

NEW SOUTH WALES

AUStralian RIVer Assessment System



ACCREDITATION MANUAL



NEW SOUTH WALES AUstralian RIVER Assessment System (AUSRIVAS) ACCREDITATION MANUAL

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Front Cover Photograph:

Thredbo River at Dead Horse Gap

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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 New South Wales AUSRIVAS Training and Accreditation Course has been developed to provide uniformity and consistency in the application of AUSRIVAS methods in New South Wales. 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 New South Wales 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 New South Wales AUSRIVAS operator. Assessment sheets should be photocopied from the manual or printed from the New South Wales 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 New South Wales 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

Complete page one of a field sampling 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.

AUSRIVAS ACCREDITATION

MODULE 1 - INSTRUCTORS NOTES

Pre-Field & Site Information

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

- New South Wales Sampling and Processing Manual
- Field Sampling Sheets
- Maps (laminated and non-laminated)
- Map measuring devices e.g., 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

Preparation

Before conducting Exercise 1, the instructor must complete page 1 of a field sampling sheet for each of the three sites being assessed. The information collected by the instructor will become the answers against which the course participants site information 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 field sampling sheets and hand out to each course participant. Participants must complete page one of a field sampling 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

Site code: 5 Collection Date: Complete in Field

Location Name: 3

Sampling Team: Name Complete in Field Organisation Complete in Field

Site Location: AMG coordinates: easting: 5 northing: 5
 Confirmed: easting: Complete in Field northing: Complete in Field

Map Details: Map Name: 1 Number: 1
 Map Scale: 1 Map Zone: 5

Site Details: (Office) Elevation: 5 m
 Slope: 5 m
 Distance from Source: 5 m
 Mean Annual Rainfall: 5 mm
 Latitude: 5
 Longitude: 5

Access Details: Complete in Field

Access Route: Complete in Field

Land Owner/Manager: Name: _____ Permission/key required: Given
 Address: _____ granted verbally []
 Phone: _____ Fax: _____ in writing []
 Comments: _____ notify prior to sampling: []
 _____ key needed for access: []

Given

Office: Entered on Computer [] By: _____ date: _____
 " " QC [] By: _____ date: _____

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

Variable	Acceptable Error
Easting	± 100m
Northing	± 100m
Elevation	± 20m
Slope	± 10m
Distance from Source	± 10%
Mean Annual Rainfall	± 10%
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 field sampling sheets back to participants and work through any areas of difficulty with them. Participants should retain their field sampling sheets for use in Module 2.

AUSRIVAS ACCREDITATION

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 = ____ %).

Macroinvertebrate Sampling

Exercise 2. 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 2.

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 2 Mark = ____ %).

MODULE 2 – ASSESSMENT SHEET

Page 2 of 2

Exercise 3. Live-Sorting

Live-sort your riffle and edge samples according to the New South Wales live-sort protocols (see New South Wales 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 3 Mark = _____%).

Note: To pass Module 2 you must pass all three 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
New South Wales Sampling and Processing Manual		
Kicknets 250 mm mesh		
Sieves, 250 mm mesh for "rapid" sampling		
Small plastic bucket		
Ethanol		
Bug sampling containers		
250ml plastic bottles for water quality samples		
Waders + spare		
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		
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		
Card table and chairs		
Forceps + pipettes		
Squeeze bottles		
Large white plastic sorting trays		
Counters		
Vials		

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 to mark allocation sheet No. 2 and hand out to each course participant. Participants should already have field sampling sheets from Module 1. 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.

Site code: 5 **GRAND TOTAL = 244** Collection Date: ____/____/____ 5

Location Name: _____ **Completed**

Sampling Team: Name 3 Organisation 1

Site Location: AMG coordinates: easting: Completed northing: Completed
 Confirmed: easting: 5 northing: 5

Map Details: Map Name: Completed Number: Completed
 Map Scale: Completed Map Zone: Completed

Site Details: Elevation: Completed m Latitude: Completed
 (Office) Slope: Completed m Longitude: Completed
 Distance from Source: Completed m
 Mean Annual Rainfall: Completed mm

Access Details: 3

Access Route: 3

Given { **Land Owner/Manager:**

Name: _____ **Permisson/key required:** **Given**

Address: _____ granted verbally []

Phone: _____ Fax: _____ in writing []

Comments: _____ notify prior to sampling: []

