AUSRIVAS Physical Assessment Protocol Field Data Sheets **Page 1** **Site No.** 003 **Date** 31/1/01

Date 31/1/01 Site No. 003 Time 9:10am Recorder's Name Melissa (+ Ben/Isobel)

River Name Murrumbidgee Location Uriarra Crossing

Weather Overcast Rain in last week? Y [✓ Heavy] N [ ]

Latitude: deg 35 min 14 sec 42 Longitude: deg 148 min 56 sec 40

GPS Name and Datum Garmin II plus Datum = WGS84

Photograph numbers and details FILM #3

Shot 19 cross-section 1

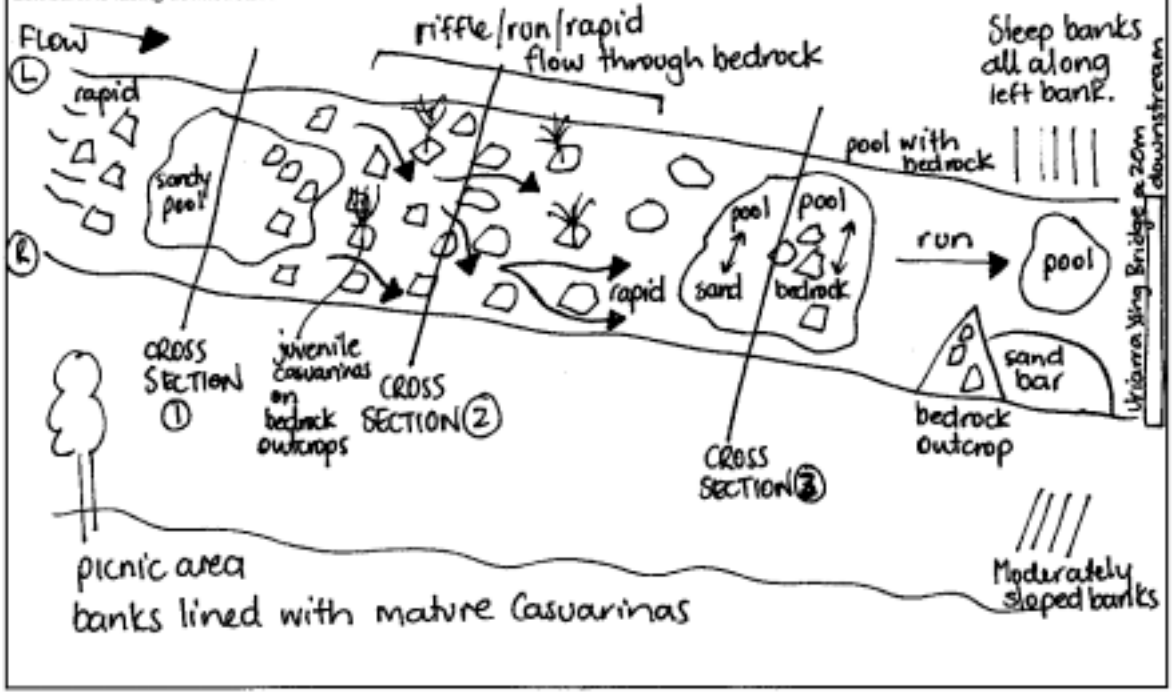
Shot 20 Cross-section 2

Shot 21 Cross-section 3

Shot 22 General site view

PLANFORM SKETCH OF SITE

Including bedform types, location of cross-sections, access points, landmarks and natural or artificial channel or floodplain features.
Left bank is facing downstream.



LENGTH OF SAMPLING SITE

Bankfull width 80 (m)

x 10

Length of sampling site 800 (m)

Notes

Access to site easy - via Uriarra Road to picnic area.
Access along bank easy on right bank. Assessment made from this side.

BEFORE LEAVING THE SITE, CHECK DATA SHEETS TO ENSURE THAT ALL VARIABLES HAVE BEEN RECORDED ✓ Y

Acknowledgments - The content and layout of these data sheets are derived from the sheets used in the River Habitat Audit Procedure (Anderson, 1993a), AUSRIVAS, the Index of Stream Condition (Ladson and White, 1999 and DNRE Victoria) and the River Habitat Survey (Raven *et al.*, 1998).

