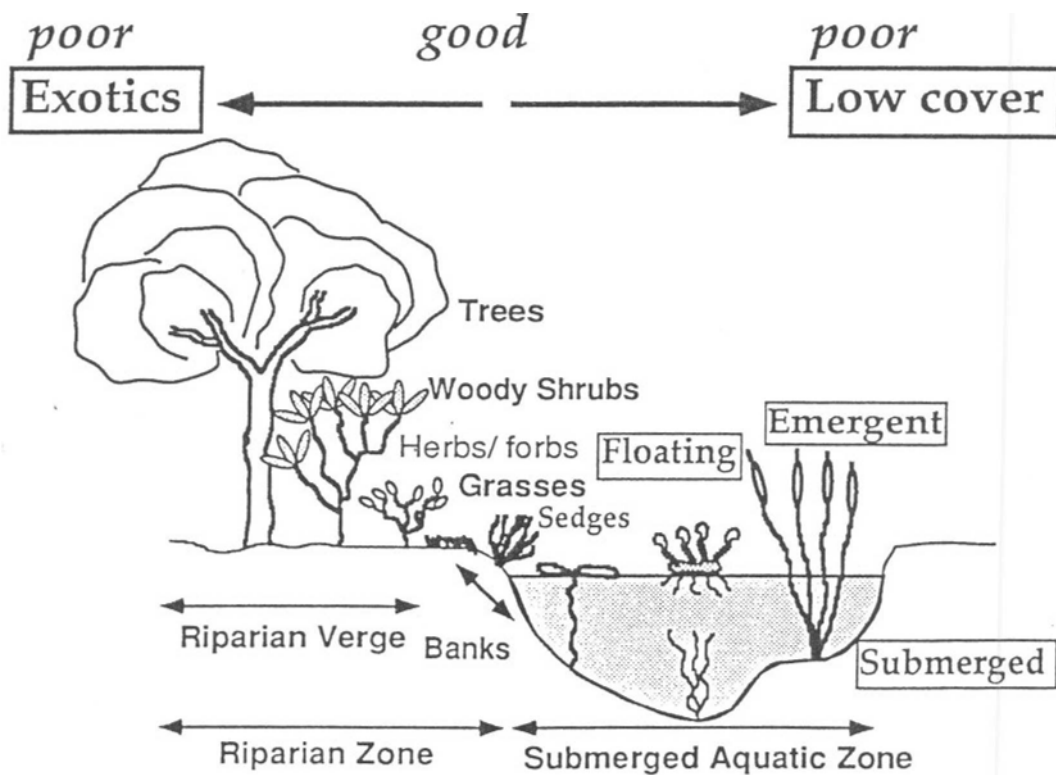
*Provide leaf litter and other organic debris to the stream*

*Provide a remnant wildlife corridor*

*Provide for enhanced fish habitat*

*Provide a buffer zone for intercepting sediments and nutrients.*

Riparian and aquatic vegetation is assessed in terms of percentage cover for various growth forms and key local native & weed species. The percentage of each group, which has been replaced by exotic species, is also assessed.



**Notes:**

# Vegetation – Sheet 9

\*\*Site Number, Tributary Name, Date, Recorder

## RIPARIAN VEGETATION

### 1. Left Bank Vegetation

- **Width of Existing Vegetation** – this includes the width of the remnant riparian vegetation and the width of the vegetation extending out onto the floodplain in metres.
- **Width of Riparian Vegetation** - this is just the width of the remnant riparian vegetation in metres.
- **% Bare of Vegetation** – assess what proportion of the riparian zone is bare of vegetation (**out of 100%**). TIP: Vegetation includes leaf litter.

2. **Scaling Factor** – Mark **1** box that best describes the condition/density of the riparian and existing vegetation. See explanatory notes for scaling factor descriptions.

3. **Vegetation Cover** – % cover - for each structural type, assess the cover it provides to the riparian area. Each structural type is assessed independently of the others and is **out of 100%**. If a structural type is present but not enough to provide 5% cover, simply mark it as present by placing a '1' in the box. TIP: Sheet 10 has some % cover examples.

% exotic – now assess what proportion of the cover provided by the structural type is actually provided by exotic species.

