ENVIRONMENTAL CONDITION OF RIVERS AND STREAMS IN THE MITCHELL, TAMBO AND NICHOLSON CATCHMENTS

1   INTRODUCTION

This publication provides an overview of a detailed study of the environmental condition of rivers and streams in the Mitchell, Tambo and Nicholson catchments[1] (Figure 1).

The Mitchell, Tambo and Nicholson rivers together form part of the catchment area of the Gippsland Lakes. All three rivers flow into Lake King, the easternmost of the three main lakes.

The Mitchell, Tambo and Nicholson catchments have undergone a number of changes since European settlement in the 1840s. The draining of wetlands, clearing of forests and diversion of water for agricultural, industrial and urban use have all contributed to increased nutrient and sediment loads to Lake King. These increased loads pose a significant threat to the Gippsland Lakes ecosystem, and contribute to blooms of potentially toxic blue-green algae, which threaten the tourist potential of the region and its viability as a commercial fishing port.

While the Latrobe, Thomson and Avon rivers are the most significant contributors of nutrients to the Gippsland Lakes, the Mitchell, Tambo and Nicholson rivers are significant sources of nitrogen and phosphorus to Lake King. As a consequence, the effectiveness of management practices in the Mitchell, Tambo and Nicholson catchments will not only be reflected in these river systems but also in the environmental condition of Lake King.

Scope

The assessment is based largely on biological indicators, which are the best indicators of overall condition, and also incorporates water and habitat quality assessments. It attempts to relate observed environmental quality with broad scale catchment issues rather than assessing specific point source impacts.

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[1] EPA Victoria, *Environmental Condition of the Rivers and Streams in the Mitchell, Tambo and Nicholson Catchments*, Publication 858, 2002.
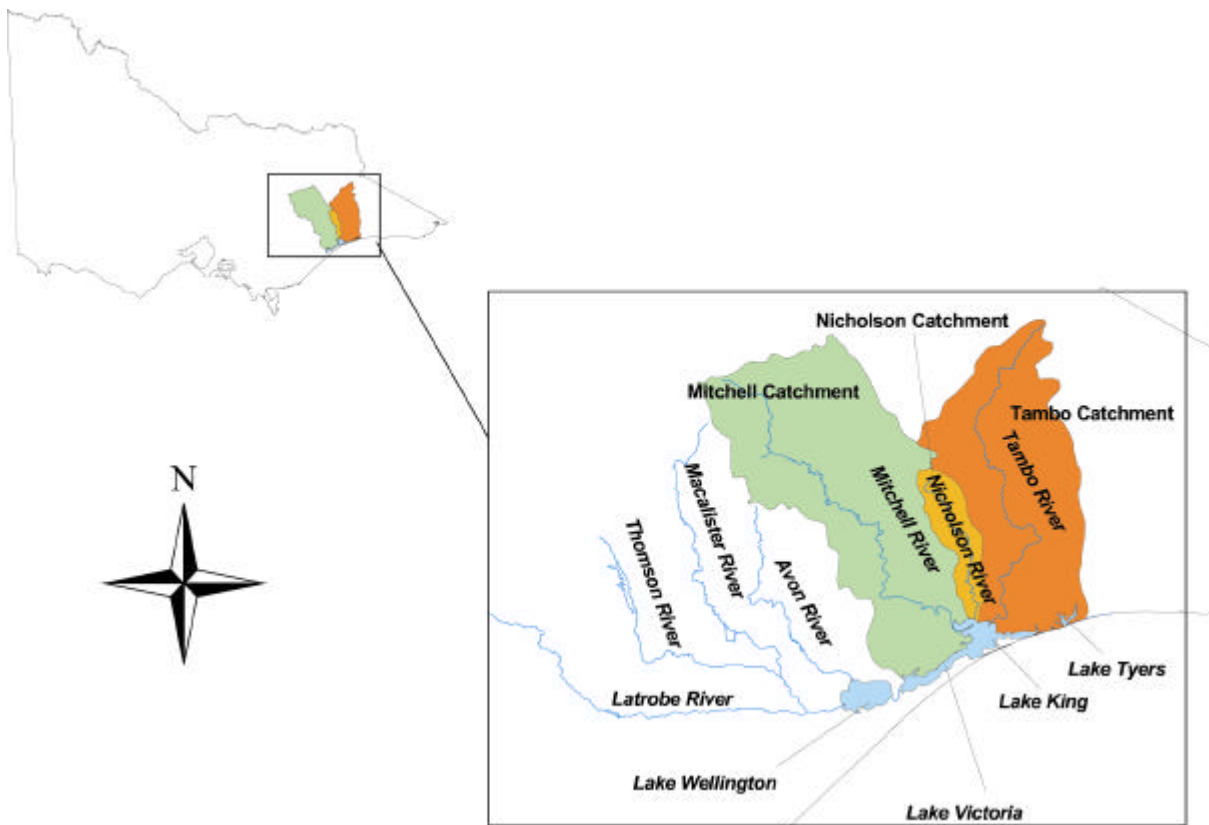
Figure 1: Location of the Mitchell, Tambo and Nicholson catchments in Victoria