Example of a completed field data sheet

AUSRIVAS Physical Assessment Protocol Field Data Sheets **Page 2** **Site No.** 003 **Date** 31/1/01

BASIC WATER CHEMISTRY

		Units
Temperature	17.96	°c
Conductivity	145.8	us/cm
Dissolved Oxygen	11.08	mg l^{-1}
Dissolved Oxygen Sat.	115.5	%
pH	8.42	
Turbidity	3.2	FNU
Total phosphorus ☑ (Water sample taken?)		
Total nitrogen ☑ (Water sample taken?)		
ALKALINITY		
Amount of water	100	ml
Amount of H_2SO_4	10.7	ml
Alkalinity	107	mg l^{-1}

Valley shape
Choose one category only

- ☒ Steep valley
- ☐ Shallow valley
- ☐ Broad valley
- ☐ Gorge
- ☐ Symmetrical floodplain
- ☐ Asymmetrical floodplain

Local impacts on streams
Choose one or more categories and describe the detail of each

- ☐ Sand or gravel mining
- ☐ Other mining
- ☒ Road
- ☒ Bridge / culvert / wharf
- ☐ Ford / ramp
- ☐ Discharge pipe
- ☐ Forestry activities
- ☐ Sugar mill
- ☐ Irrigation run-off or pipe outlet
- ☐ Sewage effluent
- ☐ Channel straightening
- ☐ River improvement works
- ☐ Water extraction
- ☐ Dredging
- ☒ Grazing
- ☒ Litter
- ☒ Recreation
- ☒ Other

Description Other = small offtake pipe for toilets
Grazing = some present slightly upstream
Bridge = Uriarra Crossing concrete bridge slightly downstream

Floodplain width ____ ____ ____ Average 0 (m)

Floodplain features
Choose one or more features when present

- ☒ Sampling site has no distinct floodplain
- ☐ Oxbows / billabongs
  Body of water occupying a former river meander, isolated by a shift in the stream channel
- ☐ Remnant channels
  Formed during a previous hydrological regime. May be infilled with sediment
- ☐ Flood channels
  A channel that distributes water onto the floodplain and off the floodplain during floods
- ☐ Scroll systems
  Short, crescentic strips or patches formed along the inner bank of a stream meander
- ☐ Splays
  Small alluvial fan formed where an overloaded stream breaks through a levee and deposits material on the floodplain
- ☐ Floodplain scours
  Scour holes formed by the concentrated clearing and digging action of flowing water
- ☐ No floodplain features present
  Floodplain present at the sampling site but does not contain any of the above features

Local landuse
Choose one category for each bank

Left	Right	
☐	☐	Native forest
☐	☐	Native grassland (not grazed)
☐	☐	Grazing (native or non-native pasture)
☐	☐	Exotic grassland (lawns etc., no grazing)
☐	☐	Forestry Native [L][R] Pine [L][R]
☐	☐	Cropped Rainfed [L][R] Irrigated [L][R]
☐	☐	Urban residential
☐	☐	Commercial
☐	☐	Industrial or intensive agricultural
☒	☒	Recreation
☐	☐	Other _____

Example of a completed field data sheet (cont.)

AUSRIVAS Physical Assessment Protocol Field Data Sheets **Page 3** **Site No.** 003 **Date** 31/1/01

Riparian zone composition

Assess for whole sampling site

	% Cover	Vegetation Description
Trees (>10m in height)	70	Casuarinas
Trees (<10m in height)	5	Casuarinas + some willows
Shrubs	10	Teatree
Grasses / ferns / sedges	20	Non-native grasses in picnic area

May total more than 100%

Shading of channel

☒ < 5% ☐ 6 – 25% ☐ 26 – 50% ☐ 51 – 75% ☐ > 76%

Extent of trailing bank vegetation

☐ nil ☒ moderate
☐ slight ☐ extensive

Native and exotic riparian vegetation

% Native 90
% Exotic 10
Total 100%

Longitudinal extent of riparian vegetation

Choose one category for each bank. Do not include ground layer except where site is in native grassland.

	Left bank	Right bank
None	☐	☐
Isolated / scattered	☐	☐
Regularly spaced	☐	☐
Occasional clumps	☐	☐
Semi-continuous	☐	☐
Continuous	☒	☒

Regeneration of native woody vegetation

Is the sampling site in undisturbed forest?

Y [ ] N [✓]

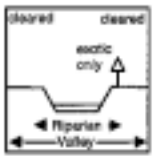
If no, record regeneration category

☒ Abundant (>5% cover) and healthy
☐ Present
☐ Very limited (<1% cover)

Overall vegetation disturbance rating

Choose one category only. Sites with valley vegetation cleared on BOTH sides, but with riparian vegetation in good condition should be scored in the high disturbance category. Words within the drawings summarise the detailed text about the state of the riparian and valley vegetation for each category.