Type	% Cover		% Exotic spp.	
Trees > 30 m		1		
Trees 10 - 30 m	7	0	2	0
Trees < 10 m	6	0	1	5

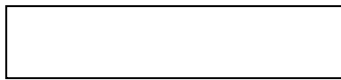
EXAMPLE: Trees 10-30m tall provide cover over 70% of the riparian area and of that 70% cover, 20% is provided by exotic species. Trees <10m tall provide cover over 60% and of that 60% cover, 15% is provided by exotic species. Trees >10m are present.

4. **Total % Exotics** – what percentage of the total cover provided by the riparian vegetation is actually provided by exotic species.

5. **Local Species Checklist** – Mark the 'Yes' or 'No' box to indicate whether or not you did the Local Species Checklist. Then below, if a listed species is present in the riparian zone mark the relevant box whether it is 'Rare' or 'Common'. If a species is not listed but is dominant or important for the site list it in the blank spaces provided next to the Aquatic Vegetation boxes.

6. to 10. – same as 1. to 5. but for Right Bank.

11. **Signs of Regeneration** – mark **1** box for the Left Bank and **1** box for the Right Bank to indicate whether native regeneration is occurring and to what extent.



# Vegetation – Sheet 9 con't

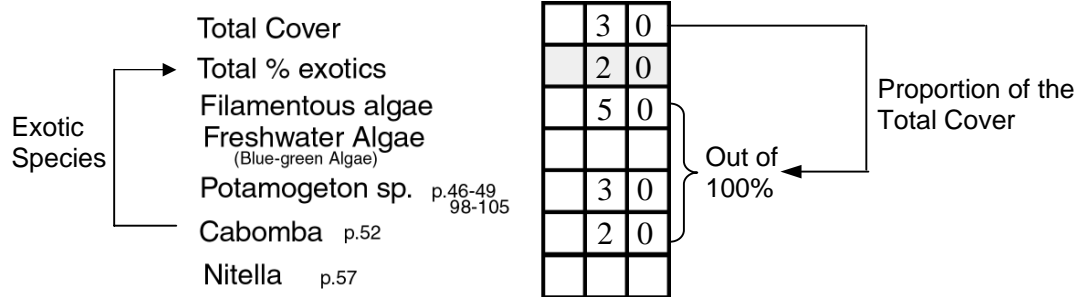
## AQUATIC VEGETATION

### 12. All Aquatic Vegetation

- **Visible Depth** – record to what depth can you see into the water
- **Too turbid – pres only** – mark this box if you cannot see into the water at all. This means you will only be recording the presence of aquatic vegetation by placing a '1' in the box and do not need to record the % cover for each type.
- **% Bare – no vegetation** – what percentage of the bed area is not covered by aquatic vegetation (i.e. bare of vegetation).
- **Tot. % Exotic sp.** – what proportion of the total cover provided by the aquatic vegetation is actually provided by exotic species.

### 13. Submerged/Floating leaf

- **Total Cover** – what percentage of the bed area is covered by Submerged aquatic vegetation (out of 100%).
- **Total % exotics** – what proportion of the cover provided by Submerged vegetation is actually provided by exotic species.
- **Species Composition** – for each Submerged vegetation species present assess the proportion of the Total Cover that is provided by that species. These values must add up to 100%.



EXAMPLE: Submerged vegetation provides cover over 30% of the bed surface. Of that 30%, 50% is Filamentous Algae, 30% is Potamogeton sp. And the remaining 20% is Cabomba. This also means that the cover is made up of 20% exotic species because Cabomba is an introduced species.

14. & 15. – same as 13. but for Floating and Emergent aquatic vegetation.

**NB:** The Total Covers for Submerged, Floating and Emergent Aquatic Vegetation can add up to more than 100% as the zone of habitation for each type may overlap. See diagram below.





