



Hydro Tasmania

Consulting

Southwood macroinvertebrate monitoring, spring 2004 report



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1 INTRODUCTION

Assessment of river health using AUSRIVAS (AUStralian RIVer Assessment System) rapid bio-assessment methodology is a component of the Southwood Bioassessment program managed by Newood Huon Pty. Ltd. This is the 2004/2005 interim report for the spring sampling of 2004 that occurred on October 13, 2004.

AUSRIVAS is a nationally standardised bio-monitoring approach that uses aquatic macroinvertebrates to assess river condition. AUSRIVAS models form a powerful tool for assessing river health and give a biological indicator of the health of the water way. AUSRIVAS assessments allow the response of a particular macroinvertebrate community to changes in river condition and water quality to be monitored and assessed.

The continued aim of the study is to collect baseline macroinvertebrate data prior to the development of the Southwood complex on the Huon River. The collection of this baseline data set will allow for future comparisons to be made between sites and any changes in river health related to the macroinvertebrate community assemblage to be assessed.

Three sites within the Huon River catchment relevant to the proposed Southwood site are being sampled. These sites are:

- Kings Creek upstream of the confluence with the Huon River
- Huon River upstream of the bridge at the Arve River confluence
- Huon River downstream of the Southwood development site

2 METHODS

Hydro Tasmania Consulting collected macroinvertebrate samples from the three sites in the Huon River catchment on the 13th of October 2004 representing the spring AUSRIVAS sampling period for the 2004/2005 financial year.

A single kick sample was collected from a 10 metre length of riffle at each site listed above that incorporated all the micro-habitats within the riffle habitat. The kick sample was collected with a 250 µm mesh net with a 280 x 340 mm opening. The sample areas remained consistent throughout the sampling regime. Standard habitat assessment and water quality data required for inclusion into the model were collected from each site (Appendix 2).

Kick samples were processed on site to facilitate live picking according to standard AUSRIVAS live picking protocols. Preserved pick samples were identified to family level upon return to the laboratory.

Individual taxa records for the spring sampling were analysed. Predictor variables necessary for inclusion into the models were determined from the habitat sheets. Both AUSRIVAS O/E values and O/E SIGNAL values were computed and used in the assessment of riverine health. The results of the spring October 2004 survey were compared to the results of the spring November 2003 survey.

The O/E SIGNAL score is an indicator of the pollution sensitivity of the community at the test site. An O/E SIGNAL equal to 1 reflects a macroinvertebrate community that is as pollution (environmental impact) sensitive as the reference site community. An O/E SIGNAL >1 reflects a test site community more pollution sensitive than the reference site. An O/E SIGNAL score <1 reflects a faunal assemblage more tolerant to pollution than the reference assemblage. The AUSRIVAS O/E SIGNAL score is an additional means of interpreting the model output in regards to the health of the macroinvertebrate community.

3 RESULTS

A summary of total taxa collected for each site for the spring sampling of 2003 and 2004 are presented in Table 1. Table 1 also outlines in detail, both the taxa that were predicted to occur at the sites by the AUSRIVAS models but were not detected, as well as the taxa that were predicted to occur and were detected. A total of 23 individual taxa were collected across the three sites from both the spring 2003 and spring 2004 surveys.

For the spring sampling of 2004, the Kings Creek site recorded a total of 14 taxa; the Huon River above the Arve confluence a total of 19 taxa; and the Huon River downstream from the Southwood development site a total of 16 taxa. This is compared to the spring sampling of 2003 during which the Kings Creek site recorded a total of 14 taxa; the Huon River above the Arve confluence a total of 18 taxa; and the Huon River downstream from the Southwood development site a total of 20 taxa.

During the spring survey of 2004, there were a total of 5 taxa predicted to occur in the Kings Creek samples that were not detected, compared to a total of 2 and 3 predicted taxa that were not detected in the upstream and downstream sites on the Huon River respectively (Table 1). These were important families for the AUSRIVAS model and the higher number of predicted and not detected taxa in the Kings Creek samples resulted in a lower O/E score for this site (discussed in more detail shortly).

Dipterans (true flies) were a significant component of the macroinvertebrate community at all sites during both spring surveys of 2003 and 2004. Dipteran Chironomid larvae -Orthoclaadiinae dominated the Kings Creek samples, while Dipteran fly larvae - Simuliidae dominated the Huon River sites. Interestingly, the spring survey of 2004 detected an increase in the relative abundance of the Dipteran Chironomid larvae – Podonominae in the Huon River sites when compared to the previous spring survey.

