

# Australian River Assessment System: National Guidelines for Mapping AusRivAS Aquatic Macroinvertebrate Scores

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## Decision Support Rules for Mapping AusRivAS Macroinvertebrate Scores

### *Background*

Mapping decision rules for banding AusRivAS O:E FAMILIES index scores are provided below. These rules are designed to facilitate the mapping of river health assessment results nationally and across jurisdictions at local, region, state, and national scales. They allow O:E FAMILIES model outputs for different habitats and seasons over various years to be allocated to a single AusRivAS band reflecting the degree of ecological integrity or “river health” at the site in question. This allows varying AusRivAS results to be integrated and mapped in a simple, easy to interpret manner that produces consistent and comparable results. These decision rules are not meant to replace the need for detailed examination of the raw outputs of the AusRivAS software.

### *Principles*

The most precautionary approach is favoured by potential end-users [Barmuta, Chessman, and Hart 1998:20]. Consequently, test sites are allocated to the band that is furthest from reference condition for that site’s available scores [Barmuta, Chessman, and Hart 1998:20]. The reasons for this approach are:

1. AusRivAS utilises rapid bioassessment procedures and is therefore less sensitive than traditional, more time-consuming and expensive quantitative procedures;
2. The error margin or confidence intervals for AusRivAS indices have not as yet been quantified, so the most precautionary approach is seen as the most defensible and prudent; and
3. Reporting the “worst case” recorded during the sampling period is simplest and most publicly accountable.

### *Rules*

Mapping decision support rules for assigning various O:E FAMILIES model outputs to a single band are:

1. *Report the combined season model outputs.* Where the bandings for both habitats allocate the site to the same band, then that is the final allocation for that site.
2. *Report the combined season model output furthest from reference condition.* If the combined season model allocate a site to different bands then, provided there are no problems with the original data, allocate the site to the band that is furthest from Band A. In the rare event that the alternative bands are Band B and Band X, allocate to Band B as this is the more precautionary approach.
3. *Report combined season model habitat outputs, where available.* If combined season model outputs are available for only one habitat, either because other habitats are not present or because the investigation is targeted at only one habitat, then allocate the site to that band.

4. *Report single season and habitat scores furthest from reference condition only as a matter of last resort.* If there are no combined season outputs available for either habitat, the more precautionary approach requires that the habitat and season score furthest from reference condition be reported. However, mixing assessments based on different seasonal models or mixtures of single- and two-habitat data is sub-optimal.

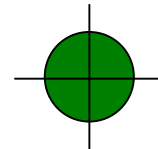
### ***Map Legend***

Maps depicting AusRivAS results should, at a minimum, include a legend describing: the name of the map; the colour coded symbols used to depict AusRivAS band score at mapped sites; associated interpretation guidelines (including AusRivAS band name, band width / score, band description, aquatic macroinvertebrate biodiversity status, and any interpretation guidelines); and an AusRivAS data source and “as at” date. An example of an AusRivAS Map Legend is set out below.

### ***Mapping AusRivAS O:E FAMILIES and SIGNAL Indices***

Where AusRivAS O:E FAMILIES and AusRivAS O:E SIGNAL index scores are being depicted together, a “circle, quadrant, cross-hair” approach [EPA Vic 2001] to depicting the scores is recommended. To ensure national consistency, the following precedence should be used:

1. top left quadrant = AusRivAS O:E FAMILIES edge band score;
2. top right quadrant = AusRivAS O:E FAMILIES riffle band score;
3. bottom left quadrant = AusRivAS O:E SIGNAL edge band score; and
4. bottom right quadrant = AusRivAS O:E SIGNAL riffle band score.



The quadrants are then coloured using the standard band colour codes. The standard Principles and Rules then apply.

### ***Mapping multiple AusRivAS Indices***

Where there is a requirement to map multiple AusRivAS indices (such as aquatic macroinvertebrates, diatoms, fish, geomorphic condition, water quality, benthic community metabolism, and / or riparian vegetation), a multi-axis polygon or “spider web” graph with one axis per index is recommended. Radiating areas are then coloured using the standard band colour codes. The standard Principles and Rules apply.