## SHEET 9 - Vegetation

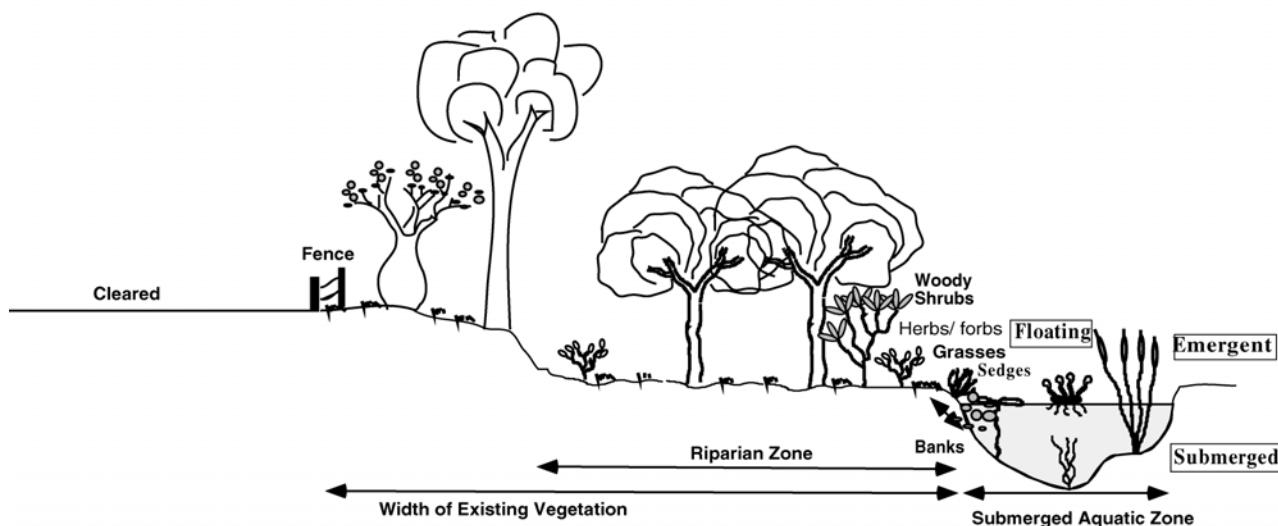
The Vegetation Rating used in the SOR methodology requires a calculation of both the 'quality' of the riparian flora (in terms of habitat structure) and the 'quantity' of riparian zone (in terms of width of the riparian zone). 'Quality' is estimated through the recording of % cover of both native and weed vegetation community types (i.e. large trees, shrubs, grasses, etc.). 'Quantity' is estimated through the recording of the **Riparian Zone Width**, **Width of Existing Vegetation** (max. 50 metres), and the **Vegetation Scaling Factor**, which are manipulated by a computer analysis program in order to rate the riparian zone's environmental value to that stream section.

The vegetation 'quantity' factors are recorded in **Sheet Subsections 1 and 2** for the left bank, and **Subsections 6 and 7** for the right bank. Some simple guidelines will ensure that this critical section of the Vegetation Datasheet will be correctly filled out.

1. Always enter a figure in **all Boxes in Subsections 1 and 6**;
2. Only **tick one Box in the Vegetation Scaling Factor Subsections 2 and 7**;
3. The width of the **Existing Vegetation will always be greater than or equal to the Riparian Zone Width**;
4. 'Existing Vegetation' does not include agricultural or pasture crops; and,
5. You may record an Existing Vegetation Width of greater than 50 metres, but the analysis program will automatically reduce this to 50 metres maximum.

An explanation of the Vegetation Scaling Factors is provided below.