_____ key needed for access: []

Office: Entered on Computer [] By: _____ date: _____

" " QC [] By: _____ date: _____

ATTRIBUTES OF THE SITE

Topography (1)	Floodplain	Broad Valley	Steep Valley	Gorge	
Water Level (3)	No flow	Low	Moderate	High	Flood
Shading of river (3)	None	Low	Moderate	High	
Riparian Vegetation					
Trees > 10m	Present (1)	Absent			
Percentage Cover	Dominant Species (1)				
Trees < 10m	(1) %	(1) _____			
Shrubs/ vines/ rushes	(1) %	(1) _____			
Grasses/ herbs/ ferns	(1) %	(1) _____			
Stream Width		Percentage Cover in 100m reach			
Minimum:	(3) _____ m	Algae	(1) _____ %		
Maximum:	(3) _____ m	Moss	(1) _____ %		
Mode:	(5) _____ m	Macrophytes	(1) _____ %		

WATER QUALITY

Collection Time (24hr): ____:____ (1)

Water Quality Measurements

Temperature (3) _____ °C

Conductivity (3) _____ μ S/cm

Turbidity (3) _____ NTU

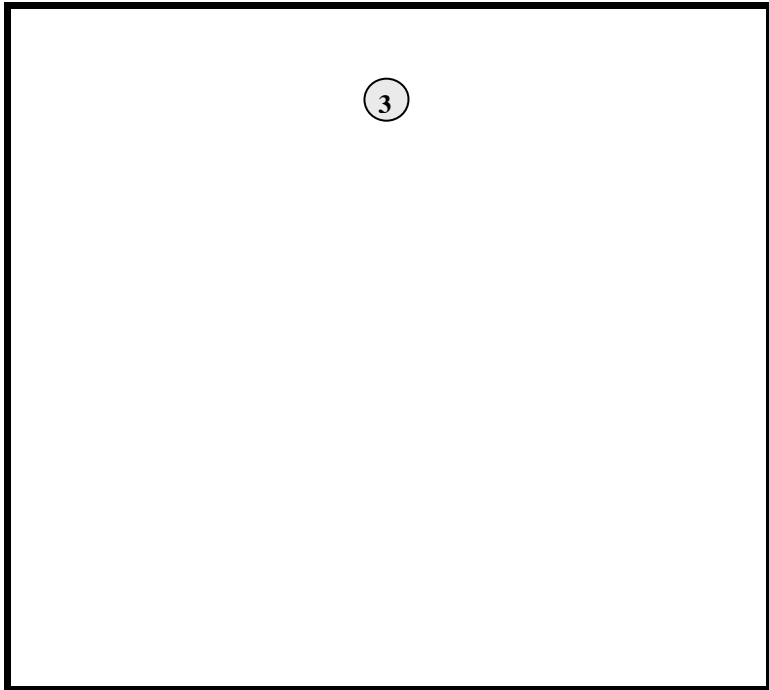
Dissolved O₂ (3) _____ mg/L

pH (3) _____

Alkalinity (5) _____

Nitrogen/phosphorus sample taken [(1)]

BIRD'S EYE VIEW OF SITE



Land use

Examples: conservation area, native forest, recreation, forestry, rural-residential, grazing, cropping, industrial, commercial, residential.

(looking downstream) Left bank: _____ (3)

Right bank: _____ (3)

Comments: _____

ATTRIBUTES OF THE RIFFLE AND EDGE HABITATS

RIFFLE Picked at site: Yes / No (3)

Collector: _____ (3) _____ Sorter: _____ (3) _____

Description of natural substrate :

Bedrock	_____ (3) _____ %
Boulder (>200mm)	_____ (3) _____ %
Cobble (60-200mm)	_____ (3) _____ %
Pebble (20-60mm)	_____ (3) _____ %
Gravel (2-20mm)	_____ (3) _____ %
Sand (0.02-2mm)	_____ (3) _____ %
Silt (0.002-0.02mm)	_____ (3) _____ %
Clay (<0.002mm)	_____ (3) _____ %
Total	_____ (1) _____ %

Depth:

Min: _____ (1) _____ m

Max: _____ (1) _____ m

Mode: _____ (5) _____ m

Percentage in habitat:

Detritus Cover _____ (1) _____ %

EDGE/BACKWATER Picked at site: Yes / No (3)

Collector: _____ (3) _____ Sorter: _____ (3) _____

Description of natural substrate :

Bedrock	_____ (5) _____ %
Boulder (>200mm)	_____ (5) _____ %
Cobble (60-200mm)	_____ (5) _____ %
Pebble (20-60mm)	_____ (3) _____ %
Gravel (2-20mm)	_____ (3) _____ %
Sand (0.02-2mm)	_____ (3) _____ %
Silt (0.002-0.02mm)	_____ (3) _____ %
Clay (<0.002mm)	_____ (3) _____ %
Total	_____ (1) _____ %

Percentage in habitat:

Detritus Cover _____ (3) _____ %

Bank Overhang _____ (3) _____ %

Trailing Bank Veg. _____ (3) _____ %

Total Macrophytes _____ (3) _____ %

Submerged _____ (3) _____ %

Emergent _____ (3) _____ %

Floating _____ (3) _____ %

COMMENTS

Please comment on any exceptional circumstances that may affect sampling or sorting efficiency eg. Extreme weather conditions - raining, frost, low light, difficulties in getting an adequate sample etc. Any exceptional or unusual features of the edge/riffle habitat. Any abnormality with water quality data.