Extreme disturbance ☐



Riparian vegetation – absent or severely reduced. Vegetation is extremely disturbed (ie. dominated by exotic species with native species rare or completely absent)

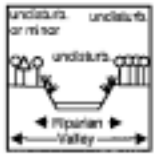
Valley vegetation – agriculture and/or cleared land BOTH sides. Plants present are virtually all exotic species (willows, pines etc.)

High disturbance ☐

Riparian vegetation – moderately disturbed by stock or through the intrusion of exotic species, although some native species remain

Valley vegetation – agriculture and/or cleared land ONE side, native vegetation on the other side clearly disturbed or with a high percentage of introduced species present

Low disturbance ☐



Riparian vegetation – native vegetation present on BOTH sides of the river and in relatively good condition with few exotic species present. Any disturbance present is relatively minor.

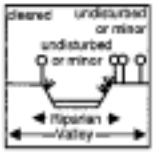
Valley vegetation – native vegetation present on BOTH sides of the river, with a virtually intact canopy and few exotic species

Very high disturbance ☐

Riparian vegetation – some native vegetation present, but it is severely modified BOTH sides by grazing or the intrusion of exotic species. Native species severely reduced in number and cover.

Valley vegetation – agriculture and/or cleared land BOTH sides. Plants present are virtually all exotic species (willows, pines etc.)

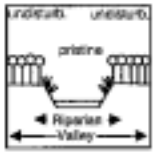
Moderate disturbance ☒



Riparian vegetation – native vegetation on BOTH sides with canopy intact or with native species widespread and common in the riparian zone. The intrusion of exotic species is minor and of moderate impact

Valley vegetation – agriculture and/or cleared land on ONE side, native vegetation on the other in reasonably undisturbed state

Very low disturbance ☐



Riparian vegetation – native vegetation present on BOTH sides of the river and in an undisturbed state. Exotic species are absent or rare. Representative of natural vegetation in excellent condition

Valley vegetation – native vegetation present on BOTH sides of the river with an intact canopy. Exotic species are absent or rare. Representative of natural vegetation in excellent condition

Example of a completed field data sheet (cont.)

AUSRIVAS Physical Assessment Protocol Field Data Sheets Page 4 Site No. 003 Date 31/1/01

Physical barriers to local fish passage

Choose one category for each flow condition

	Base flow	Low flow	High flow
No passage	☐	☐	☐
Very restricted passage	☐	☐	☐
Moderately restricted passage	☐	☒	☐
Partly restricted passage	☐	☐	☐
Good passage	☒	☐	☒
Unrestricted passage	☐	☐	☐

Type and height of barrier(s) Bedrock outcrops may restrict passage, especially through riffle/rapid sections.

Type of bars

Choose one or more categories

- ☐ Bars absent
- ☐ Side/point bars VEGETATED
- ☒ Side/point bars UNVEGETATED
- ☐ Mid-channel bars VEGETATED
- ☐ Mid-channel bars UNVEGETATED
- ☐ Bars around obstructions
- ☐ Braided channel
- ☐ Infilled channel
- ☐ High flow deposits

Extent of bars

% of streambed forming a bar of any type 5 %

Dominant sediment particle size on bars

Boulder/cobble [ ] Pebble [ ] Gravel [ ]
Sand [✓] Silt/clay [ ] or _____mm

Channel modifications

Choose one or more categories

	☒ No modifications		☐ Reinforced
	☐ Desnagged		☐ Revegetated
	☐ Dams and diversions		☐ Infilled
	☐ Resectioned		☐ Berms or embankments
	☐ Straightened	Signs of work still visible	☐ Recently channelised
	☐ Realigned	Works old and revegetated	☐ Channelised in the past

Channel shape

Choose one category only

☐ U shaped	☒ Flat U shaped	☐ Deepened U shape	☐ Widened or infilled	☐ Two stage	☐ Multi stage
☐ Box	☐ Wide box	☐ V shaped	☐ Trapezoid	☐ Concrete V	☐ Pipe or culvert

Example of a completed field data sheet (cont.)