Similar to the spring survey of 2003, the Ephemeropteran mayfly - Leptophlebiidae and the Trichopteran caddis fly - Hydrobiosidae were collected in large numbers from the Huon River sites compared to the Kings Creek site. Both these taxa were still present at the Kings Creek site and were marginally more abundant than in the 2003 spring survey.

Included in Table 1 are the SIGNAL scores for each individual taxa. SIGNAL or Stream Invertebrate Grade Number, is an index of the sensitivity of the taxa to pollution. A SIGNAL score of 10 reflects a taxa that is highly sensitive to pollution, while a low SIGNAL score such as 2, reflects a taxa that is tolerant to pollution.

Table 1: Overview of the number of each individual taxa collected for both the Spring 2003 and Autumn 2004 sampling runs. Comparisons have been made between modelled predicted occurrence and actual occurrence for the AUSRIVAS Spring, Autumn and combined season models.

■ Taxa Predicted and Collected
 ■ Taxa Predicted and NOT Collected
 ■ Taxa Collected but NOT Predicted

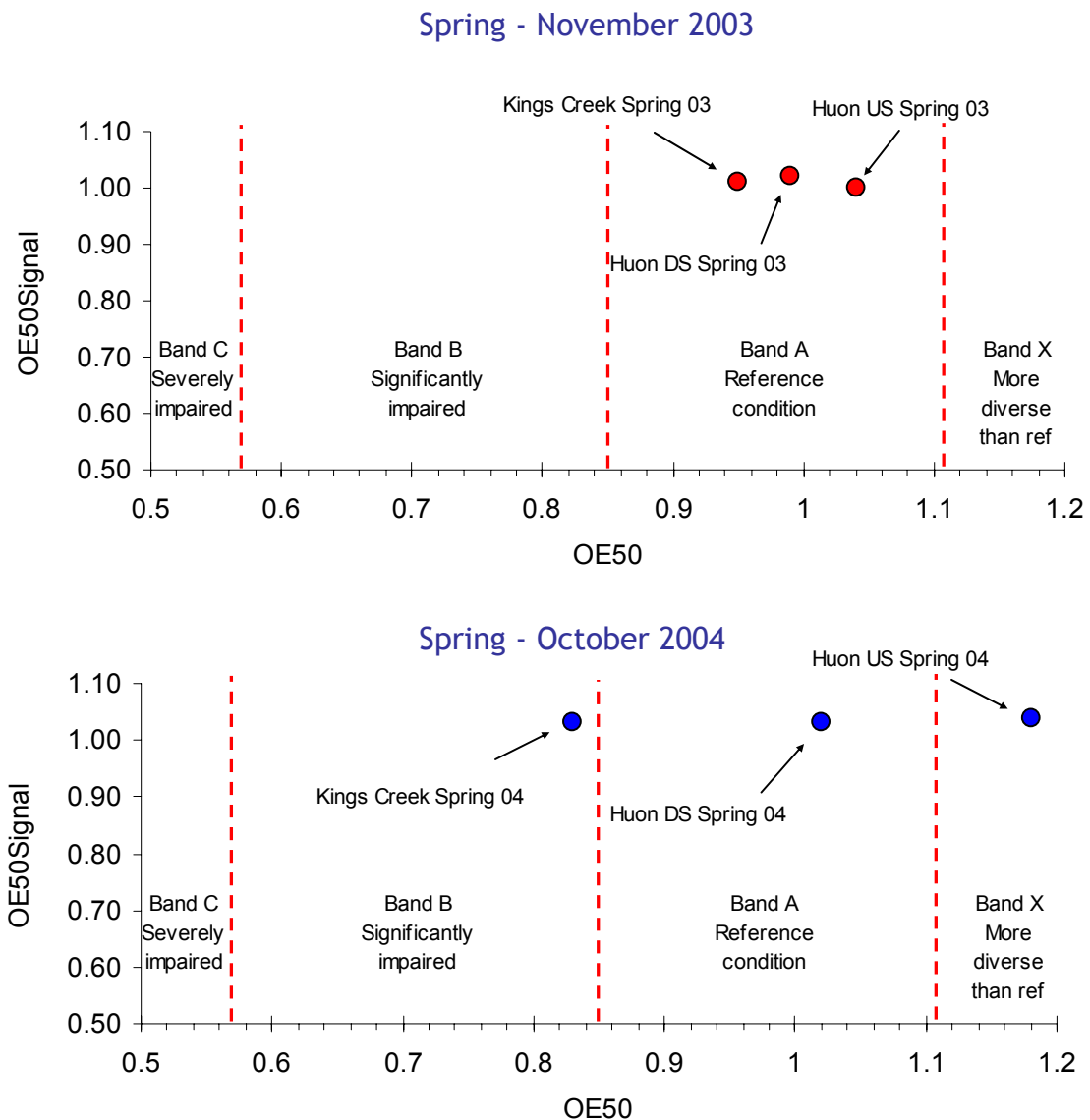
SIGNAL Score	Order	Family	Spring Model - November 2003			Spring Model - October 2004		
			Huon US	Huon DS	Kings Ck	Huon US	Huon DS	Kings Ck
2	Oligochaeta	Oligochaeta	20	18	11	5	34	5
6	Acarina	Acarina	1	2	3			
4	Amphipoda	Paramelitidae	18	2		1	1	
6	Coleoptera	Scirtidae	0	0	1	1	1	0
7	Coleoptera	Elmidae - Adults	17	1	5	3	6	13
7	Coleoptera	Elmidae - Larvae	1	1	0	0	5	0
6	Coleoptera	Psephenidae		1		1		
5	Diptera	Tipulidae	2	0	8	1	0	4
10	Diptera	Blephariceridae	1	2		5	11	1
4	Diptera	Ceratopogonidae		1				
5	Diptera	Simuliidae	46	36	4	42	39	2
8	Diptera	Athericidae						1
6	Diptera	Diamesinae	1					
6	Diptera	Podonominae	6	9	1	24	38	0
4	Diptera	Tanypodinae						1
4	Diptera	Orthoclaadiinae	0	2	39	1	4	26
3	Diptera	Chironominae	0	3	5	0	0	7
5	Ephemeroptera	Baetidae	2	2		3	1	
8	Ephemeroptera	Leptophlebiidae	25	30	5	54	20	11
10	Plecoptera	Eustheniidae	4	16	3	11	7	7
8	Plecoptera	Gripopterygidae	5	21	4	15	7	8
8	Trichoptera	Hydrobiosidae	19	45	3	22	16	8
7	Trichoptera	Conoesucidae	9	7	0	1	7	0
9	Trichoptera	Calocidae	0	0	0	1	0	9
8	Trichoptera	Philorheithridae	1	1		1		
6	Trichoptera	Leptoceridae	4	1	3	3	1	0
		OE50	1.00	1.02	1.01	1.18	1.02	0.83
		OE50Signal	1.04	0.99	0.95	1.04	1.03	1.03
		Band*	A	A	A	X	A	B

