VICTORIA

AUStralian RIVer Assessment System

AUSRIVAS

ACCREDITATION MANUAL

ENVIRONMENT PROTECTION AUTHORITY

COOPERATIVE RESEARCH CENTRE FOR FRESHWATER ECOLOGY

Natural Heritage Trust

Environment Australia

Department of the Environment and Heritage

VICTORIA AUStralian RIVer Assessment System (AUSRIVAS)
ACCREDITATION MANUAL

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INTRODUCTION

AUSRIVAS sampling methods are standardized within each State and Territory, but vary nationally. Therefore, AUSRIVAS Training and Accreditation Courses have been tailored specifically for each State and Territory. Additional training and accreditation may be required to use AUSRIVAS as an accredited operator outside the state or territory where accreditation was originally obtained.

The Victorian AUSRIVAS Training and Accreditation Course has been developed to provide uniformity and consistency in the application of AUSRIVAS methods in Victoria. The course comprises two major components, a training component and an accreditation component. Each of these components consists of four modules (listed below). Depending on the needs of the course participant, one or all of the modules may be completed (i.e., training with or without accreditation or just accreditation).

Module 1
Pre-Field & Site Information
- Preparation for field work
- Collection of site information

Module 2
Field Work
- Collection of field data
- Macroinvertebrate sampling
- Sample processing – live-sorting

Module 3
Laboratory
- Macroinvertebrate Identification
- Data entry (Training Component only)
- Quality Assurance/Quality Control (Training Component only)

Module 4
AUSRIVAS Predictive Models
- Using the predictive models
- Interpreting the results

The Victorian AUSRIVAS Accreditation Manual provides details of the accreditation component, including the assessment sheets and instructors notes for each of the four modules. The manual also provides a guide to the level of training required to become accredited. For more information on the training component, see the AUSRIVAS Training and Accreditation Course Outline, Content and Structure document, or visit the AUSRIVAS web site at http://ausrivas.canberra.edu.au.

Assessment Sheets

Assessment sheets have been provided for each of the four modules. Each assessment sheet details a number of exercises that course participants must pass to be accredited as a Victorian AUSRIVAS operator. Assessment sheets should be photocopied from the manual or printed from the Victorian AUSRIVAS Training and Accreditation CD and handed out to course participants at the beginning of each accreditation module.

Instructor's Notes

For each accreditation module, instructor's notes have been provided to aid instructors in preparing, conducting and assessing the accreditation exercises. The notes also ensure a standardized accreditation procedure among instructors. Included in the instructor's notes are Mark Allocation Sheets. These sheets provide the instructor with the marking scheme to be used when assessing exercises.

Accreditation Assessment Results Summary Sheet

An Accreditation Assessment Results Summary Sheet (Appendix 1) is included in the Victorian AUSRIVAS Accreditation Manual to summarize the accreditation assessment results for each course participant.

AUSRIVAS ACCREDITATION

MODULE 1 – ASSESSMENT SHEET

Page 1 of 1

Name: _____

Pre-Field & Site Information

Collection of Site Information

Exercise 1. Site Information Sheet - Page 1
Complete page 1 of a site information sheet for sites _____, _____, and _____.

(Exercise 1 Mark =____%).

Note: A mark of 90% or greater (averaged over the three sites) is required in Exercise 1 to pass Module 1.

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MODULE 1 - INSTRUCTORS NOTES

Pre-Field & Site Information

A list of materials and resources required for Module 1 is given below.

- Victorian Sampling and Processing Manual
- Site Information Sheets
- Maps (laminated and non-laminated)
- Map measuring devices eg. digital planimeter, map wheel, ruler etc.
- Magnifying glass
- GPS (for converting grid references to latitude and longitude)

Collection of Site Information

Exercise 1. Site Information Sheet - Page 1

Preparation

Before conducting Exercise 1, the instructor must complete page 1 of a site information sheet for each of the three sites being assessed. The information collected by the instructor will become the answers against which the course participant's site information sheets will be assessed. The sites used in the Module 1 (and Module 2) assessment should be reference sites from the area in which the course is being conducted. The use of local sites increases the information retained by the participants because the information is more relevant. The use of the same sites throughout the accreditation process provides continuity between accreditation modules, and enables course participants to gain a detailed knowledge of the sites being examined.

Copy the site numbers of the three sites being assessed onto the Module 1 assessment sheet. For each site, place a dot on the relevant map indicating the site's location.

Assessment

Attach copies of the AUSRIVAS accreditation Module 1 assessment sheet and mark allocation sheet No. 1 to three blank site information sheets and hand out to each course participant. Participants must complete page 1 of a site information sheet for each site. Once participants have completed the exercise, collect sheets, ensuring participant's names are on the assessment sheet.

Marking

Award marks for each question according to the marking scheme on mark allocation sheet No. 1. An answer is marked as correct if it is the same as the instructor's answer, or for variables listed in Table 1, within the acceptable error range. Answers for variables not listed in Table 1 must be the same as the instructor's answer to be marked correct (i.e., no variation is allowed). Answers receive full marks if correct, and zero marks if incorrect (i.e., a proportion of a question's mark cannot be given). Missing values are to be marked as wrong even when the correct answer is zero.

Mark Allocation Sheet No. 1

VICTORIAN SITE INFORMATION SHEET

(Version 1.0 September 2000 – AUSRIVAS Training and Accreditation Course)

RIVER NAME_____ (5) _____ **LOCATION CODE** (1) (1) **2** Given

(Drainage divn. / Basin / 2 / Site)

LOCATION_____ (5) _____

CATCHMENT_____ (1) _____

DISTANCE FROM SOURCE_____ (5) _____**km** **ALTITUDE**____ (5) ____**m asl**

CATCHMENT AREA UPSTREAM____ (5) ____**km^2** **SLOPE**_____ (5) _____**m/km**

MAP & GPS DETAILS

NAME_____ (1) _____**NUMBER**_____ (1) _____

SCALE_____ (1) _____

GRID REFERENCE_____ (3) _____

LATITUDE_____ (5) _____**LONGITUDE**_____ (5) _____

GPS DATUM (as set on the GPS at the time you recorded your position)_____ (3) _____

JOINING MAP NAMES/ NUMBERS_____ (1) _____

_____

Page Total = 53

SITE ACCESS PHOTOGRAPH - DATE OF PHOTO_____

NOT ASSESSED

Table 1. The acceptable error for specific variables on page 1 of the site information sheet. Variables not listed below must be the same as the instructor's answer to be marked correct.

Variable	Acceptable Error
Distance from Source	± 10%
Altitude	± 20m
Catchment Area Upstream	± 10%
Slope	± 10%
Grid Reference	± 100m
Latitude	± 00° 00' 04"
Longitude	± 000° 00' 04"

A mark of 90% or greater (averaged over the three sites) is required in Exercise 1 to pass Module 1. Record the mark for Exercise 1 in the space provided on the assessment sheet, and on the participant's Accreditation Assessment Results Summary Sheet (Appendix 1). Hand the assessment sheet and site information sheets back to participants and work through any areas of difficulty with them. Participants should retain their site information sheets for use in Module 2.