Bank shape
Choose one category for each bank

	Left bank	Right bank
Concave	☒	☒
Convex	☐	☐
Stepped	☐	☐
Wide lower bench	☐	☐
Undercut	☐	☐

Bank slope
Choose one category for each bank

	Left bank	Right bank
Vertical 80 - 90°	☐	☐
Steep 60 - 80°	☒	☐
Moderate 30 - 60°	☐	☒
Low 10 - 30°	☐	☐
Flat <10°	☐	☐

Factors affecting bank stability
Choose one or more categories

- ☐ None
- ☐ Mining
- ☐ Runoff
- ☐ Stock access
- ☒ Human access
- ☐ Ford, culvert or bridge
- ☐ Feral animals
- ☐ Other
- ☐ Cleared vegetation
- ☐ Irrigation draw-down
- ☐ Reservoir releases
- ☐ Seepage
- ☐ Flow and waves
- ☐ Drainpipes

Description Recreation

Bedrock outcrops
Assess % of each bank covered by bedrock outcrops

% bedrock outcrops Left bank 95
Right Bank 75

Artificial bank protection measures
Choose one or more categories

- ☒ None
- ☐ Fence structures
- ☐ Levee banks
- ☐ Rock or wall layer
- ☐ Rip rap
- ☐ Fenced human access
- ☐ Other
- ☐ Fenced stock watering points
- ☐ Vegetation plantings
- ☐ Logs strapped to bank
- ☐ Concrete channel lining

Sediment oils
☒ absent ☐ light ☐ moderate ☐ profuse

Water oils
☐ none ☒ flecks ☐ globs ☐ sheen ☐ slick
backwaters only, could be sunscreen derived

Sediment odours
☒ normal/none ☐ sewage ☐ petroleum ☐ chemical
☐ anaerobic ☐ other _____

Water odours
☒ normal/none ☐ sewage ☐ petroleum ☐ chemical
☐ other _____

Turbidity (visual assessment)
☐ Clear ☒ Slight ☐ Turbid ☐ Opaque

Is water clarity reduced by:
☒ Suspended material (e.g mud, clay, organics) ☐ Dissolved material (e.g plant leachates)

Water level at the time of sampling
☐ Dry ☐ No flow ☐ Low ☒ Baseflow or near baseflow
☐ High ☐ Flood (don't sample)

Artificial features at the sampling site
Choose one or more categories

☐ Major weir ☒ Minor weir ☐ Ford ☒ Bridge ☐ Culvert ☐ Other

Description Minor weir = rock ledges built by people swimming. Bridge = Uriarra Crossing slightly downstream.

Large woody debris
Overall % cover of logs and branches greater than 10cm in diameter

3 % Notes on visibility LWD present only along edges. None present in main channel.

Example of a completed field data sheet (cont.)

AUSRIVAS Physical Assessment Protocol Field Data Sheets Page 6 Site No. 003 Date 31/1/01

Extent of bedform features

Total % composition for all features must equal 100%

Height >1m Gradient >60°	Waterfall	0 % of site ____ Est. Av. Length (m) ____ Est. Av. Height (m) ____ Est. Av. Gradient (°)
Step Height <1m Gradient 5-60° Strong currents	Cascade	0 % of site ____ Est. Av. Length (m) ____ Est. Av. Height (m) ____ Est. Av. Gradient (°)
Gradient 3-5° Strong currents Rocks break surface	Rapid	10 % of site 40 Est. Av. Length (m) 0.50 Est. Av. Depth (m) 50 Est. Av. Width (m)
Gradient 1-3° Moderate currents Surface unbroken but unsmooth	Riffle	5 % of site 5 Est. Av. Length (m) 0.30 Est. Av. Depth (m) 5 Est. Av. Width (m)
Gradient 1-3° Small currents Surface unbroken and smooth	Glide	5 % of site 15 Est. Av. Length (m) 0.30 Est. Av. Depth (m) 3 Est. Av. Width (m)
Gradient 1-3° Small but distinct & uniform current Surface unbroken	Run	5 % of site 25 Est. Av. Length (m) 0.75 Est. Av. Depth (m) 10 Est. Av. Width (m)
Area where stream widens or deepens and current declines	Pool	75 % of site 100 Est. Av. Length (m) 1 Est. Av. Depth (m) 55 Est. Av. Width (m)
A reasonable sized (>20% of channel width) cut-off section away from the channel	Backwater	0 % of site ____ Est. Av. Length (m) ____ Est. Av. Depth (m) ____ Est. Av. Width (m)

Note: An additional response variable planform channel pattern is measured in the office

Macrophyte cover

Assess % cover of the sampling site by each category.

Overall % cover of macrophytes 0

% cover of emergent macrophytes 0
% cover of floating macrophytes 0
% cover of submerged macrophytes 0

} Total should equal overall % cover of macrophytes

Macrophyte composition

Use a macrophyte field guide (i.e. Sainty and Jacobs, 1994) to aid identification.
Listed macrophytes can be changed to reflect the common taxa present in each State or Territory.
N denotes a native taxa and I denotes an introduced taxa.