### VEGETATION SCALING FACTOR #1

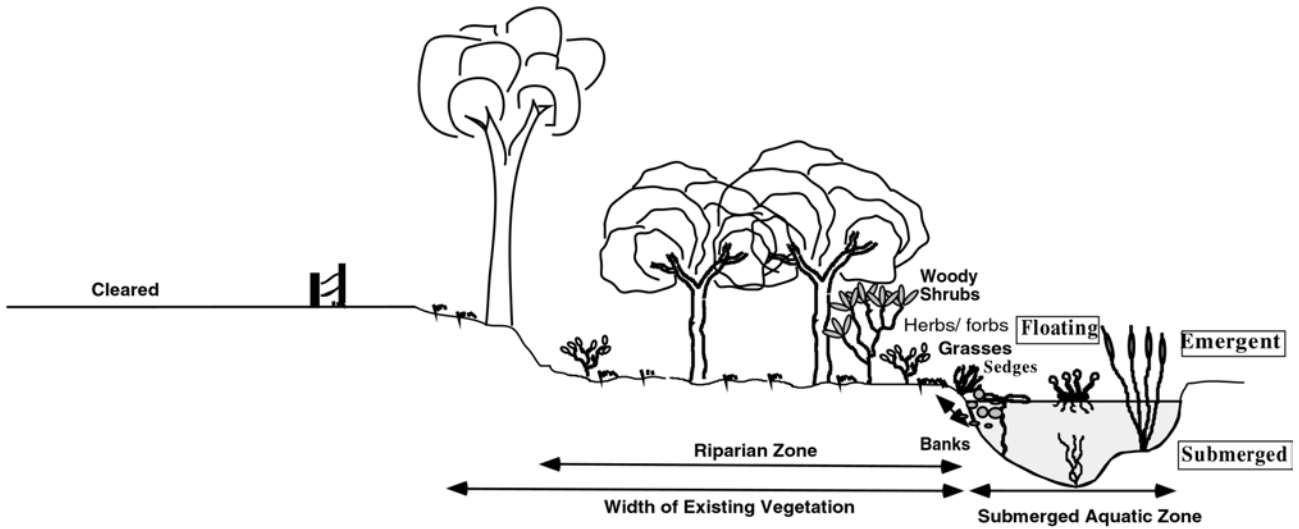


Tick BOX 1 in the SCALING FACTOR section of the Vegetation Datasheet when the vegetation within 50 metres of the stream bank is either highly disturbed or has a distinct boundary on the vegetation edge (as portrayed in the figure above).





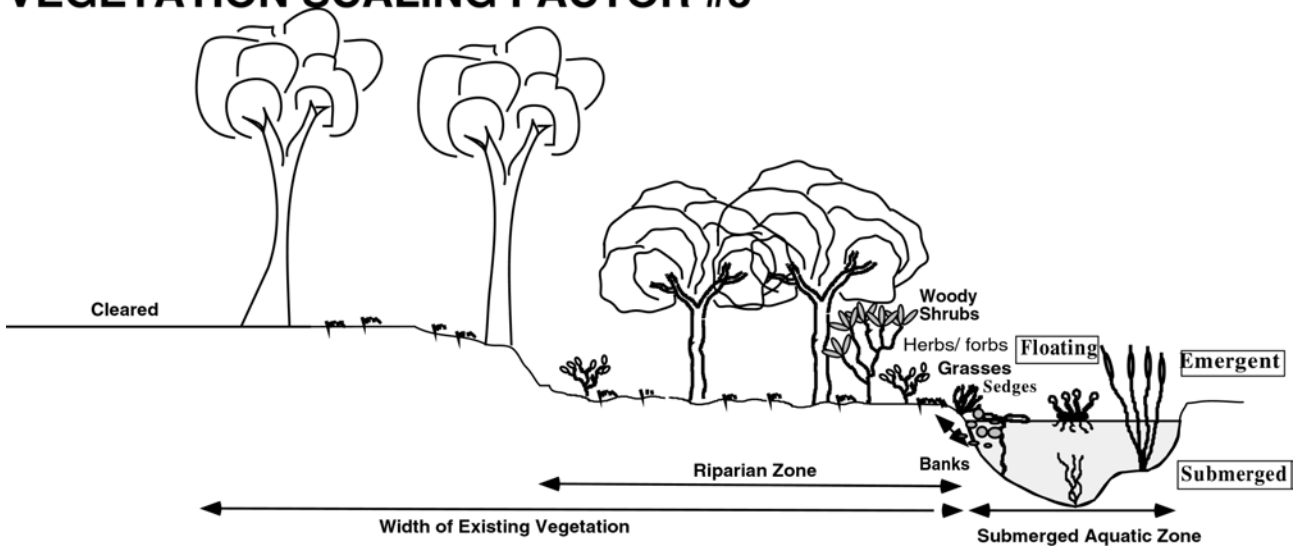
## VEGETATION SCALING FACTOR #2



Tick BOX 2 in the SCALING FACTOR section of the Vegetation Datasheet when the vegetation within 50 metres of the stream bank is either disturbed and non-grass species extend only to the top of the bank (as portrayed in the figure above).