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MODULE 2 – ASSESSMENT SHEET

Page 1 of 2

Name: _____

Field Work

Collection of Field Data

Exercise 1. Field Sampling Sheet
Complete a field sampling sheet for sites _____ and _____. A mark of 90% or greater (averaged over the two sites) is required to pass Exercise 1.

(Exercise 1 Mark =____%).

Exercise 2. Site Information Sheet – Page 2
Complete page 2 of a site information sheet for sites _____ and _____. A mark of 90% or greater (averaged over the two sites) is required to pass Exercise 2.

(Exercise 2 Mark =____%).

Macroinvertebrate Sampling

Exercise 3. Sample Collection
Collect a 10m riffle and edge sample from site _____ and place into separate live-sorting trays. A mark of 90% or greater (averaged over the two habitats) is required to pass Exercise 3.

Assessable Criteria	**Riffle Mark**	**Edge Mark**
• 10m of habitat sampled	___/ 2	___/ 2
• Available range of micro-habitats sampled	___/ 5	___/ 5
• Habitat sampled effectively	___/ 3	___/ 3
• Net rinsed when necessary	___/ 2	___/ 2
• Sample transferred successfully from net to live-sorting tray	___/ 3	___/ 3
Total	___/ 15	___/ 15

(Exercise 3 Mark =____%).

MODULE 2 – ASSESSMENT SHEET

Page 2 of 2

Exercise 4. Live-Sorting

Live-sort your riffle and edge samples according to the Victorian live-sort protocols (see Victorian Sampling and Processing Manual for details). Retain the sample residues for further laboratory processing. Remember to label both the sample vials and sample residues with the site number; river name; date; your name; and habitat sampled. Your mark for this exercise will be determined after the macroinvertebrates have been identified in Module 3, Exercise 2.

The instructor will analyse your data using the WISE Access macro and to pass you are required to achieve:

- A sample size of 200 animals or failing this, show evidence that the sample has been sorted for one hour;
- A sample size of chironomid larvae > 20 individuals (target 30) wherever the corresponding number in the Whole Sample Estimate (WSE) also exceeds this value;
- a Live-Sort/Whole of Sample Estimate (LS/WSE) taxa number ratio > 0.9 (result displayed as "Actual" LS/WSE in WISE macro results);
- A Bray-Curtis dissimilarity measure (pres/abs) calculated between LS and WSE that is < 0.3 (result displayed as "Actual", "Unadjusted Bray-Curtis" Pres/Abs in WISE macro results);
- A Bray-Curtis dissimilarity measure (pres/abs) calculated between taxa in the live-sort component that are common to those in the residue, and all WSE taxa, that is ≤ 0.25 (result displayed as "Actual", "Bray-Curtis less taxa unique to LS" Pres/Abs in WISE macro results).

(Exercise 4 Mark =____%).

Note: To pass Module 2 you must pass all four exercises.

AUSRIVAS ACCREDITATION

MODULE 2 - INSTRUCTORS NOTES

Field Work

A list of materials and resources required for Module 2 is given below.

ITEM	QUANTITY	CHECK
Victorian Sampling and Processing Manual		
Kicknets 250 mm mesh		
Sieves, 250 mm mesh for "rapid" sampling		
Small plastic bucket		
Medium white tray		
Ethanol		
Gloves		
Bug sampling containers		
250ml plastic bottles for water quality samples		
Flow meter		
Float (if flow meter fails)		
Waders + spare		
Wader repair kit		
Field meters for DO, pH, EC and Temp.		
Alkalinity kit		
Spare batteries		
Spare DO membranes & O_2 probe solution		
Calibration standards		
Calibration instructions		
GPS		
Digital camera		
Mobile phone		
Site Information Sheets		
Field Sampling Sheets		
Clipboard		
Maps		
Marker pens/ pencils		
Esky (large) & ice and/or fridge		
First Aid Kit		
4WD recovery equipment		
Tape measure 100m		
Camera & film		
Sunscreen		
Toilet paper / shovel		
Rain Jackets		
Plastic bags for veg. samples		
Labels and rubber bands		
Reference - "A Field Guide to Waterplants in Australia" Sainty and Jacobs 1994		

ITEM	QUANTITY	CHECK
Card table and chairs		
Forceps + pipettes		
Ethanol - made up in the jar to approx. 70%		
Squeeze bottles		
Large white plastic sorting trays		
Counters		
Vials		
Labels		

Collection of Field Data

Exercise 1. Field Sampling Sheet

Preparation
Before conducting Exercise 1, the instructor must complete field sampling sheets for the two sites being assessed. These sheets will provide the answers against which the course participant's field sampling sheets will be assessed. The sites should be selected from the three reference sites used in the Module 1 assessment.

Copy the site numbers of the sites being assessed onto the Module 2 assessment sheet.

Assessment
Attach copies of the AUSRIVAS accreditation Module 2 assessment sheet and mark allocation sheet No. 2 to two blank field sampling sheets and hand out to each course participant. The participants must complete a field sampling sheet for each site. Once participants have completed the exercise, collect the field sampling sheets, ensuring participant's names are on the front page. Participants should retain their Module 2 assessment sheet until all Module 2 exercises have been completed.

Marking
Award marks for each question according to the marking scheme on mark allocation sheet No. 2. An answer is marked as correct if it is the same as the instructor's answer, or for variables listed in Table 2, within the acceptable error range. Answers for variables not listed in Table 2 must be the same as the instructor's answer (or within the same category) to be marked correct. Answers receive full marks if correct, and zero marks if incorrect (i.e., a proportion of a question's mark cannot be given). Missing values are to be marked as wrong even when the correct answer is zero.

Mark Allocation Sheet No. 2

GRAND TOTAL = 266

FIELD SAMPLING AND HABITAT ASSESSMENT SHEETS (ver 7 9/2/99)

DATE ..... (5) ..... **TIME** ..... (1) ..... **LOCATION CODE** ..... (3) .....
RIVER ..... (5) ..... **LOCATION** ..... (5) .....
RECORDERS NAME ..... (1) ..... **PHOTOGRAPH NUMBER (S)** ..... (N/A) .....
MAP DRAWN/MODIFIED ..... (1) ..... **AIR TEMPERATURE** ..... (N/A) ..... **^{o}C**
RAIN IN LAST WEEK ? **Y [ ] N [ ]** (N/A) **LOCATION NOTED IN BASIN BOOK** ..... (N/A) .....

AMG ..... (5) .....
.....
LATITUDE ..... (5) ..... **LONGITUDE** ..... (5) .....
.....