2 ASSESSMENT METHODS

Indicators of Condition

Ecosystems are affected by many factors not detected by spot sampling programs, for example, fluctuations in water quality, changed flow regimes and deterioration in habitat. Biological indicators respond to all these stresses and provide a direct measure of overall ecological health.

The study examined measures of biological health, then used habitat health indices and physical and chemical water quality parameters to explain why sites may be degraded.

Several biological indices - AUSRIVAS, Key Families, SIGNAL, Number of Families and EPT Index – are used in the assessment.

The key physical and chemical water quality indicators considered are nutrients (phosphorus and nitrogen), turbidity, salinity, pH, temperature and dissolved oxygen.

Even with good water quality and flows, a healthy aquatic ecosystem cannot be supported if suitable habitat is not present. Two measures, the USEPA (United States Environmental Protection Agency) Rapid Habitat Assessment (RHA) Protocol and the Index of Stream Condition (ISC), providing semi-quantitative assessments of habitat condition, have been included.

A healthy streamside zone is important to the health of the river itself. Streamside vegetation plays an important role in stabilising stream banks, reducing the transportation to waterways of fine sediments

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and nutrients bound to particulates. Streamside vegetation also lowers the water table and provides a source of woody debris for streams.

Descriptions of all these indices can be found in the detailed study report.

Environmental quality objectives

Through State environment protection policies (SEPPs), EPA sets environmental quality objectives in order to maintain healthy ecosystems and guide improvements in degraded water bodies. The waters of the Mitchell, Tambo and Nicholson catchments are covered by the SEPP Waters of Victoria (SEPP (WoV)) [2].

The principal policy SEPP (WoV) is being reviewed and a draft has recently been released [3]. Draft quantitative biological, nutrient and water quality objectives, developed as part of the WoV review, have been used in this condition assessment.

A fundamental feature of the draft biological objectives is that they are based on biological regions [4]. Three biological regions are represented across the combined Mitchell, Tambo and Nicholson catchments: Highlands, Forests B, and Cleared Hills and Coastal Plains (Figure 2). These regions are further described in the detailed study report.

Data sources

The information presented in this report (Figure 3 and Table 1) incorporates a number of data sources, but relies predominantly on biological monitoring and water quality snap-shots undertaken by EPA between 1990 and 1999, as part of the National River Health Program (NRHP). Other primary sources of information include the Index of Stream Condition assessment and water quality data collected for the Victorian Water Quality Monitoring Network (VWQMN) (http://www.vicwaterdata.net/).

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[2] Government of Victoria, State environment protection policy (Waters of Victoria), 1988.

[3] EPA Victoria, Draft State environment protection policy (Waters of Victoria), Publication 795, 2001.