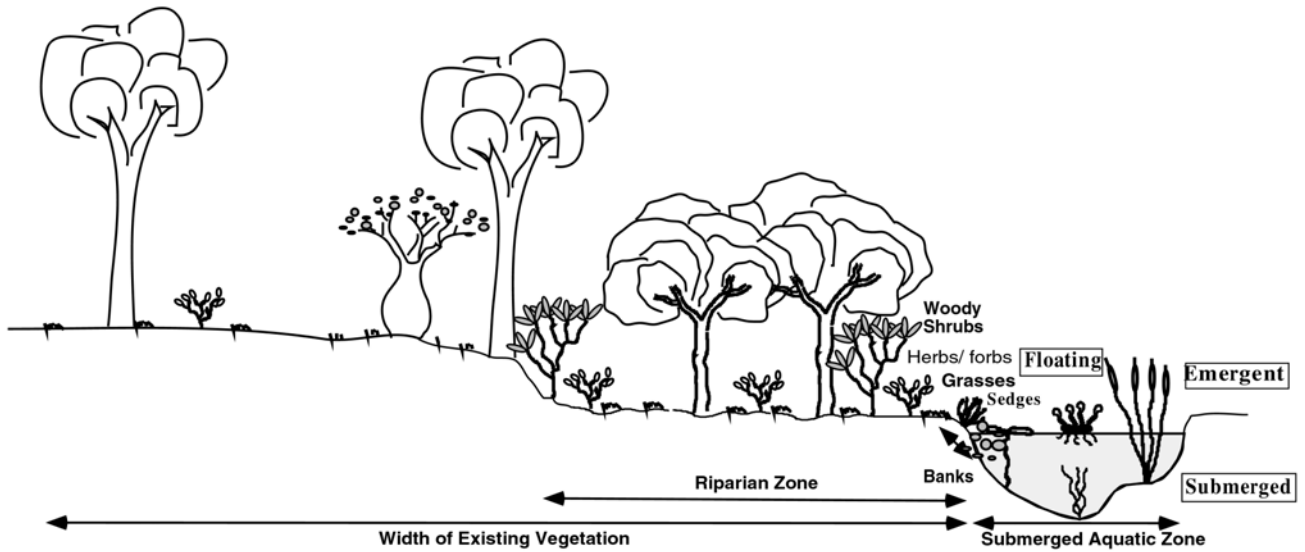
## VEGETATION SCALING FACTOR #3



Tick BOX 3 in the SCALING FACTOR section of the Vegetation Datasheet when the vegetation within 50 metres of the stream bank is disturbed and non-grassed species extend partially into the original zone (floodplain) (as portrayed in the figure above).