Huon DS: Huon River downstream of the Southwood development site. **Huon US:** Huon River upstream of the Arve River bridge. **Kings Ck:** Kings Creek upstream of the Huon River confluence. * Bands indicate the health of macroinvertebrate communities where band A = similar condition to reference sites, B = significantly impaired, C = severely impaired and X = in better condition than reference sites.

AUSRIVAS modelling found the macroinvertebrate communities from the Huon River to be in the X and A bands for the upstream and downstream sites respectively. This indicates the macroinvertebrate communities at these two sites to be in very good health. The increase in OE50 score for the upstream Huon River site for 2004 compared to 2003 was attributed to two extra predicted taxa being recorded at this site although only a single individual of the Dipteran – Orthocladiinae and the Trichopteran – Calocidae were found.

The Kings Creek macroinvertebrate community health had fallen from an A band classification in spring 2003 to a B band classification in spring 2004 (Figure 1). This was due to an increase in the number of predicted and not observed taxa recorded for this site in 2004, despite a comparable number of taxa being measured in the 2003 and 2004 spring surveys. The OE50 score for Kings Creek in the spring 2004 survey only just places it in the B band and is largely insignificant in regards to a reduction in macroinvertebrate community health.

Figure 1: Bandwidths and inferred condition for the AUSRIVAS spring season model output for the three sites sampled for 2003 and 2004.