RIPARIAN VEGETATION

Width of riparian zone[1]: estimated / measured left bank[2] ..... (3) ..... **m**
estimated / measured right bank[2] ..... (3) ..... **m**

Vegetation type:	**% Cover of riparian zone[3]**	**Description**
trees (>10m)	(3)	
trees (<10m)	(3)	
shrubs / vines	(3)	
grasses / ferns / sedges	(3)	

(N/A)

Vegetation cover of river[4]: <5% [ ] 6-25% [ ] 26-50% [ ] 51-75% [ ] >76% [ ] (5)

Cover of Exotic vegetation[5]	0%(4)	1-10%(3)	11-40%(2)	41-60%(1)	>60%(0)	
Overstorey	[ ]	[ ]	[ ]	[ ]	[ ]	(1)
Shrub Layer	[ ]	[ ]	[ ]	[ ]	[ ]	(1)
Groundcover	[ ]	[ ]	[ ]	[ ]	[ ]	(1)

[1] Area where waterway interacts with vegetation. [2] Facing downstream. [3] From 'Plan' view, estimation of outline cover; may total >100%. [4] Estimate as at midday. [5] Total may be >100%. [6]. From edge of water to cleared land.

MEASUREMENTS:

Stream Width[6] (m) **1**..... (1) ..... (Max.) **2**..... (1) ..... (Min.) **3**..... (3) ..... (Mean) **channel width[7]** ..... (3) ..... **m** **bank height[8]** ..... (3) ..... **m**

Water Temperature[9] (^{o}C) ..... (3) ..... **pH[9]** ..... (3) .....
Conductivity[9] (uS/cm,ambient) ..... (3) ..... **Alkalinity (mg/L)** ..... (5) .....
Conductivity (uS/cm @ 25 ^{o}C) ..... (3) ..... **Turbidity[9] (FTU)** ..... (3) .....
Dissolved Oxygen[9] (mg/l) ..... (3) .... (N/A) .... (N/A) .....
% Sat. Dissolved Oxygen ..... (3) .... (N/A) .... (N/A) .....

Depth[11] (cm) — **1** **2** **3** — **Mean**
..... (1) .... (3) .....

Flow[11,12] (revs/30sec) — **U / L** **U / L** **U / L**
...../..... ..... (1) ..../..... **Flow meter fan no.** ..... (3) .....

% in Reach[10] **Riffle** ..... (1) ..... **Pool** ..... (1) ..... **Macrophyte** ..... (1) ..... **Run** ..... (1) .....

[6] From edges of water. [7] From tops of banks. [8] From water surface vertical to top of bank. [9] Measured/sampled from riffle area. [10] Within 'Reach' :ie. 5 times mean water width either side of riffle sampling site. [11] U = Upper, at 4/5 depth; L = Lower, at 1/5 depth; if <30cm, measure at 1/2 depth only. [12] Measurements at 1/4, 1/2, 3/4 width along mean width transect.

N/A = Not Assessed

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RIVER.....(3)..... **DATE**.....(3)..... **LOCATION CODE**.....(3).....

OBSERVATIONS (Indicate appropriate number in box)

WATER ODOURS: **1. normal** **2. sewage** **3. petroleum** **4. chemical** **5.stormwater** **6. musty** (1) [ ]

WATER OILS: **1. slick** **2. sheen** **3. globs** **4. flecks** **5. none** (1) [ ]

TURBIDITY: **1. clear** **2. slight** **3. turbid** **4.opaque/liquid silt (clay like)** (1) [ ]

PLUME: **1. little** **2. some** **3. lots** (1) [ ]
(amount of fine sediment generated when kick-sampling)

SEDIMENT OILS: **1. absent** **2. light** **3. moderate** **4. profuse** (1) [ ]

SEDIMENT ODOURS: **1. normal** **2. sewage** **3. petroleum** **4. chemical** **5. anaerobic** **6. none** **7. other**..... (1) [ ]

FLOW LEVEL: (relative to "water mark" ie. **normal inundation level shown by limit of terrestrial grasses, or by eroded area**, or boundary in bank sediment types).
1. No flow (dry / isolated) **2. Low** (<water mark) **3. Moderate** (=) **4. High** (>water mark) **5. Flood** (1) [ ]

Bare ground above normal inundation level shown by above: **Left bank**.....(1)...**%**
Right bank.....(1)...**%**

SEDIMENT DEPOSITS: **1. none** **2. sludge** **3. sand** **4. floc/silt (very light)** **5. other** (1) [ ]

LOCAL CATCHMENT EROSION (within sight of site) **1. none** **2. moderate** **3. heavy** (1) [ ]

LOCAL NPS POLLUTION: **1. no evidence** **2. potential**.....**3. obvious**..... (1) [ ]

LOCAL PS POLLUTION: **1. STP** **2. road** **3. other**..... (1) [ ]

DAMS / BARRIERS (local) **1. present upstream / downstream** **2. absent** **3. river regulated** (1) [ ]

BRAIDING: **1. yes** **no. of channels** ..... **2. no** (1) [ ]

SITE CLASSIFICATION: **1. steep valley** **2. broad valley** **3. wetland/bog** **4. heath** **5. plains** **6. natural riparian meadow**
(indicate >1 if required) (1) [ ]

LANDUSE: **1. Native forest** **2. Forestry** **3. Native pasture** **4. Grazing** **5. Cropped**
Left Bank[2] **6. Residential** **7. Industrial** **8. Recreational** (1) [ ]

LANDUSE: **1. Native forest** **2. Forestry** **3. Native pasture** **4. Grazing** **5. Cropped**
Right Bank[2] **6. Residential** **7. Industrial** **8. Recreational** (1) [ ]

VEGCAT (for AUSRIVAS)
1. Urban/Residential **2. Intensive agriculture/some residential**
3. Some forestry/agriculture(eg grazing) **4. Native forest/natural vegetation** (5) [ ]

BARS: (bed surface protruding from water & forming a bar) (1) .....**%**

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RIVER.....3..... **DATE**.....3..... **LOCATION CODE**.....3.....

REACH[10]

Length of Reach[10].....3.....metres.

SUBSTRATUM DESCRIPTION (% cover): **ORGANIC SUBSTRATUM** (% cover of inorganic substrate)

			PHI
Bedrock		[.....5.....]	-9.5
Boulder	(>256mm)	[.....5.....]	-9.0
Cobble	(64-256mm)	[.....5.....]	-6.5
Pebble	(16-64mm)	[.....5.....]	-4.5
Gravel	(2-16mm)	[.....5.....]	-2.0
Sand	(0.06-2mm)	[.....1.....]	2.0
Silt	(0.004-0.06mm)	[.....1.....]	6.5
Clay	(<0.004mm)	[.....1.....]	9.5

Detritus (sticks, wood, CPOM[14]) [.....1.....]
Muck/Mud (black, very fine organics) [.....1.....]
FPOM/CPOM categories 1= <5%
2 = 5 - 20 %
3 = >20 %

Moss	**0**	**1**	**2**	**3**	**4**	1	**(percent of reach covered by)**
Filamentous algae	**0**	**1**	**2**	**3**	**4**	1	**(percent of reach covered by)**
Macrophytes	**0**	**1**	**2**	**3**	**4**	1	**(percent of reach covered by)**

0= <10% 1=10-35% 2=35-65% 3=65-90% 4=>90%

[10] 'Reach' :ie. 5 times mean water width either side of riffle sampling site.
[14] Coarse Particulate Organic Material.