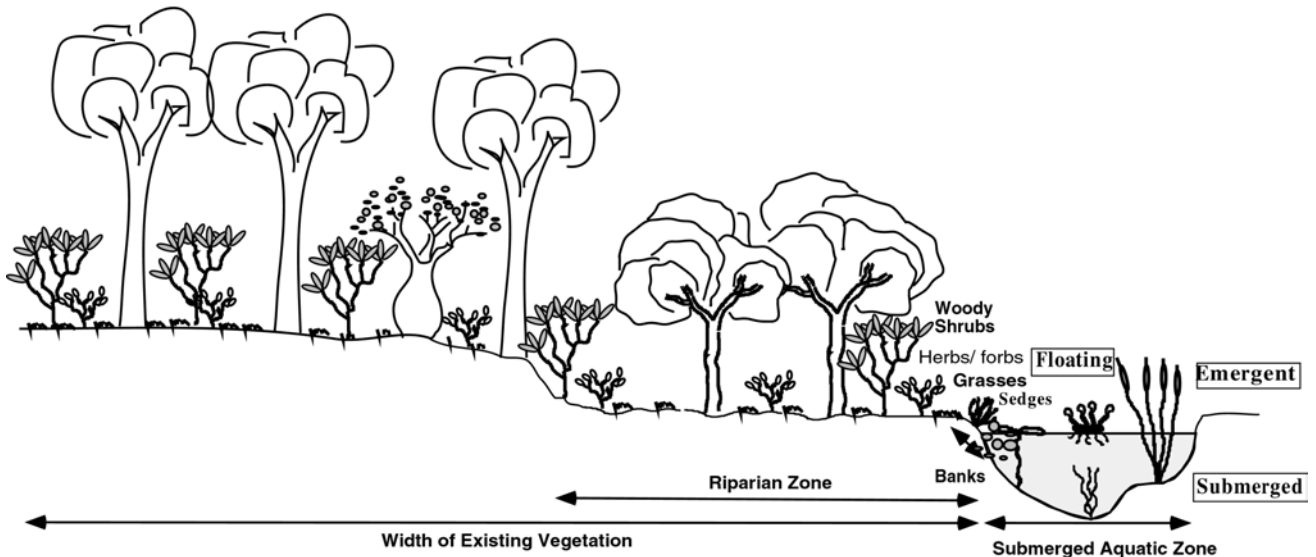
### VEGETATION SCALING FACTOR #4



Tick **BOX 4** in the **SCALING FACTOR** section of the Vegetation Datasheet when the vegetation extends for greater than 50 metres from the stream bank but is either disturbed or thinly cleared (such as in the figure above).

4

### VEGETATION SCALING FACTOR #5



Tick **BOX 5** in the **SCALING FACTOR** section of the Vegetation Datasheet when the vegetation extends greater than 50 metres from the stream bank and is in a natural and relatively undisturbed state (as portrayed in the figure above).

5

## Aquatic Habitat

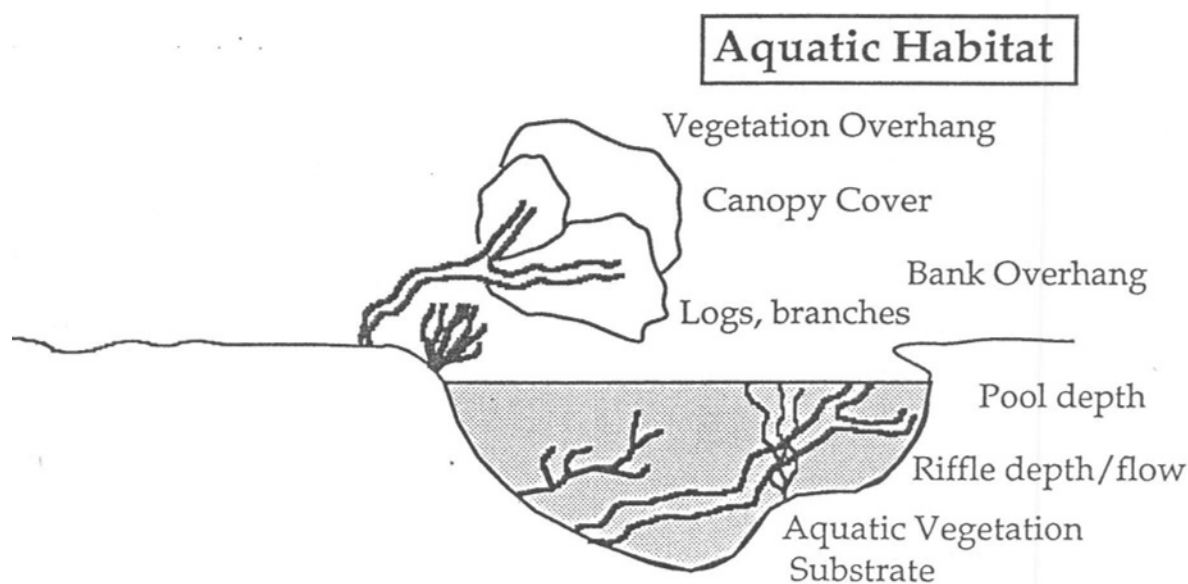
Some of the attributes collected on the other sheets are important for assessing aquatic habitat. These include:

*Channel habitats (pool, riffles and runs)*

*Depth*

*Bed Substrates*


Cover of various types is also important for fish and invertebrates. Instream cover in the form of logs and branches provide shelter and attachment points, and also increases the diversity of flow and depth in the channel. Bank and vegetation cover also provide shade and shelter for the stream.



# Aquatic Habitat – Sheet 10

\*\*Site Number, Tributary Name, Date, Recorder

1. **Too Turbid** – if the water is too turbid then mark this box. Only record the ‘Presence’ of Instream Debris. TIP: This means you indicate presence by putting a ‘1’ in the patches box and do not need to record % cover.
2. **Instream Debris Cover** – for each debris type record the number of patches and the percentage of the bed area covered by the debris. TIP: in the bottom left hand corner of the datasheet there are examples of what certain % cover may look like.