[4] EPA Victoria, Draft State environment protection policy (Waters of Victoria), Biological Objectives for Rivers and Streams – Ecosystem Protection, Publication 793, 2001.
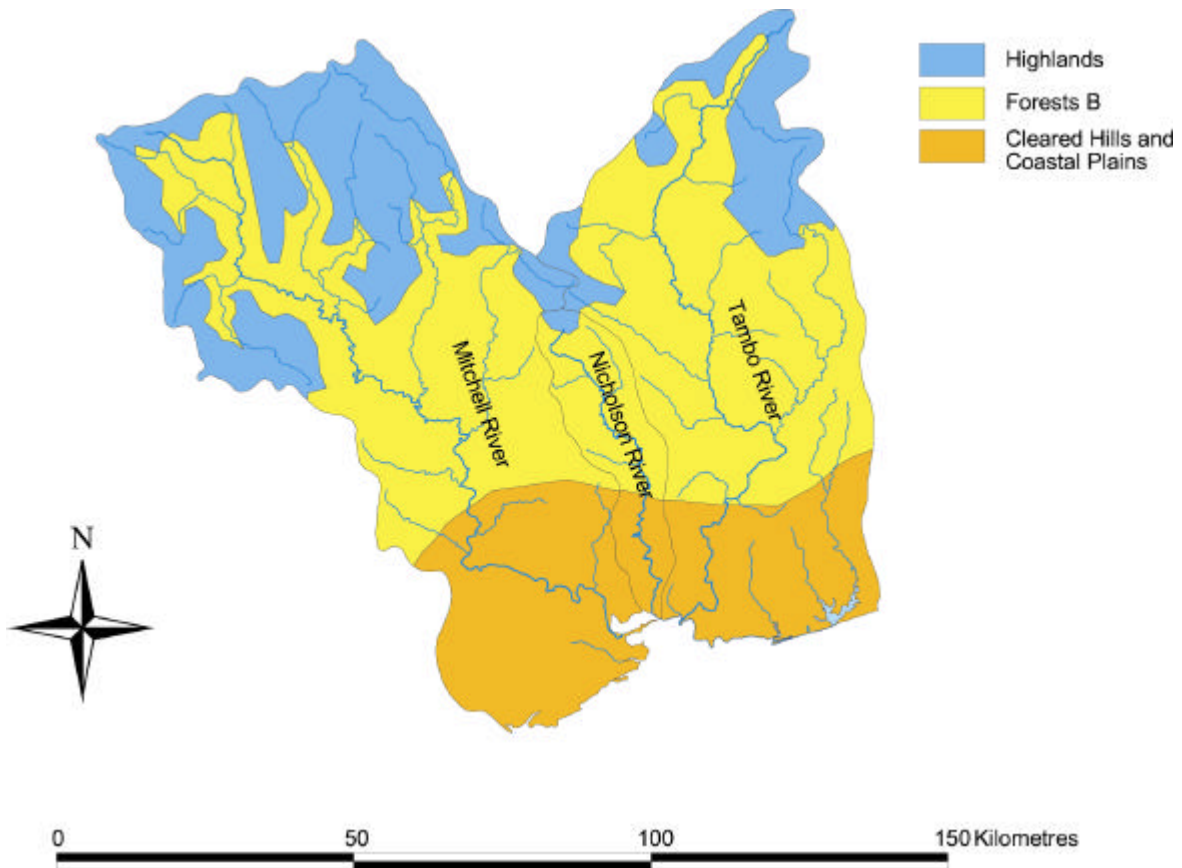
Figure 2: Biological Regions in the Mitchell, Tambo and Nicholson catchments

3   ENVIRONMENTAL CONDITION

For the convenience of discussion, sites in the Mitchell, Tambo and Nicholson river systems have been assigned to one of three groups: Highlands, Upper Catchments and Lowland Reaches. These groups broadly correspond to the topography, present land use and, to some extent, the biological regions outlined in the draft SEPP (WoV).

Highlands

The main highland areas are in the north of the Mitchell and Tambo catchments (Figure 2). Streams in this region are, for the most part, in a relatively natural state. The majority of the land is contained in the Alpine National Park.

No highland sites were assessed in the Mitchell or Nicholson catchments. One site was assessed in the highlands region of the Tambo catchment. ***Timbarra River at Timbarra Plains*** appeared to be in excellent condition, meeting all draft SEPP biological objectives. This was supported by an 'excellent' assessment for the Index of Stream Condition (ISC). While RHA assessed this site as 'marginal', this probably reflects the unsuitability of the RHA methodology for small alpine streams. Although nutrient levels were relatively high for this site, human influence is minimal and there appears to be a low level of risk to ecological health.