Emergent macrophytes

	Present	% cover
Brachiaria (Para Grass) I	☐	
Crassula (Crassula) N	☐	
Cyperus (Sedge) I/N	☐	
Eleocharis (Spikerush) N	☐	
Juncus (Rush) I/N	☐	
Paspalum (Water Couch) N	☐	
Phragmites (Common Reed) N	☐	
Ranunculus (Buttercup) I	☐	
Scirpus (Clubrush) N	☐	
Triglochin (Water Ribbon) N	☐	
Typha (Cumbungi) N	☐	
Other _____	☐	
Other _____	☐	
Other _____	☐	

Submerged macrophytes

	Present	% cover
Ceratophyllum (Hornwort) N	☐	
Chara (Stonewart) N	☐	
Elodea (Canadian Pondweed) I	☐	
Myriophyllum (Water Milfoil) I/N	☐	
Nitella (Stonewart) N	☐	
Potamogeton (Pondweed) N	☐	
Triglochin (Water Ribbon) N	☐	
Vallisneria (Ribbonweed) N	☐	
Other _____	☐	
Other _____	☐	
Other _____	☐	

Floating macrophytes

	Present	% cover
Azolla (Azolla) N	☐	
Callitriche (Starwart) I	☐	
Other _____	☐	
Other _____	☐	
Other _____	☐	

Overall % cover of native macrophyte taxa 0
Overall % cover of native macrophyte taxa 0

} Total should equal overall % cover of macrophytes from above

Example of a completed field data sheet (cont.)

AUSRIVAS Physical Assessment Protocol Field Data Sheets Page 7 Site No. 003 Date 31/1/01

Bed compaction
Choose one category only

- Tightly packed, armoured
  Array of sediment sizes, overlapping, tightly packed and very hard to dislodge
- Packed, unarmoured
  Array of sediment sizes, overlapping, tightly packed but can be dislodged with moderate effort
- Moderate compaction
  Array of sediment sizes, little overlapping, some packing but can be dislodged with moderate effort ☒
- Low compaction (1)
  Limited range of sediment sizes, little overlapping, some packing and structure but can be dislodged very easily
- Low compaction (2)
  Loose array of fine sediments, no overlapping, no packing and structure and can be dislodged very easily

Sediment matrix
Choose one category only

- Bedrock ☒
- Open framework
  0-5% fine sediment, high availability of interstitial spaces
- Matrix filled contact framework
  5-32% fine sediment, moderate availability of interstitial spaces
- Framework dilated
  32-60% fine sediment, low availability of interstitial spaces
- Matrix dominated
  >60% fine sediment, interstitial spaces virtually absent

Sediment angularity
Choose one category only
Assess cobble, pebble and gravel fractions only

- Very angular
- Angular
- Sub-angular
- Rounded ☒
- Well rounded
- Cobble, pebble and gravel fractions not present

In the USEPA Habitat Assessment on the following pages, be sure to use the correct form for high or low gradient streams

Bed stability rating Choose one category only

Unstable - eroding ← Stable → Unstable - depositing

Severe erosion	Moderate erosion	Bed stable	Moderate deposition	Severe deposition
Streambed scoured of fine sediments. Signs of channel deepening. Bare, severely eroded banks. Erosion heads. Steep streambed caused by erosion.	Little fine sediment present. Signs of channel deepening. Eroded banks. Streambed deep and narrow. Steep streambed comprised of unconsolidated (loosely arranged and unpacked) material	A range of sediment sizes present in the streambed. Channel is in a 'relatively natural' state (not deepened or infilled). Bed and bar sediments are roughly the same size. Banks stable. Streambed comprised of consolidated (tightly arranged and packed) material. ☒	Moderate build-up of fine sediments at obstructions and bars. Streambed flat and uniform. Channel wide and shallow.	Extensive build up of fine sediments to form a flat bed. Channel blocked, but wide and shallow. Bars large and covering most of the bed or banks. Streambed comprised of unconsolidated (loosely arranged and unpacked) material.

Example of a completed field data sheet (cont.)

Example of a completed field data sheet (cont.)

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 8

Site No. 003 Date 31/1/01

USEPA Habitat Assessment
Circle a score for each parameter

HIGH GRADIENT STREAMS

Page 1 of 2

Habitat parameter	Condition category			
	Excellent	Good	Fair	Poor
1. Epifaunal substrate / available cover	Greater than 70% of substrate favourable for epifaunal colonisation and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonisation potential (i.e. logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonisation potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonisation (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 **(14)** 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	**(10)** 9 8 7 6	5 4 3 2 1 0
3. Velocity / depth regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). Slow is <0.3m/s, deep is >0.5m).	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 **(13)** 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition in pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 **(12)** 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel flow status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 **(17)** 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging (greater than 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 **(18)** 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Continued over

Example of a completed field data sheet (cont.)