4 CONCLUSIONS

Interim results of the spring October 2004 baseline study indicated that all three sites in the survey had a macroinvertebrate community composition closely comparable to that of the reference or 'pristine' sites used to develop the model. In the case of the upper Huon site, the test site condition was found to be in better health or more diverse than the reference site condition. Contrastingly, the Kings Creek site was found to have a slightly reduced fitness when compared to the reference site condition.

The O/E SIGNAL scores for the spring 2004 models all fell around 1, indicating that the families detected, were, on average, comparable in their sensitivity to pollution, to the families that were predicted to occur at the reference sites. It may, therefore, be concluded that the sites sampled in spring 2004 had macroinvertebrate communities in good health.

The continued running of the Southwood Macroinvertebrate Monitoring Program using AUSRIVAS rapid bioassessment methodologies has formed a baseline dataset of the macroinvertebrate community composition for the Huon River, in the proximity of the proposed Southwood development site.

The study continues to find the macroinvertebrate community composition in the Huon River to be of extremely good health, with a high level of taxa representation across the macroinvertebrate community. The small tributary stream, Kings Creek, continues to display a highly variable community composition with increased fitness for spring surveys when compared to the autumn survey of 2004. The reasons for this are likely due to the seasonally intermittent nature of flows within this small stream in addition to habitat instability (Appendix 2). Further sampling of Kings Creek in the Autumn 2005 will help to confirm this.

Following the completion of the autumn sample in 2005, the spring and autumn data sets will be analysed using a combined season model increasing the power of the AUSRIVAS model analysis. The results of the 2004/2005 survey will then be compared to the survey of the previous year.

APPENDIX 1 SPRING SURVEY OCTOBER 2004 - SITE PHOTOGRAPHS



Huon River upstream of the Arve Road bridge.



Huon River downstream of the proposed Southwood development site.



Kings Creek upstream of the Huon River confluence

APPENDIX 2 SPRING SURVEY OCTOBER 2004 - HABITAT ASSESSMENT

1. Conditions	Huon us Arve River	Huon ds Southwood	Kings Creek
Date	13-Oct-04	13-Oct-04	13-Oct-04
Time	16:30	11:00	12:00
Personnel	mj, au	mj, au	mj, au
Picker	au	au	mj
Habitat	au	au	mj
Site Name	Huon us Arve River bridge	Huon ds Southwood devt	Kings ck us Huon confluence
Weather	Windy, cool	Windy, mild, light drizzle	O'cast, windy, rain periods
Cloud Cover (%)	40	95	99
Air Temp (°C)	14	18	16
Rain in last week	yes	yes	yes
Sampling conditions	good	good	average
Picking conditions	good	good	average
2. Habitat Assessment			
<i>A) Riffle or Run</i>			
Collected by	au	au	mj
Picked by	au	au	mj
Time taken	40 min	50 min	60 min
<i>Substrate composition</i>			
Bedrock %	0	0	0
Boulder %	5	5	0
Cobble %	40	40	5
Pebble%	40	30	35
Gravel %	10	20	40
Sand %	5	5	5
Silt %	0	0	5
Clay %	0	0	10
% Total (=100%)	100	100	100
<i>Percentage Cover</i>			
Algae %	10	20	0
Detritus %	5	0	15
Silt %	0	0	10
Moss%	0	0	0
% Total (>=<100%)	15	20	25
Mean depth (cm)	30	40	15
Residue Preserved ?	no	no	no
Comment/Photo	yes	yes	yes
3. Site Assessment			
<i>A) Vegetation (100m reach)</i>			
<i>1 = Nil (<5%)</i>			
<i>2 = Sparse (6 - 25%)</i>			
<i>3 = Moderate (26 -50%)</i>			
<i>4 = Thick (51 - 75%)</i>			
<i>5 = Extensive (>76%)</i>			
<i>These scores relate to the two rows directly below</i>			
Overhanging Vegetation	1	1	4
Trailing Bank Vegetation	3	3	4