Upper Catchments

This group includes the upper reaches of the Tambo, Mitchell and Nicholson rivers and their tributaries.

The upper catchments of the Mitchell and Nicholson rivers are largely forested. The uppermost reaches of the Tambo River are also forested but land has been cleared downstream from around Omeo down to Ensay.

The Wonnangatta, Wongungarra, Wentworth and Dargo rivers, all major tributaries of the Mitchell River, were assessed. These sites met all the draft SEPP biological objectives indicating they were in very good condition. RHA and ISC scores generally indicated excellent habitat. An exception was **Dargo River at Dargo** where the RHA score was in the 'very poor' category. Land has been cleared for grazing around the township of Dargo. This clearing has significantly reduced the streamside zone in this area, which contributed to the low RHA score. The streamside zone of **Wonnangatta River at Crooked River** has also been partially cleared which accounts for the 'marginal' ISC and RHA ratings for this site. There was no evidence that these relatively low ISC and RHA scores affected the biological health or water quality of either of these sites.

Biological sampling of **Cobbannah Creek at Dargo Road** indicated clear impact. This site failed to meet all but one of the draft SEPP biological objectives for edge habitat. No riffle habitat was present. This is a relatively turbid creek with low dissolved oxygen levels and a predominance of fine sediments. Such conditions do not favour diverse macroinvertebrate communities, particularly sensitive forms, and together with the lack of suitable habitat are likely to be responsible for the low biological scores.

Although the RHA suggested that habitat quality in the immediate vicinity of the site was relatively good, the ISC score was in the 'poor' category. The streambed and banks of this creek are moderately eroded and this, in addition to a patchy streamside zone, contributed to the low ISC score.

In marked contrast to the Mitchell catchment, a number of Tambo River sites in the upper catchment group failed to meet at least one of the draft SEPP biological objectives. In particular, many SIGNAL scores did not meet the draft objectives. This indicates that some of the more pollution-sensitive families of macroinvertebrates were not present, and that these sites may be subject to poor water quality.

Salinity levels, in particular, were high in the upper to mid reaches of the Tambo catchment. While this may reflect a naturally saline base flow in the Tambo catchment, the elevated salinity levels in the cleared sections of the Tambo catchment are of concern and warrant further investigation.

ISC scores were generally in the 'marginal' category in the upper reaches of the Tambo River. Largely, this is a reflection of the fact that much of the streamside zone has been removed and been invaded by exotic species such as willow and poplar.

Two tributaries of the Tambo River in this region, **Little River at Ensay South** and **Swifts Creek at Swifts Creek**, both failed to meet three of the draft SEPP biological objectives. Little River and Swifts Creek suffer from similar problems. Much of the streamside zone has been removed and there is little evidence of regeneration of native species. The small amount of remaining streamside zone is

largely dominated by exotic species such as willows. In-stream habitat for aquatic life and water quality are also very poor at these sites.

In contrast, two tributaries whose catchments are largely forested, **Haunted Stream at Stirling** and **Timbarra River downstream of Wilkinson Creek** were found to be in excellent condition.

One site on the Nicholson River fell into this group. **Nicholson River at Deptford** met all the draft SEPP biological objectives, had good water quality, RHA and ISC scores.

Lowland Reaches

This group includes the lower reaches of the Mitchell, Tambo and Nicholson rivers and their tributaries. It also includes Toms Creek, which flows into Lake Victoria.

This area comprises the floodplains of the three major river systems and has been largely cleared. Much of the lower catchment is devoted to agriculture, and also includes most of the area's industries and towns.