RIFFLE

Macroinvertebrates collected by .....1.....
Macroinvertebrates picked/ sorted by .....1.....
Length of riffle sampled 10 metres [ ] Other.....**metres.** 1
Sample preserved [ ] N/A
Time taken to pick sample:..... N/A

SUBSTRATUM DESCRIPTION (% cover): **ORGANIC SUBSTRATUM** (% cover of inorganic substrate)

			PHI
Bedrock		[.....1.....]	-9.5
Boulder	(>256mm)	[.....1.....]	-9.0
Cobble	(64-256mm)	[.....1.....]	-6.5
Pebble	(16-64mm)	[.....1.....]	-4.5
Gravel	(2-16mm)	[.....1.....]	-2.0
Sand	(0.06-2mm)	[.....1.....]	2.0
Silt	(0.004-0.06mm)	[.....1.....]	6.5
Clay	(<0.004mm)	[.....1.....]	9.5

Detritus (sticks, wood, CPOM[14]) [.....1.....]
Muck/Mud (black, very fine organics) [.....1.....]
FPOM/CPOM categories 1= <5%
2 = 5 - 20 %
3 = >20 %

Moss	**0**	**1**	**2**	**3**	**4**	1	**(percent of riffle covered by)**
Filamentous algae	**0**	**1**	**2**	**3**	**4**	1	**(percent of riffle covered by)**
Macrophytes	**0**	**1**	**2**	**3**	**4**	1	**(percent of riffle covered by)**

0= <10% 1=10-35% 2=35-65% 3=65-90% 4=>90%

Page Total = 61

RIVER.....3..... **DATE**.....3..... **LOCATION CODE**.....3.....

EDGE / BACKWATER (where sample was taken)**:**

Macroinvertebrates collected by .....1.....
Macroinvertebrates picked/ sorted by .....1.....
Length of edge sampled 10 metres [ ] Other.....**metres.** 1
Sample preserved [ ] N/A
Time taken to pick sample:..... N/A

ORGANIC SUBSTRATUM (% cover of inorganic substrate)

Detritus (sticks, wood, CPOM[14]**)** **[**..1.....**]**
Muck/Mud (black, very fine organics) **[**.....1...**]**
FPOM/CPOM categories 1= <5%
2 = 5 - 20 %
3 = >20 %

Trailing bank Vegetation:
nil [ ] slight (<10%) [ ] moderate (10-30%) [ ] extensive (>30%) [ ] 1
Edge description.(plants sampled in sweep).....1.....
.....

Percentage of edge covered by:

backwaters	**[ ]**	1
leaf packs	**[ ]**	1
undercut banks	**[ ]**	1
roots	**[ ]**	1
other.....		

Moss	**0**	**1**	**2**	**3**	**4**	1	**(percent of edge covered by)**
Filamentous algae	**0**	**1**	**2**	**3**	**4**	1	**(percent of edge covered by)**
Macrophytes	**0**	**1**	**2**	**3**	**4**	1	**(percent of edge covered by)**

0= <10% 1=10-35% 2=35-65% 3=65-90% 4=>90%

MACROPHYTES IN REACH

Indicate whether the following common taxa are present in the reach:

3

SUBMERGED/ FLOATING	EMERGENT
Ceratophyllum (Hornwort)	*Callitriche* (Starwort).....
Chara (Stonewort).....	*Carex* (Tussock Sedge) .....
Elodea (Canadian Pondweed)	*Crassula* (Crassula) .....
Myriophyllum (Water Milfoil)	*Cyperus* (Sedge).....
Nitella (Stonewort)	*Eleocharis* (Spikerush).....
Potamogeton (Pondweed)	*Juncus* (Rush).....
Triglochin (Water Ribbon)	*Paspalum* (Water Couch) .....
Vallisneria (Ribbonweed)	*Polygonum* (Smartweed) .....
Other	*Phragmites* (Common Reed).....
.....	*Ranunculus* (Buttercup) .....
.....	*Scirpus* (Clubrush).....
.....	*Typha* (Cumbungi).....
.....	Other .....

Number of plant species .....5.....

Vegetation samples collected: Yes [ ] No [ ] N/A

Epiphyte cover on macrophytes Nil [ ] Slight [ ] Moderate [ ] Extensive [ ] 1

Page Total = 32

RIVER.....(3)..... **DATE**.....(3)..... **LOCATION CODE**.....(3).....

HIGH GRADIENT STREAMS

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal substrate/ available cover (1)	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 (logs/snags are not newly fallen 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 newly fallen logs but not yet "seasoned" (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 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. Riffle quality (1)	Well developed riffle and run; riffle is as wide as stream and length extends two times the width of stream; abundance of cobble (boulders prevalent in headwater streams)	Riffle as wide as stream but length is less than 2 times width; abundance of cobble; boulders and gravel common	Run area may be lacking; riffle not as wide as stream and its length is less than 2 times the stream width; gravel or bedrock prevalent; some cobbles present	Riffles or runs virtually nonexistent; bedrock prevalent, cobbles lacking.
Score	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
3 Embedd-edness (1)	Gravel, cobble and boulder particles are 0-25% surrounded by fine sediment	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 >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**
4. Channel alteration (1)	Channelisation or dredging absent or minimal; stream with normal pattern	Some channelisation present, usually in areas of bridge abutments; evidence of past channelisation, ie, dredging (greater than past 20 yrs) may be present, but recent channelisation is not present.	Channelisation may be extensive; embankments or shoring structures present on both banks; and 40 – 80% of stream reach channelised and disrupted.	Banks shored with gabion or cement, over 80% of stream reach channelised 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**
5. Sediment deposition (1)	Little or no enlargement of islands or point bars and less than 5% (<20% for low gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravels and/or fine sediment; 5-30% (20-50% for low gradient streams) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient streams) of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low gradient streams) 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**

Page Total = 14

RIVER.....(3)..... **DATE**.....(3)..... **LOCATION CODE**.....(3).....

HIGH GRADIENT STREAMS

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Frequency of riffles and velocity-depth combin-ations:- (1) slow/deep (<.3m/s,>.5m) slow/shallow fast/deep fast/shallow	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of stream <7:1 (generally 5 to 7); variety of habitat is the key; in streams where riffles are continuous, placement of boulders or other large, natural obstruction is important. All 4 velocity/depth patterns present.	Occurrence of riffles infrequent; ratio of distance between riffles divided by width of stream between 7 to 15. Only 3 of the 4 vel/depth patterns present.	Occasional riffle or bend bottom contours provide some habitat; distance between riffles divided by width of stream between 15 to 25. May be only 2 velocity depth patterns present; usually lacking deep areas.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by width of stream between >25. Dominated by one velocity/depth pattern.
Score	**20 19 18 17 16**	**15 14 13 12 11**	**10 9 8 7 6**	**5 4 3 2 1 0**
7 Channel flow status (1)	Water reaches base of both lower banks, and minimal amount of channel substrate exposed.	Water fills >75% of available channel or <25% of channel substrate exposed	Water fills 25-75% of 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**
8. Bank vegetative protection (score each bank) (1)	More than 90% of the streambank surfaces covered by native vegetation, including trees, understorey shrubs or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or nor 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	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank is very high; vegetation has been removed to 5 cm or less.
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. Bank stability (score each bank) (1)	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**
10. Riparian Vegetative zone width (score each bank) (1)	Width of riparian zone >18 m; human activities (ie roads, lawns, crops etc.) have not impacted zone.	Width of riparian zone 12-18 m; human activities have impacted zone only minimally.	Width of riparian zone 6-12 m; human activities have impacted zone a great deal.	Width of riparian zone <6 m; little or no riparian vegetation due to 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 score_____(1)_____

Page Total = 15

RIVER.....3..... **DATE**.....3..... **LOCATION CODE**.....3.....