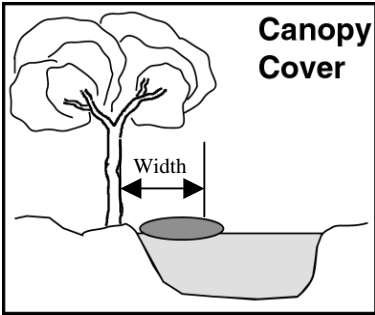
**diam. > 250 mm**

**Individual log**

5	patches ( record No.)
	5 % bed cover

EXAMPLE: There are 5 individual logs that provide cover over 5% of the bed area.

3. **Stream Cover** – For the Left and Right Banks determine the percentage of the bank length that provides Canopy Cover, Vegetation Overhang, Root Overhang, Bank Overhang and Man-made Overhang over the stream. Record the average width of the stream bed that is covered by each of the cover types.



4. **Overall Aquatic Rating** – using all the information you just recorded mark 1 box to best describe the overall condition of the aquatic habitat of the site



**Notes:**

## **Scenic, Recreational and Conservation Values**

**A preliminary assessment of these' values is made at each site. The sites are classified according to their recreational opportunity type, using remoteness, access, human contact and impact, and facilities available at the site.**

**The suitability of the site for various types of recreation, and their scenic values are also assessed.**

**A preliminary assessment of the conservation values of the sites is made in terms of ratings for the sites as remnant habitats for rare or endangered species of animals or plants, or as wildlife corridors.**

## Scenic, Recreation & Conservation Values – Sheet 11

\*\*Site Number, Tributary Name, Date, Recorder

- 1. Recreational Opportunity** – working through the descriptions mark **1** box that best describes the Recreational Opportunity of the site.
- 2. Recreation Types** – mark in boxes where relevant a ‘1’ for a potential recreation type (something you think might be good to do at this site) or ‘2’ for a recreation type that has/is actually occurring at the site. If a Recreation Type is not listed then mark the ‘Other’ box and indicate what it is. TIP: Be realistic! Would you travel to this site to do the activity?
- 3. Scenic Value Assessment** – Rate the site 1- 10 for it’s Overall Scenic Value. 10 being the best! Then RANK the components listed to indicate what makes up that Scenic Value. If a scenic Component is not listed then mark the ‘Other’ box and indicate what it is.

7	Overall Scenic Value Rating
1-10	Rank the components for Scenic Value
2	Inherent Natural Beauty ( bushland setting)
	Inherent Physical Beauty ( waterfalls etc.)
1	Scenic Rural Setting
	Scenic Urban Setting
	Artistic merit or value
3	Scenic value of a component e.g. tree etc.

- 4. Initial Conservation Value Assessment** – Rate the site 1-10 as a remnant habitat for AQUATIC plant and animal species. 10 being the best!  
Rate the site 1-10 as a remnant habitat for RIPARIAN plant and animal species. 10 being the best!  
Rate the site 1-10 for it’s value as a Wildlife Corridor. 10 being the best!
- 5. Representativeness** - Rate site 1-10 in terms of its quality as a representative AQUATIC Habitat for this type of site in the catchment.  
Rate site 1-10 in terms of its quality as a representative RIPARIAN Habitat for this type of site in the catchment.