### ***Map Caveat***

Maps depicting AusRivAS results should include the following caveat: ‘All data are presumed to be correct as received from data providers. AusRivAS results depict the combined season score furthest from reference condition, where available (or the single season habitat score furthest from reference condition where a combined season score is not available) recorded during the assessment period.’

**Legend for Mapping AusRivAS Scores (ANZECC Indicator IW 13 - River Health)**

| <b>Symbo</b> | <b>AusRivAS Band</b> | <b>AusRivA S O/E score</b> | <b>Band Description</b>   | <b>Aquatic Macroinvertebrate Biodiversity Status</b>                      | <b>Interpretation guide</b>   |
|--------------|----------------------|----------------------------|---|---|---|
| ●            | X                    | >1.12                      | More biologically diverse than reference sites (needs detailed investigation) | Over 112% more biodiversity than reference sites                          | More macroinvertebrate families found than expected<br>Potential biodiversity "hot spot"<br>Possible mild nutrient enrichment   |
| ▲            | R                    | Approx. 1.00               | Reference Site  | Natural or near-natural levels of biodiversity                            | Reference site used in the construction of the AusRivAS models<br>Presumed to be in reference condition<br>Undisturbed / natural / pristine or least disturbed / impacted   |
| ●            | A                    | 0.85 to 1.15               | Reference condition   | Similar levels of biodiversity to reference sites                         | Most or all of the expected families were found at the site<br>Water quality and / or habitat condition roughly equivalent to reference sites<br>Impact on water quality and habitat condition does not result in a loss of macroinvertebrate biodiversity<br>AusRivAS score within the range of the central 80% of all reference sites |
| ●            | B                    | 0.55 to 0.84               | Significantly impaired  | Approximately 16% to 45% of macroinvertebrate biodiversity has been lost  | Several expected families not found<br>Water quality and / or habitat condition significantly impaired<br>Significant loss of macroinvertebrate biodiversity  |
| ●            | C                    | 0.25 to 0.54               | Severely impaired   | Approximately 46% and 75% of macroinvertebrate biodiversity has been lost | Many expected families not found<br>Water quality and / or habitat condition severely impaired<br>Severe loss of macroinvertebrate biodiversity   |
| ●            | D                    | 0 to 0.24                  | Extremely impaired  | Approximately 76% to 100% of macroinvertebrate biodiversity has been lost | Extremely few of the expected macroinvertebrate families found<br>Extremely poor water and / or habitat quality<br>Extreme loss of macroinvertebrate biodiversity<br>Highly degraded  |
| ○            | ?                    | -                          | Beyond the capacity of current AusRivAS models                                | Could not be assessed using current AusRivAS models                       | Could not be assessed using current AusRivAS models   |

### ***Map Sources***

Maps depicting AusRivAS results should indicate the sources of the various mapped data layers. Examples of these sources include: AWRAC (1975): Australia's Drainage Divisions and Basins; BRS (2001): NAP Regions; AUSLIG (1994): Topographic data – roads / water / drainage 1:250 000; ABS (1991): Populated Places; MapInfo (1998): Major Features – rivers; AUSLIG (1996): Digital Elevation Model – 9s; AUSLIG (1990): Australia – coastlines / state borders 1:100K; NRHP (2001): MRHI – river health band scores.

### ***Map Metadata***

Maps depicting AusRivAS scores should be accompanied by an appropriate metadata file which is to be maintained by the relevant data custodian. Guidelines for AusRivAS map metadata are available from the Monitoring River Health Initiative web page [<http://www.deh.gov.au/water/publications/index.html#data>]. A further example is available from the Environmental Data Directory of the Environmental Resources Information Network [<http://www.deh.gov.au/erin/edd/index.html>] under the title of *Australia- Assessment of River Condition (Reach and Basin) – 2001*.

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