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 9
Site No. 003 Date 31/1/01

USEPA Habitat Assessment
Circle a score for each parameter

HIGH GRADIENT STREAMS

Page 2 of 2

Habitat parameter	Condition category																			
	Excellent					Good					Fair					Poor					
7. Frequency of riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.				
SCORE	20	19	18	17	16	15	14	13	12	(11)	10	9	8	7	6	5	4	3	2	1	0
8. Bank stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; 'raw' areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.				
SCORE	Left bank		10		9	(8)			7	6	5			4	3	2			1	0
SCORE	Right bank		10		9	(8)			7	6	5			4	3	2			1	0
9. Vegetative protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understorey shrubs, or non woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimetres or less in average stubble height.				
SCORE	Left bank		10		(9)	8			7	6	5			4	3	2			1	0
SCORE	Right bank		10		(9)	8			7	6	5			4	3	2			1	0
10. Riparian zone score (score each bank)	Width of riparian zone >18 metres; human activities (i.e. roads, lawns, crops etc.) have not impacted the riparian zone.					Width of riparian zone 12-18 metres; human activities have impacted the riparian zone only minimally.					Width of riparian zone 6-12 metres; human activities have impacted the riparian zone a great deal.					Width of riparian zone <6 metres; little or no riparian vegetation is present because of human activities.				
SCORE	Left bank		10		9	(8)			7	6	5			4	3	2			1	0
SCORE	Right bank		10		9	(8)			7	6	5			4	3	2			1	0

TOTAL HIGH GRADIENT HABITAT SCORE 145

Example of a completed field data sheet (cont.)

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 10
Site No. _____ **Date** _____

USEPA Habitat Assessment
Circle a score for each parameter

LOW GRADIENT STREAMS

Habitat parameter	Condition category																					
	Excellent					Good					Fair					Poor					
1. **Epifaunal substrate / available cover**	Greater than 50% of substrate favourable for epifaunal colonisation and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonisation potential (i.e. logs/snags that are not new fall and not transient).					30-50% mix of stable habitat; well-suited for full colonisation potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonisation (may rate at high end of scale).					10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.					Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2. **Pool substrate characterization**	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.					Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present.					All mud or clay or sand bottom; little or no root mat; no submerged vegetation.					Hard-pan clay or bedrock; no root mat or vegetation.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
3. **Pool variability**	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.					Majority of pools large-deep; very few shallow.					Shallow pools much more prevalent than deep pools.					Majority of pools small-shallow or pools absent.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4. **Sediment deposition**	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.					Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.					Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition in pools prevalent.					Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
5. **Channel flow status**	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.					Water fills >75% of the available channel; or <25% of channel substrate is exposed.					Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.					Very little water in channel and mostly present as standing pools.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
6. **Channel alteration**	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging (greater than 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Continued over

Example of a completed field data sheet (cont.)

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 11
Site No. _____ Date _____

USEPA Habitat Assessment
Circle a score for each parameter

LOW GRADIENT STREAMS

Page 2 of 2

Habitat parameter	Condition category																			
	Excellent					Good					Fair					Poor					
7. Channel sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note – channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas).					The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.					The bends in the stream increase the stream 1 to 2 times longer than if it was in a straight line.					Channel straight; waterway has been channelized for a long distance.				
SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; 'raw' areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.				
SCORE	Left bank		10	9		8			7	6	5		4		3	2			1	0
SCORE	Right bank		10	9		8			7	6	5		4		3	2			1	0
9. Vegetative protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understorey shrubs, or non woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimetres or less in average stubble height.				
SCORE	Left bank		10	9		8			7	6	5		4		3	2			1	0
SCORE	Right bank		10	9		8			7	6	5		4		3	2			1	0
10. Riparian zone score (score each bank)	Width of riparian zone >18 metres; human activities (i.e. roads, lawns, crops etc.) have not impacted the riparian zone.					Width of riparian zone 12-18 metres; human activities have impacted the riparian zone only minimally.					Width of riparian zone 6-12 metres; human activities have impacted the riparian zone a great deal.					Width of riparian zone <6 metres; little or no riparian vegetation is present because of human activities.				
SCORE	Left bank		10	9		8			7	6	5		4		3	2			1	0
SCORE	Right bank		10	9		8			7	6	5		4		3	2			1	0