<i>Riparian Vegetation</i>			
1 = Nil			
2 = Sparse			
3 = Moderate			
4 = Thick			
<i>These scores relate to the two rows directly below</i>			
Riparian Vegetation left	3	3	4
Riparian Vegetation right	3	3	4
<i>Composition of Riparian Vegetation</i>			
Native (%)	100	100	100
Exotic (%)	0	0	0
Total (=100%)	100	100	100
<i>Exotic Species (enter "yes" if present)</i>			
Blackberries			
Pines			
Bracken Fern			
Gorse			
Willow			
Other (please state species)			
<i>Width of Riparian Zone</i>			
1 = >40m			
2 = 30m - <40m			
3 = 20m - <30m			
4 = 10m - <20m			
5 = 5m - <10m			
6 = <5m			
<i>These scores relate to the two rows directly below</i>			
Left	1	1	1
Right	1	1	1
<i>Land Use</i>			
1 = Native forest			
2 = Forestry			
3 = Native Pasture			
4 = Grazing			
5 = Cropped			
6 = Urban			
<i>These scores relate to the two rows directly below</i>			
Left	1	1	1
Right	1	1	1
<i>Erosion</i>			
0 = None			
1 = Some			
2 = Moderate			
3 = Heavy			
<i>These scores relate to the row directly below</i>			
Evidence of Erosion	1	1	2
<i>Dams/Weirs</i>			
0 = None			
1 = Upstream			
2 = Downstream			
<i>These scores relate to the row directly below</i>			
Location of Dams/Weirs	0	0	0
<i>Pollution</i>			
0 = No evidence			
1 = Potential			
2 = Obvious			
<i>These scores relate to the row directly below</i>			
Evidence of Pollution	0	0	1

<i>Habitat Diversity part A</i>			
Riffle area (%)	40	65	20
Run area (%)	60	35	40
Pool (%)	0	0	40
Total (=100%)	100	100	100
0 = None 0%			
1 = Few <10%			
2 = Moderate 11 - 30%			
3 = Numerous 31 - 50%			
4 = Abundant >50%			
<i>These scores relate to the row directly below</i>			
Amount of Woody Debris	1	1	3
<i>Aquatic Plants</i>			
0 = None			
1 = Low			
2 = Medium			
3 = High			
<i>These scores relate to the three rows directly below</i>			
Emergent	0	0	0
Submerged	0	0	0
Floating	0	0	0
Cover over 100m (%)	0	0	0
<i>Disturbance</i>			
1 = Extreme			
2 = V.High			
3 = High			
4 = Moderate			
5 = Low			
6 = Very Low			
<i>These scores relate to the row directly below</i>			
Extent of Disturbance	5	6	5
4. Physical Parameters			
Temperature	12.2	12.0	10.4
Conductivity	84.4	82.6	134.1
pH	7.63	7.61	7.29
Dissolved O ₂	10.27	11.21	10.65
Turbidity	2.11	1.69	14.3
Guage Height (if present)	low	low	low
<i>Dams/Weirs</i>			
Distance (up/down & km)			
Discharge (m ³ /sec)			
<i>Discharge Type</i>			
P = Power Station			
R = Riparian			
S = Spill			
N = None			
<i>These scores relate to the row directly below</i>			
Discharge Type			
<i>Geographical Site Location</i>			
Eastings	485095	485264	483943
Northings	5232627	5233466	5232958
Elevation (m)	60	48	65

5. Habitat Assessment			
1. Bottom substrate / Available Cover			
Excellent (16-20)	18	19	
Good (11-15)			
Fair (6-10)			8
Poor (0-5)			
2. Embeddedness			
Excellent (16-20)	18	17	
Good (11-15)			
Fair (6-10)			8
Poor (0-5)			
3. Velocity / Depth category			
Excellent (16-20)			
Good (11-15)	14	12	15
Fair (6-10)			
Poor (0-5)			
4. Channel Alteration			
Excellent (12-15)		12	
Good (8-11)	11		
Fair (4-7)			5
Poor (0-3)			
5. Bottom Scouring & Deposition			
Excellent (12-15)		12	
Good (8-11)	11		
Fair (4-7)			5
Poor (0-3)			
6. Pool / Riffle, Run / Bend Ratio			
Excellent (12-15)			
Good (8-11)	9		
Fair (4-7)		7	7
Poor (0-3)			
7. Bank Stability			
Excellent (9-10)			
Good (6-8)	8	8	7
Fair (3-5)			
Poor (0-2)			
8. Bank Vegetative Stability			
Excellent (9-10)	9	9	
Good (6-8)			8
Fair (3-5)			
Poor (0-2)			
9. Streamside Cover			
Excellent (9-10)	10	10	10
Good (6-8)			
Fair (3-5)			
Poor (0-2)			
Column Totals			
Excellent	55	79	10
Good	53	20	30
Fair	0	7	33
Poor	0	0	0
Overall Score	108	106	73