LOW GRADIENT STREAMS

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
1. Epifaunal substrate/ available cover 1	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 (logs/snags are not newly fallen 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 newly fallen logs but not yet "seasoned" (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 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 charactcterisation 1	Mixture of substrate materials with gravel and firms 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 1	Even mix of large/shallow, large/deep, small/shallow and 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. Channel alteration 1	Channelisation or dredging absent or minimal; stream with normal pattern	Some channelisation present, usually in areas of bridge abutments; evidence of past channelisation, ie, dredging (greater than past 20 yrs) may be present, but recent channelisation is not present.	Channelisation may be extensive; embankments or shoring structures present on both banks; and 40 – 80% of stream reach channelised and disrupted.	Banks shored with gabion or cement, over 80% of stream reach channelised 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**
5. Sediment deposition 1	Little or no enlargement of islands or point bars and less than 5% (<20% for low gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravels and/or fine sediment; 5-30% (20-50% for low gradient streams) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low gradient streams) of the bottom affected; sediment deposits at obstructions, constrictions and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low gradient streams) 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**

Page Total = 14

RIVER.....(3)..... **DATE**.....(3)..... **LOCATION CODE**.....(3).....

LOW GRADIENT STREAMS

Habitat Parameter	Category			
	Optimal	**Suboptimal**	**Marginal**	**Poor**
6. Channel sinuosity (1)	The bends in the stream increase the stream length 3 to 4 times longer than if it was a staright 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 a staright line.	The bends in the stream increase the stream length 1 to 2 times longer than if it was a staright line.	Channel straight; waterway has been channelised 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**
7 Channel flow status (1)	Water reaches base of both lower banks, and minimal amount of channel substrate exposed.	Water fills >75% of available channel or <25% of channel substrate exposed	Water fills 25-75% of 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**
8. Bank vegetative protection (score each bank) (1)	More than 90% of the streambank surfaces covered by native vegetation, including trees, understorey shrubs or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or nor 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	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank is very high; vegetation has been removed to 5 cm or less.
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. Bank stability (score each bank) (1)	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**
10. Riparian Vegetative zone width (score each bank) (1)	Width of riparian zone >18 m; human activities (ie roads, lawns, crops etc.) have not impacted zone.	Width of riparian zone 12-18 m; human activities have impacted zone only minimally.	Width of riparian zone 6-12 m; human activities have impacted zone a great deal.	Width of riparian zone <6 m; little or no riparian vegetation due to 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**

Page Total = 15

Total score_____(1)_____

Table 2. The acceptable error for specific variables on the field sampling sheet. Variables not listed below must be the same as the instructor's answer (or within the same category) to be marked correct.

Variable	Acceptable Error
AMG	± 100m
Latitude	± 00° 00' 04"
Longitude	± 00° 00' 04"
Width of riparian zone	± 20%
% cover of riparian zone	± 10%
Stream width	± 20%
Channel width	± 20%
Bank height	± 20%
Water Temperature (^{o}C)	± 10%
Conductivity (µS cm^{-1}, ambient)	± 10%
Conductivity (µS cm^{-1}, @ 25 ^{o}C)	± 10%
Dissolved Oxygen (mg l^{-1})	± 10%
Dissolved Oxygen % sat.	± 10%
pH	± 10%
Alkalinity (mg l^{-1})	± 10%
Turbidity (NTU)	± 10%
Depth (cm)	± 20%
Flow	± 20%
% habitat in reach	± 10%
Length of reach	± 20%
Substratum description (% cover of each size category)	± 10%

A mark of 90% or greater (averaged over the two sites) is required to pass Exercise 1. Where a participant's mark falls just below the 90% threshold, assessment of a third site may be permitted at the instructor's discretion. Record the mark for Exercise 1 in the space provided on the participant's Accreditation Assessment Results Summary Sheet (Appendix 1). Hand the field sampling sheets back to participants and work through any areas of difficulty with them. Participants may record their mark on the Module 2 assessment sheet.

Exercise 2. Site Information Sheet – Page 2

Preparation
Before conducting Exercise 2, the instructor must complete page 2 of a site information sheet for the two sites being assessed. The information collected by the instructor will become the answers against which the course participant's site information sheets will be assessed.

Assessment
Hand out a copy of mark allocation sheet No. 3 to each participant. Participants will already have the site information sheets and the details of Exercise 2 on the Module 2 assessment sheet given to them earlier. The participants must complete page 2 of a site information sheet for each site. Once participants have completed the exercise, collect the site information sheets, ensuring participant's names are on the front page.

Marking
Award marks for each question according to the marking scheme shown on mark allocation sheet No. 3. A mark of 90% or greater (averaged over the two sites) is required to pass Exercise 2. Record the mark for Exercise 2 in the space provided on the participant's Accreditation Assessment Results Summary Sheet (Appendix 1). Hand the site information sheets back to participants and work through any areas of difficulty with them. Participants may record their mark on the Module 2 assessment sheet.

Mark Allocation Sheet No. 3

ACCESS DETAILS

DIRECTIONS (5) _____

_____

_____

_____

Given

LAND-OWNER/MANAGER _____

ADDRESS_____

PHONE NUMBER_____

Given

NOTIFY BEFORE EACH VISIT? **Y [ ]** **N [ ]**

PERMISSION REQUIRED? **Y [ ]** **N [ ]**

KEY REQUIRED? **Y [ ]** **N [ ]** **No.**_____

KEY AVAILABLE FROM_____

SKETCH OF ACCESS ROUTE

Include:

- **river and flow direction** (1)
- **site location** (1)
- **roads** (1)
- **access details (location of turnoffs, distances and landmarks leading to site)** (1)
- **a northing** (1)

SKETCH OF REACH

Include:

- **location of riffle, run, pool, edge and macrophyte habitats within the reach** (1)
- **flow direction** (1)
- **access point** (1)
- **riffle and edge sampling locations** (1)
- **a northing** (1)

Page Total = 15

Macroinvertebrate Sampling

Exercise 3. Sample Collection

Assessment
While completing Exercises 1 and 2, take each course participant aside and assess them collecting a riffle and edge sample as outlined in Exercise 3.