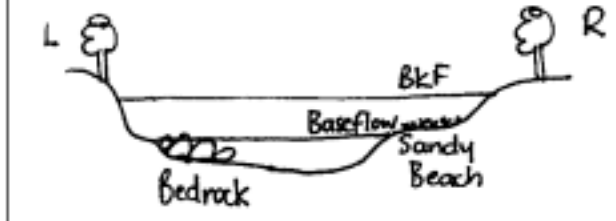
TOTAL LOW GRADIENT HABITAT SCORE [ ]

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 12 Site No. 003 Date 31/1/01

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding.
Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams).
Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cross-section sketch



The channel sketch should show in cross-section the shape of the channel and include the location of the water surface, watermark and bankfull points. Also show other features such as bars, rocky outcrops and snags encountered at the cross section.

Cross-section number 1 of 3

Type of bedform at the cross-section
☐ Riffle ☐ Run ☒ Pool ☐ Cascade ☐ Other _____

Bankfull channel width (m) (=total of boxes A+B+C) 62.4
Stream width at the water mark (m) 40.6A
Stream width at the water surface (m) 40.6

Bank height (m) 1.3
Bank width (m) 10.0B
Vertical distance between the water surface and the water mark (m) 0

Horizontal distances (m)
0.3 | 2.9 | 4.2 | 8 | 11 | 12.5 | 15 | 17 | 19.6 | 22.4 | 25 | 27.4 | 29.1 | 31.8 | 32.8

Vertical water depths (cm)
10 | 40 | 30 | 20 | 80 | 100 | 100 | 100 | 105 | 100 | 100 | 65 | 65 | 40 | 40

extra: 35.4 / 20 | 37.2 / 20 | 39.2 / 10

Bank height (m) 1.2
Bank width (m) 11.8C
Vertical distance between the water surface and the water mark (m) 0

Notes on cross-section measurement

Riparian zone width
Left bank 8 (m) Right bank 15 (m)

Bank material
Assess % composition for each bank

	Left bank	Right bank
Bedrock	45	20
Boulder (>256mm)	0	0
Cobble (64-256mm)	0	0
Pebble (16-64mm)	0	0
Gravel (2-16mm)	10	20
Sand (0.06-2mm)	30	60
Fines (silt and clay, <0.06mm)	25	0
	Total 100% each	

Substrate composition
Assess % composition in the area of bed 5m either side of the cross-section.

Bedrock	40
Boulder (>256mm)	5
Cobble (64-256mm)	5
Pebble (16-64mm)	0
Gravel (2-16mm)	0
Sand (0.06-2mm)	45
Fines (silt and clay <0.06mm)	10

Total 100%

Assess in the area 5m either side of the cross section

Filamentous algae cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Periphyton cover
☐ <10% ☐ 10–35% ☒ 35-65% ☐ 65-90% ☐ >90%

Moss cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Detritus cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

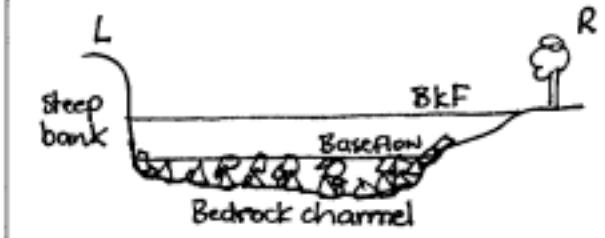
Example of a completed field data sheet (cont.)

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 13 Site No. 003 Date 31/1/01

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding.
Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams).
Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cross-section sketch



The channel sketch should show in cross-section the shape of the channel and include the location of the water surface, watermark and bankfull points. Also show other features such as bars, rocky outcrops and snags encountered at the cross section.

Cross-section number 2 of 3

Type of bedform at the cross-section Mixed pool, riffle, run through bedrock
☐ Riffle ☐ Run ☐ Pool ☐ Cascade ☒ Other

Bankfull channel width (m) (=total of boxes A+B+C) 82
Stream width at the water mark (m) 75 A
Stream width at the water surface (m) 75

Bank height (m) 2
Bank width (m) 0 B
Vertical distance between the water surface and the water mark (m) 0

Horizontal distances (m) * ESTIMATED

5	10	20	25	30	35	45	50	55	60	65	70	75		

Vertical water depths (cm)

20	20	75	55	35	30	15	10	25	40	20	15	10		

Bank height (m) 2
Bank width (m) 7 C
Vertical distance between the water surface and the water mark (m) 0

Notes on cross-section measurement

* Access difficult across stream because of bedrock + flow combination. Widths were estimated and depths taken using a weighted + marked rope.