In general, sites in the lowland reaches of the Mitchell catchment were in poorer ecological condition compared to upland sites. ISC and RHA scores were significantly lower with many sites rated as 'poor' or 'very poor'. This was largely a result of poor streamside zones and unstable streambeds and banks. A number of creeks including **Iguana Creek at Dargo Road** and **Boggy Creek at Counihans Bridge** had poor water quality with elevated salinity and nutrient levels. **Clifton Creek** had elevated salinity and turbidity and failed to meet the draft SEPP biological objectives for AUSRIVAS and number of families. **Flaggy Creek at Wy Yung-Calulu**

Road and **Toms Creek at Bengworden** were particularly poor and did not meet any of the draft SEPP biological objectives. This reflects the fact that these creeks lie in agricultural areas and are impacted by agricultural run-off. In addition, there is little streamside zone to intercept run-off and prevent stock access to the creeks.

While scores were generally lower than in the upper catchments group, one site, **Mitchell River at Lamberts Flat** met all the biological objectives and also had good ISC and RHA scores and water quality.

The distinction between river health in the upper and lower reaches was less clear in the Tambo catchment compared to the Mitchell catchment. This is chiefly due to the fact that large portions of the central and upper catchment have been cleared for grazing.

Both the **Tambo River at Bruthen Bridge** and **Tambo River at Stephenson Road** met the draft SEPP objectives for AUSRIVAS and number of families but failed to meet the draft objective for SIGNAL. Although water quality was good, ISC and RHA scores were 'marginal' to 'poor'. Streamside zones and in-stream habitats in the lower reaches of the Tambo River are very degraded. There is also a 'sand slug' in this section of the Tambo River. As well as filling in pools and smothering coarser substrates and riffles, this large mass of constantly shifting sand provides an unstable habitat for many aquatic macroinvertebrates.

Two sites on the Nicholson River were assessed. **Nicholson River upstream of Morgans Creek** met all the draft SEPP biological objectives for the available habitat. **Nicholson River at Atkinson Road** just failed

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to meet the draft SEPP objective for AUSRIVAS for the edge sample but met the draft SEPP objectives for SIGNAL and number of families. RHA, ISC scores and water quality were generally good for the Nicholson River sites. Nicholson River upstream of Morgans Creek scored a 'marginal' RHA because of eroded stream banks and sediment deposition in pools but otherwise appeared to be in good condition. **Morgans Creek at Bellbird Road**, a tributary of the Nicholson River, did not meet the draft SEPP SIGNAL objective for the available edge habitat and scored poorly in RHA. Morgans Creek was essentially a series of pools in autumn and spring of 1998, the year it was sampled. Consequently, it is not surprising that water quality was poor with high nutrient, salinity and turbidity levels. These largely explain the relatively low SIGNAL score for this site. Intermittent streams such as Morgans Creek are poorly represented in the reference site data set used to derive the draft SEPP biological objectives. The results for Morgans Creek give an indication of the health of this stream type but further investigation using the risk-assessment approach would be necessary to make a more accurate assessment.
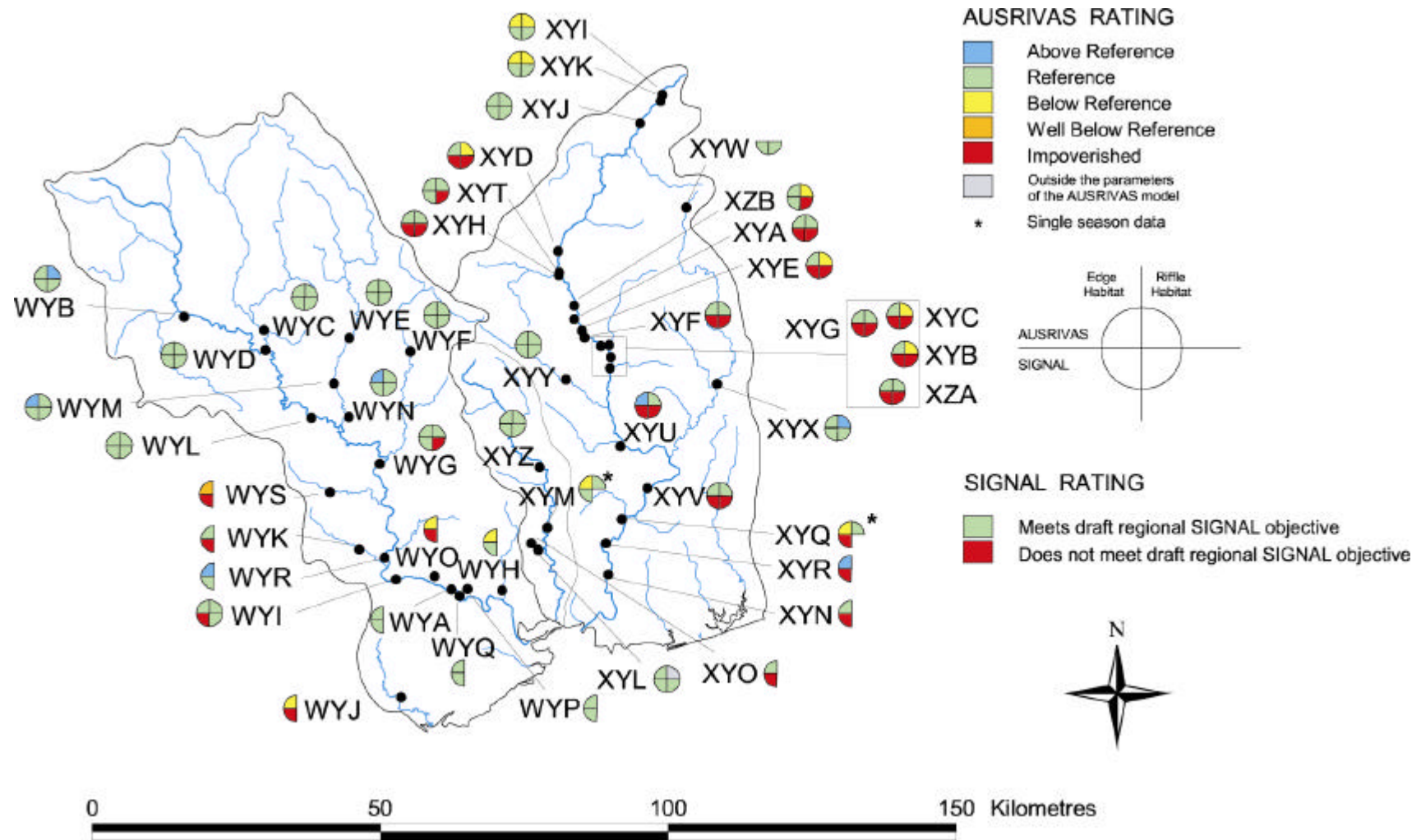
Figure 3: AUSRIVAS and SIGNAL ratings for sites in the Mitchell, Tambo and Nicholson catchments