Marking
Award marks according to the marking scheme shown below. Participants receive full marks for each criterion correctly completed, and zero marks for those criteria incorrectly completed (i.e., a proportion of a mark cannot be given). A mark of 90% or greater (averaged over the two habitats) is required to pass Exercise 3. Record the marks for Exercise 3 in the space provided on the assessment sheet and on the Accreditation Assessment Results Summary Sheet. Hand the assessment sheet back to participants and work through any areas of difficulty with them.

Assessable Criteria	**Riffle Mark**	**Edge Mark**
• 10m of habitat sampled	___/ 2	___/ 2
• Available range of micro-habitats sampled	___/ 5	___/ 5
• Habitat sampled effectively	___/ 3	___/ 3
• Net rinsed when necessary	___/ 2	___/ 2
• Sample transferred successfully from net to live-sorting tray	___/ 3	___/ 3
Total	___/ 15	___/ 15

Exercise 4. Live-Sorting

Assessment
Riffle and edge samples are to be live-sorted according to the Victorian live-sort protocols (see Victorian Sampling and Processing Manual for details). Participants are required to retain the sample residues for further laboratory processing.

On return to the laboratory, sub-sample the preserved residues using the following procedure:

1. Using a multi-cell sub-sampler, take a sufficient sub-sample of animals likely to result in slightly more animals than were live-sorted (this estimate is typically derived by sorting the contents of just one or two cells). Where less than 100 animals were live-sorted, a minimum sub-sample size of 100 organisms is required.

2. Sort and identify the contents of sufficient cells to derive approximately 50 animals. This portion of the 'sub-sample' is used to estimate the taxa and relative abundances of animals that are 'common' in the sample.

3. Sort the remainder of the sub-sample, ignoring (leaving behind) the taxa that were recovered in step 2.

4. Scale up the raw taxa abundances derived from step 2 to the full sub-sample fraction taken in step 1. Add together taxa and relative abundances from step 2 (scaled up) and step 3, which now forms the sub-sample of the residue.

5. Enter the residue sub-sample and live-sort data (once identified in Module 3, Exercise 2 and QA/QC has been conducted by instructor) into the Whole of Individual Sample Estimate (WISE) database to obtain a Live-Sort/Whole of Sample Estimate taxa number ratio (LS/WSE) and Bray-Curtis dissimilarity index.

The WISE database is an MS Access database that automatically calculates the LS/WSE and Bray-Curtis dissimilarity index. Instructions on the installation and use of the WISE database can be down loaded from the AUSRIVAS web site at http://ausrivas.canberra.edu.au.

Marking

To pass participants are required to achieve:

- A sample size of 200 animals or failing this, show evidence that the sample has been sorted for one hour;
- A sample size of chironomid larvae > 20 individuals (target 30) wherever the corresponding number in the Whole Sample Estimate (WSE) also exceeds this value;
- a Live-Sort/Whole of Sample Estimate (LS/WSE) taxa number ratio > 0.9 (result displayed as "Actual" LS/WSE in WISE macro results);
- A Bray-Curtis dissimilarity measure (pres/abs) calculated between LS and WSE that is < 0.3 (result displayed as "Actual", "Unadjusted Bray-Curtis" Pres/Abs in WISE macro results);
- A Bray-Curtis dissimilarity measure (pres/abs) calculated between taxa in the live-sort component that are common to those in the residue, and all WSE taxa, that is ≤ 0.25 (result displayed as "Actual", "Bray-Curtis less taxa unique to LS" Pres/Abs in WISE macro results).

Note: To pass Module 2 participants must pass all four exercises.

AUSRIVAS ACCREDITATION

MODULE 3 – ASSESSMENT SHEET

Page 1 of 1

Name: _____

Laboratory

Macroinvertebrate Identification

Exercise 1. Reference Collection Identification
Identify macroinvertebrates in the reference collection to family taxonomic level, except for Oligochaeta (Class), Acarina (Order) and Chironomidae (Sub-family), using the keys recommended by Hawking (2000). You may also use the Interactive Guide to Australian Aquatic Invertebrates CD (Gunn *et al*. 1999) to aid in identifications.

Each taxon should be placed into a separate vial and the count for each recorded on a data sheet. To pass Exercise 1 you must achieve a "Percent Taxa Error" of ≤ 5%. A "Taxa Error" is defined as a mis-identification resulting in the loss or addition of a taxon. The "Percent Taxa Error" is the "Number of Taxa Errors" divided by the "Total Number of Original Taxa", multiplied by one hundred.

Percent Taxa Error	
Number of Taxa Errors (a)	
Total Number of Original Taxa (b)	
Percent Taxa Error ([a/b] x 100)	
Pass or Fail? (Pass if ≤ 5%)	

(Exercise 1 Mark =____%).

MODULE 3 – ASSESSMENT SHEET

Page 2 of 2

Exercise 2. Sample Identification
Identify each of the macroinvertebrate samples collected from the riffle and edge habitats to family taxonomic level, except for Oligochaeta (Class), Acarina (Order) and Chironomidae (Sub-family), using the keys recommended by Hawking (2000). You may also use the Interactive Guide to Australian Aquatic Invertebrates CD (Gunn *et al*. 1999) to aid in identifications.

Each taxon should be placed into a separate vial and the count for each recorded on a data sheet. Remember to record important sample information on the data sheet, such as the site number; river name; date; your name; habitat sampled, total number of organisms, total number of taxa etc.

To pass Exercise 2 you must achieve a "Percent Taxa Error" of ≤ 5% (averaged over the two samples).

(Exercise 2 Mark =____%).

Note: To pass Module 3 a "Percent Taxa Error" of ≤ 5% (averaged over Exercises 1 and 2) is required.

AUSRIVAS ACCREDITATION

MODULE 3 - INSTRUCTORS NOTES

Laboratory

A list of materials and resources required for Module 3 is given below.

- Reference collection containing all families used in the creation of the Victorian AUSRIVAS models
- Riffle and edge macroinvertebrate sample
- Taxonomic keys for invertebrate taxa. See Key to Keys: A guide to keys and zoological information to identify invertebrates from Australian inland waters. Identification Guide No. 2, 2nd Edition.
  (Hawking 2000). Visit the AUSRIVAS web site for a list of keys to families.
- *Interactive Guide to Australian Aquatic Invertebrates*, Compact Disk. 2nd Edition. (Gunn *et al*. 1999)
- Computer to run interactive identification CD.
- Invertebrate data sheets
- Staff with macroinvertebrate identification expertise
- Laboratory with stereo microscopes
- Forceps
- Vials
- Channel trays or grided dishes
- Counters
- Labels
- Ethanol
- Squeeze bottles (for water and ethanol)
- Glycerol (dropper bottle)

Macroinvertebrate Identification

Exercise 1. Reference Collection Identification

Preparation
Prepare laboratory with equipment required for macroinvertebrate identification (see above). A reference collection containing all families used in the creation of the Victorian AUSRIVAS models is needed for this exercise.