Riparian zone width

Left bank 10 (m) Right bank 25 (m)

Bank material

Assess % composition for each bank

	Left bank	Right bank
Bedrock	85	80
Boulder (>256mm)	0	0
Cobble (64-256mm)	0	0
Pebble (16-64mm)	0	0
Gravel (2-16mm)	0	0
Sand (0.06-2mm)	5	15
Fines (silt and clay, <0.06mm)	10	5
	Total 100% each	

Substrate composition

Assess % composition in the area of bed 5m either side of the cross-section.

Bedrock	75
Boulder (>256mm)	5
Cobble (64-256mm)	5
Pebble (16-64mm)	5
Gravel (2-16mm)	5
Sand (0.06-2mm)	0
Fines (silt and clay <0.06mm)	5
	Total 100%

Assess in the area 5m either side of the cross section

Filamentous algae cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Periphyton cover
☐ <10% ☐ 10–35% ☒ 35-65% ☐ 65-90% ☐ >90%

Moss cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Detritus cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

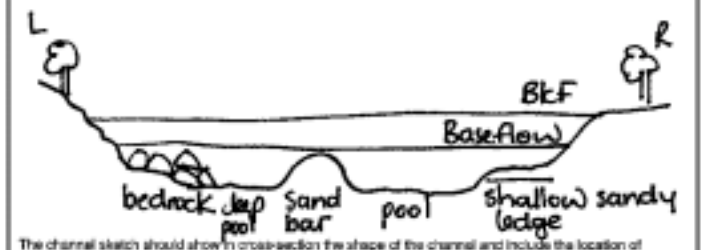
Example of a completed field data sheet (cont.)

AUSRIVAS Physical and Chemical Assessment Protocol Field Data Sheets Page 14 Site No. 003 Date 31/1/01

Channel cross-sections and variables to be measured in the area around a cross section

Detailed instructions on the measurement of channel cross-sections are provided in the protocol manual. Be familiar with these before proceeding.
Two cross-sections are required at homogeneous sampling sites (generally lowland streams) and three cross-sections at heterogeneous sampling sites (generally upland streams).
Where the water level at the time of sampling is at or near the water mark level, stream width at the water surface will be equal to stream width at the water mark. In this case, vertical distance between the water surface and the water mark should be entered as 0.

Cross-section sketch



The channel sketch should show in cross-section the shape of the channel and include the location of the water surface, watermark and bankfull points. Also show other features such as bars, rocky outcrops and snags encountered at the cross section.

Cross-section number 3 of 3

Type of bedform at the cross-section
☐ Riffle ☐ Run ☒ Pool ☐ Cascade ☐ Other _____

Bankfull channel width (m) (=total of boxes A+B+C) 74.3
Stream width at the water mark (m) 67.8A
Stream width at the water surface (m) 67.8

Bank height (m) 1.2
Bank width (m) 1.5B
Vertical distance between the water surface and the water mark (m) 0

Horizontal distances (m)
1.2 | 3.4 | 6.3 | 13.6 | 19 | 25.1 | 31 | 36 | 41 | 44.7 | 48.4 | 50.4 | 54 | 57.4 | 61.5

Vertical water depths (cm)
18 | 50 | 130 | 115 | 100 | 115 | 100 | 60 | 70 | 100 | 100 | 60 | 20 | 40 | 38

extra: 64 | 67 | 67.7 / 40 | 10 | 3

Bank height (m) 1.3
5C Bank width (m)
0 Vertical distance between the water surface and the water mark (m)

Notes on cross-section measurement

Riparian zone width
Left bank 5 (m) Right bank 20 (m)

Bank material
Assess % composition for each bank

	Left bank	Right bank
Bedrock	70	30
Boulder (>256mm)	10	0
Cobble (64-256mm)	0	0
Pebble (16-64mm)	0	0
Gravel (2-16mm)	0	5
Sand (0.06-2mm)	10	65
Fines (silt and clay, <0.06mm)	10	0

Total 100% each

Substrate composition
Assess % composition in the area of bed 5m either side of the cross-section.

Bedrock	15
Boulder (>256mm)	0
Cobble (64-256mm)	5
Pebble (16-64mm)	0
Gravel (2-16mm)	10
Sand (0.06-2mm)	65
Fines (silt and clay <0.06mm)	5

Total 100%

Assess in the area 5m either side of the cross section

Filamentous algae cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Periphyton cover
☐ <10% ☒ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Moss cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Detritus cover
☒ <10% ☐ 10–35% ☐ 35-65% ☐ 65-90% ☐ >90%

Example of a completed field data sheet (cont.)