Basin Sub-section Site Tributary Name

1 Recreational Opportunity Type

Allocate the site to ONE of the following types considering all aspects	Natural 1.	Natural 2.	Natural 3.	Rural 1.	Rural 2.	Urban 1.	Urban 2.	Urban 3.
	<sup>1</sup> Near Pristine National Parks or, undeveloped, naturally vegetated areas	<sup>2</sup> Semi - Natural Infrequent, low-level disturbances; Native Forestry; Remnant areas; Reserves.	<sup>3</sup> Roaded- Natural Environmental Parks; Camping/Rest Areas with structured sites and facilities.	<sup>4</sup> Undeveloped Rural Recreational settings in rural landscapes that are modified	<sup>5</sup> Developed Rural Rural areas cleared for camping grounds, within rural towns	<sup>6</sup> Undeveloped Urban Undeveloped urban parks and bushland kept semi-natural	<sup>7</sup> Developed Urban Urban Parks and Sports grounds Walls along stream	<sup>8</sup> Highly Developed Urban Towns; Suburbs; Resort developments
LANDUSE	National Park or Watercourse in a large stand of undisturbed, natural vegetation	Watercourse with relatively undisturbed vegetation extending on both banks	Watercourse with modification and some disturbed or cleared vegetation; vegetation extends on both banks	Agriculture; Grazing; etc, or large scale clearing of natural vegetation on one or both sides of banks	Watercourses running through Rural Towns or Rural Residential areas; cleared or modified vegetation	Watercourses in natural parklands or through semi-natural vegetation less than 500m from urban areas	Watercourses running through built urban areas; modified surrounds with some natural vegetation	Watercourses running through highly developed Urban areas with highly modified surrounds
ACCESS	only by foot and 4 WD vehicle into the area tertiary roads only	only by foot and 4 WD vehicle into the area, tertiary roads only	Moderate road access primary & secondary roads	good road access primary & secondary roads	accessible to all vehicles	primary road access	no limit to access	no limit to access
HUMAN IMPACT & DEVELOPMENT	no structures or exotic plants, pristine condition	only minor human influence, but small clearings O.K.	Moderate disturbance and development of facilities	natural setting but greatly modified	substantial modifications, rural residential	remnant bushland urban parkland with near natural veg.	modified open space	dominated by buildings etc.
EXPECTED HUMAN CONTACT & EVIDENCE OF VISITATION	few other visitors expected; very little evidence of human visitation	contact with people at site rare; some evidence of human visitation (litter, etc)	Moderate disturbance and some contact with groups; ample evidence of visitation	moderate contact on roads and trial sites	moderate to high interaction	Regular use by local residents	moderate to high density use	high density and frequent use
FACILITIES, REGULATIONS, & STRUCTURE	none	some but subtle as formed tracks and signs	Minimal facilities, no powered sites etc.	Controls obvious; facilities not necessarily present	barriers, signs & fences obvious; some facilities present (water, power)	minimal facilities, some tracks, toilets, signage, barriers, etc	well developed and extensive facilities	highly developed and extensive facilities

2 Recreation Types suitable for the area

3 Scenic Value Assessment

4 Initial Conservation Value Assessment

Mark "1" for potential and "2" for actual use

Rate the site from 1 - 10 relative to other sites in the area

NOTE!! consider...

- Barbeque and picnic
  - Bushwalking - camping
  - Bushwalking - day trips
  - Camping - car access
  - Canoeing / kyaking / rafting
  - Dogs
  - Shore Fishing
  - Boat fishing - small boats
  - Boat fishing - large boats
  - Four Wheel driving
  - Horse Riding
  - Motor bikes
  - Rowing
  - Sailing
- Photography
- Nature appreciation
- Swimming
- Water Skiing
- Bird Watching
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_
- Other \_\_\_\_\_

NOTE: BE REALISTIC.... Would you choose to travel to do these activities at this site

Overall Scenic Value Rating

1-10 RANK the components for Scenic Value

Inherent Natural Beauty ( bushland setting)

Inherent Physical Beauty ( waterfalls etc.)

Scenic Rural Setting

Scenic Urban Setting

Artistic merit or value

Scenic value of a component e.g. tree etc.

Other \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Rate the site as remnant habitat for Aquatic Plant or Animal spp.

1-10 \_\_\_\_\_

Rate the site as remnant habitat for Riparian Plant or Animal spp.

1-10 \_\_\_\_\_

Rate the value of the site as a wildlife corridor

1-10 \_\_\_\_\_

NOTE!! consider...

instream cover  
instream debris  
diversity of substrate  
diversity of channel habitat  
apparent water quality  
evidence of fauna in dry beds

vegetation structure  
vegetation diversity  
extent of disturbance  
stability of banks  
extent of weed invasion  
width of riparian vegetation

vegetation structure/diversity  
width of vegetation  
proximity to disturbances  
continuity  
linkages to other habitat areas

5 Rank the Site ( 1-10) in terms of its quality as representative Aquatic Habitat for this type of site in this catchment.

Rank the Site ( 1-10) in terms of its quality as representative Riparian Habitat for this type of site in this catchment.

**Notes:**