Assessment
Participants are required to identify macroinvertebrates in the reference collection to family taxonomic level except for Oligochaeta (Class), Acarina (Order) and Chironomidae (Sub-family) using the keys recommended by Hawking (2000). The Interactive Guide to Australian Aquatic Invertebrates CD (Gunn *et al*. 1999) may also be used to aid in identifications. Once participants have completed the exercise, collect identification sheets, ensuring participant's names are written on the sheet.

Marking
To pass Exercise 1, participants must achieve a "Percent Taxa Error" of ≤ 5%. A "Taxa Error" is defined as a mis-identification resulting in the loss or addition of a taxon. The "Percent Taxa Error" is the "Number of Taxa Errors" divided by the "Total Number of Original Taxa", multiplied by one hundred.

Percent Taxa Error	
Number of Taxa Errors (a)	
Total Number of Original Taxa (b)	
Percent Taxa Error ([a/b] x 100)	
Pass or Fail? (Pass if ≤ 5%)	

Record the mark for Exercise 1 in the space provided on the Accreditation Assessment Results Summary Sheet. Hand sheets back to participants and work through with them any areas of difficulty.

Exercise 2. Sample Identification

Preparation
Prepare laboratory with equipment required for macroinvertebrate identification (see above). Two samples are required for this exercise, one from a riffle habitat and another from a stream edge habitat.

Assessment
Participants are required to identify macroinvertebrate samples collected from both the riffle and edge habitats to family taxonomic level, except for Oligochaeta (Class), Acarina (Order) and Chironomidae (Sub-family) using the keys recommended by Hawking (2000). The Interactive Guide to Australian Aquatic Invertebrates CD (Gunn *et al*. 1999) may also be used to aid in identifications. Once participants have completed the exercise, collect identification sheets, ensuring participant's names are written on the sheet.

Marking
To pass Exercise 2, participants are required to achieve a "Percent Taxa Error" of ≤ 5% (averaged over the two samples). Record the mark for Exercise 2 in the space provided on the Accreditation Assessment Results Summary Sheet. Hand sheets back to participants and work through with them any areas of difficulty.

Note: To pass Module 3 a "Percent Taxa Error" of ≤ 5% (averaged over Exercises 1 and 2) is required.

AUSRIVAS ACCREDITATION

MODULE 4 – ASSESSMENT SHEET

Page 1 of 4

Name: _____

AUSRIVAS Predictive Models

Using the Predictive Models

Exercise 1. Single-Season Predictive Model

a) Determine the habitat predictor variables required by the _____ _____ AUSRIVAS model and list below.

Predictor Variables Used:

_____
_____
_____
_____
_____
_____
_____
_____
_____

b) Place macroinvertebrate and habitat data into the format required by AUSRIVAS.
c) Import the bug and habitat files into AUSRIVAS and run model. Save the file on the floppy disk provided. Call the file "your name_single_model.AUS".
d) Export the AUSRIVAS sheet labelled Predicted/Collected containing the Observed to Expected (O/E) ratios and open in Excel.
e) Save this file as an Excel spreadsheet on the floppy disk provided. Call the file "your name_single_oe.xls". Ensure your name is written on the disk.

A mark of 90% or greater is required to pass Exercise 1.

(Exercise 1 Mark =____%).

MODULE 4 – ASSESSMENT SHEET

Page 2 of 4

Exercise 2. Combined-Season Predictive Model

a) Determine the habitat predictor variables required by the _____ _____ AUSRIVAS model and list below.

Predictor Variables Used:

_____
_____
_____
_____
_____
_____
_____
_____
_____

b) Combine the macroinvertebrate data for autumn and spring.
c) Combine the habitat data for autumn and spring.
d) Place macroinvertebrate and habitat data into the format required by AUSRIVAS.
e) Import the bug and habitat files into AUSRIVAS and run model. Save the file on the floppy disk provided. Call the file "your name_combined_model.AUS".
f) Export the AUSRIVAS sheet labelled Predicted/Collected containing the Observed to Expected (O/E) ratios and open in Excel.
g) Save this file as an Excel spreadsheet on the floppy disk provided. Call the file "your name_combined_oe.xls". Ensure your name is written on the disk.

A mark of 90% or greater is required to pass Exercise 2.

(Exercise 2 Mark =____%).

MODULE 4 – ASSESSMENT SHEET

Page 3 of 4

Interpreting the Results

Exercise 3. Site Assessment
Using the information provided, complete the summary table below.

Site	Overall Site Assessment (Band)	Habitat used for Overall Site Assessment	Taxa Predicted to occur but not collected in the habitat used for overall site assessment

Note: If both riffle and edge habitats are placed into the same band, refer to the habitat with the lowest O/E taxa ratio.

One mark is awarded for each section of the table completed correctly. A mark of 90% or greater is required to pass Exercise 3.

(Exercise 3 Mark =____%).

MODULE 4 – ASSESSMENT SHEET

Page 4 of 4

Exercise 4. Interpreting Results
List 5 of the steps that one can take when interpreting AUSRIVAS results.

1. _____

2. _____

3. _____

4. _____

5. _____

One mark is awarded for each step listed. A mark of 4 out of 5 (80%) or greater is required to pass Exercise 4.

(Exercise 4 Mark =____%).

Note: To pass Module 4 you must pass all four exercises.

AUSRIVAS ACCREDITATION

MODULE 4 - INSTRUCTORS NOTES

AUSRIVAS Predictive Models

A list of materials and resources required for Module 4 is given below.

- Predictive Model Manual - hard copy
- Macroinvertebrate and habitat data for two sites assessed as mildly impacted
- AUSRIVAS combined season riffle and edge model outputs for five sites
- Access to AUSRIVAS models (password)
- Computers with AUSRIVAS software
- Access to the Internet
- Floppy disk for each participant containing the above data

Note: The AUSRIVAS Training and Accreditation CD contains demonstration data from the ACT that may prove useful when developing data sets for Victoria.

Using the Predictive Models

Exercise 1. Single-Season Predictive Model

Preparation
Prepare a data set comprising macroinvertebrate and habitat data collected from two mildly impacted test sites. The macroinvertebrate data may be from any habitat for which there is a single season model and should be saved as an Excel spreadsheet. Photocopies of the field sampling sheets can be used to provide the habitat data.

Assessment
Participants are required to manipulate the data into the format required by AUSRIVAS and run the data through a single season model.

Marking
Award marks for each question according to the marking scheme shown below. Participants receive full marks for each criterion correctly completed, and zero marks for those criteria incorrectly completed (i.e., a proportion of a mark cannot be given). A mark of 90% or greater is required to pass Exercise 1. Record the mark for Exercise 1 in the space provided on the Accreditation Assessment Results Summary Sheet. Work through any areas of difficulty with participants.