Sampling Conditions: _____ (3) _____

Habitat Conditions: _____ (3) _____

Water quality: _____ (3) _____

Other: _____

If sample/s not picked in the field

RIFFLE where: _____ (1) _____ How long after sampling: _____ (1) _____

EDGE where: _____ (1) _____ How long after sampling: _____ (1) _____

Site code: _____ (3) _____

Collection Date: ____/____/____ (3)

A Visual Assessment of Disturbance Related to Human Activities

Below is an assessment of site disturbance broken down into a number of categories. Please make comments on any visual observations that indicate human disturbance for each category and give a ranking. Examples of relevant observations are listed below each category. However, this list is by no means complete and should be used as a guide only. In making your judgement, take into account the type of stream and geographic region you are sampling in. Once this is complete add up all the category rankings to give a grade, out of ten, for the site as a whole. In the field please record any observations relating to catchment disturbance. A ranking will be assigned back at the office.

Ranking	0	= no evidence of disturbance	3	= high disturbance
	1	= little disturbance	4	= extreme disturbance
	2	= moderate disturbance		

Site Assessment

Water Quality Ranking 0 1 2 3 4 (3)

Examples: odour, water clarity, disruption of the natural hydrology, presence of foam from detergents, oil.

Comments: (3) _____

Instream Ranking 0 1 2 3 4 (3)

Examples include: change in substrate eg. rock piles or sedimentation from road construction or other development pipes, rubbish, filamentous algae, alien fish species, invasion by exotic aquatic plants.

Comments: (3) _____

Riparian Zone Ranking 0 1 2 3 4 (3)

Examples include: devegetation, exotic plant invasion bank degradation, point sources.

Comments: (3) _____

Catchment Assessment

Examples include: mine, STP, tip, dam, industry, logging, agriculture, clearing, salinity, grazing, urban development.

Comments: (3) _____

Office Work Ranking 0 1 2 3 4

Comments: _____

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
Confirmed Easting	± 100m
Confirmed Northing	± 100m
% cover of trees <10m	± 10%
% cover of shrubs/vines/rushes	± 10%
% cover of grasses/herbs/ferns	± 10%
Stream width – minimum, maximum and mode	± 20%
% cover of algae in reach	± 10%
% cover of moss in reach	± 10%
% cover of macrophytes in reach	± 10%
Temperature (°C)	± 10%
Conductivity (µS cm ⁻¹)	± 10%
Turbidity (NTU)	± 10%
Dissolved Oxygen (mg l ⁻¹)	± 10%
pH	± 10%
Alkalinity (mg l ⁻¹)	± 10%
Substratum description (% cover of each size category - excluding silt and clay)	± 10%
% cover of silt and clay	± 15%
Depth– minimum, maximum and mode	± 20%
Detritus cover	± 10%
Bank overhang	± 10%
Trailing bank vegetation	± 10%
Total macrophytes	± 10%
Submerged macrophytes	± 10%
Emergent macrophytes	± 10%
Floating macrophytes	± 10%
Water quality assessment	± 1 category
Instream assessment	± 1 category
Riparian zone assessment	± 1 category

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.

Macroinvertebrate Sampling

Exercise 2. Sample Collection

Assessment

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

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 2. Record the marks for Exercise 2 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 3. Live-Sorting

Assessment

Riffle and edge samples are to be live-sorted according to the New South Wales live-sort protocols (see New South Wales 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 three exercises.

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MODULE 3 – ASSESSMENT SHEET

Page 1 of 2

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 $\leq 5\%$. 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 ($[a/b] \times 100$)	
Pass or Fail? (Pass if $\leq 5\%$)	

(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 $\leq 5\%$ (averaged over the two samples).

(Exercise 2 Mark = _____ %).

Note: To pass Module 3 a “Percent Taxa Error” of $\leq 5\%$ (averaged over Exercises 1 and 2) is required.

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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 New South Wales 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 New South Wales 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 $\leq 5\%$. 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 ($[a/b] \times 100$)	
Pass or Fail? (Pass if $\leq 5\%$)	

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 $\leq 5\%$ (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 $\leq 5\%$ (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 New South Wales.

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		See Page 17		
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: _____