Assessable Criteria	**Marks**	**Comments**
• Predictor Variables Correct	/ 5	
• Macroinvertebrate data in correct format:		
– Adults and larvae combined	/ 2	
– Bug codes correct	/ 5	
– Zeros added and no blanks found	/ 2	
– Data with sites as rows and bugs as columns	/ 2	
– File saved as text (tab delimited) file	/ 1	
• Habitat data in correct format:		
– Habitat codes correct	/ 3	
– Zeros added and no blanks found	/ 2	
– Data with sites as rows and habitat variables as columns	/ 2	
– Sites in the same order as the bug data	/ 2	
– File saved as text (tab delimited) file	/ 1	
• Imported the bug file into AUSRIVAS successfully	/ 2	
• Imported the habitat file into AUSRIVAS successfully	/ 2	
• Choose the correct AUSRIVAS model i.e. region, season and habitat	/ 3	
• Exported the AUSRIVAS predicted/collected sheet successfully	/ 2	
• Opened the AUSRIVAS predicted/collected sheet in excel and saved the file as an excel spreadsheet	/ 2	
Total	/ 38	

Exercise 2. Combined-Season Predictive Model

Preparation

Prepare a data set comprising macroinvertebrate and habitat data collected from two mildly impacted test sites. The macroinvertebrate data should be from the same habitat and include both autumn and spring data. The data should be saved as an Excel spreadsheet. Photocopies of the autumn and spring field sampling sheets can be used to provide the habitat data.

Assessment

Participants are required to manipulate the data into the format required by AUSRIVAS and run the data through a combined season model.

Marking

Award marks for each question according to the marking scheme shown below. Participants receive full marks for each criterion correctly completed, and zero marks for those criteria incorrectly completed (i.e., a proportion of a mark cannot be given). A mark of 90% or greater is required to pass Exercise 2. Record the mark for Exercise 2 in the space provided on the Accreditation Assessment Results Summary Sheet. Work through any areas of difficulty with participants.

Assessable Criteria	**Marks**	**Comments**
• Predictor Variables Correct	/ 5	
• Macroinvertebrate data in correct format:		
– Autumn and spring macroinvertebrate data combined	/ 5	
– Adults and larvae combined	/ 2	
– Bug codes correct	/ 5	
– Zeros added and no blanks found	/ 2	
– Data with sites as rows and bugs as columns	/ 2	
– File saved as text (tab delimited) file	/ 1	
• Habitat data in correct format:		
– Autumn and spring habitat data combined	/ 5	
– Habitat codes correct	/ 3	
– Zeros added and no blanks found	/ 2	
– Data with sites as rows and habitat variables as columns	/ 2	
– Sites in the same order as the bug data	/ 2	
– File saved as text (tab delimited) file	/ 1	
• Imported the bug file into AUSRIVAS successfully	/ 2	
• Imported the habitat file into AUSRIVAS successfully	/ 2	
• Choose the correct AUSRIVAS model i.e. region, season and habitat	/ 3	
• Exported the AUSRIVAS predicted/collected sheet successfully	/ 2	
• Opened the AUSRIVAS predicted/collected sheet in excel and saved the file as an excel spreadsheet	/ 2	
Total	/ 48	

Interpreting the Results

Exercise 3. Site Assessment

Preparation
Prepare two data sets comprising AUSRIVAS combined season riffle and edge model outputs for five sites. As the first part of this exercise is designed to test whether course participants know the rules for combining bands, sites exhibiting different band assessments between habitats should be used.

Assessment
Participants are required to complete the summary table, indicating the:

- Overall site assessment - determined by combining assessments from the riffle and edge habitats.

  The rules for combining assessments from different habitats are as follows. Where the bandings from both habitats allocate the site to the same band, then that is the final band allocation for the site. Where there is a mismatch in the band allocation from the two habitats, then allocate the site to the band that is farther from band A. In the rare event that the alternative bands are band B and band X, allocate to band B, because this is the most precautionary approach.

- Habitat used for the overall site assessment. If both riffle and edge habitats are placed into the same band, the habitat with the lowest O/E taxa ratio should be referred to.

- Taxa predicted to occur but not collected in the habitat used for the overall site assessment.

Marking
Award marks for each question according to the marking scheme shown below. Participants receive full marks for each criterion correctly completed, and zero marks for those criteria incorrectly completed (i.e., a proportion of a mark cannot be given). A mark of 90% or greater is required to pass Exercise 3. Record the mark for Exercise 3 in the space provided on the Accreditation Assessment Results Summary Sheet. Work through any areas of difficulty with participants.

Assessable Criteria	**Marks (1 mark per site)**	**Comments**
• Overall site assessment correct	/ 5	
• Habitat used in overall site assessment correct	/ 5	
• Taxa predicted but not collected correct	/ 5	
Total	/ 15	

Exercise 4. Interpreting Results

Assessment
Participants are required to list 5 of the steps that one can take when interpreting AUSRIVAS results. Steps include:

- Check for data entry errors – bug data and habitat data.
- Check "Unused Bugs" for any bugs which should have been used by AUSRIVAS but were maybe given the wrong code.
- Examine O/E values in relation to the band width e.g., if a site is assigned Band B, how far below reference is the site?
- Band X – may require further examination – possible biological "hot spot", nutrient enrichment, constant flow in normally intermittent stream etc.
- Examine the list of taxa predicted to occur but not collected.
- Examine field data sheets for impact indicators, including
    - poor water quality
    - poor habitat
    - land use impacts
    - point source pollution
    - non-point source pollution
    - dams/barriers upstream
    - recent flooding or low flows
    - under-sampling
    - poor live-sorting conditions
- May need to draw a conclusion of "no reliable assessment possible"

Steps other than those listed above may be deemed acceptable.

Marking
Award 1 mark for each of the 5 steps listed. A mark of 4 out of 5 (80%) or greater is required to pass Exercise 4. Record the mark for Exercise 4 in the space provided on the Accreditation Assessment Results Summary Sheet. Work through any areas of difficulty with participants.

Note: To pass Module 4 participants must pass all four exercises.

REFERENCES

Gunn, B., Cranston, P.S., Dimitriadis, S. & Trueman, J.W.H. (1999). *Interactive guide to Australian Aquatic Invertebrates*. Windows edn 2. CSIRO, Land & Water Resources Research & Development Corporation, & Environment Australia: Canberra.

Hawking J.H. (2000) *Key to Keys: A Guide to keys and zoological information to identify invertebrates from Australian inland waters, Identification Guide No. 2*, 2nd Edn. Cooperative Research Centre for Freshwater Ecology, Albury, NSW.

APPENDICES

Appendix 1 Accreditation Assessment Results Summary Sheet

Participants Name: _____

MODULE	MARK (%)	MARK (%) REQUIRED TO PASS	PASS/FAIL	COMMENTS
MODULE 1				
Exercise 1		≥90		
MODULE 2				
Exercise 1		≥90		
Exercise 2		≥90		
Exercise 3		≥90		
Exercise 4		See Page 23		
MODULE 3				
Exercise 1		≥95		
Exercise 2		≥95		
MODULE 4				
Exercise 1		≥90		
Exercise 2		≥90		
Exercise 3		≥90		
Exercise 4		≥80		

MODULE	PASS/FAIL
Module 1	
Module 2	
Module 3	
Module 4	

Organisation Conducting Course: _____

Instructor's Name: _____

Instructor's Signature: _____

Date: _____