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Table 1: Results for the draft SEPP biological objectives, ISC, and RHA for sites in the Mitchell, Tambo and Nicholson catchments.

Site	Site Code	AUSRIVAS O/E score (Band)		Key Families Combined Habitats	SIGNAL		Number of Families		EPT Taxa		ISC Reach	ISC score	RHA	Total N (mg/l)	Total P (mg/l)	Turbidity (NTU)	EC25 (uS/cm)
		Edge	Riffle		Edge	Riffle	Edge	Riffle	Edge	Riffle							
Highland Sites																	
Timbarra River at Timbarra Plains	XYW	No objective		21	6.8	7.0	24	24	11	11	16	43*	132	0.22	0.030	2	22
Upper Catchments																	
Wonnangatta River at Moroka	WYB	1.05 (A)	1.14 (X)	N/R	6.2	6.6	34	41	14	21	12	45	166	0.11	0.016	2	40
Wonnangatta River at Crooked River	WYC	0.99 (A)	0.96 (A)	N/R	5.8	6.4	32	31	9	13	11	33*	132	0.09	0.015	1	48
Wonnangatta River at Waterford	WYL	1.05 (A)	1.04 (A)	N/R	5.8	6.5	36	38	12	17	9	36*	162	0.18	0.018	2	69
Mitchell R, d/s of Wentworth River	WYG	0.93 (A)	1.07 (A)	N/R	5.8	5.7	34	34	9	14	7	37*	155	0.10	0.011	1	59
Wongungarra R. at Crooked River	WYD	1.07 (A)	0.94 (A)	N/R	6.3	6.6	33	29	12	17	30	42*	144	0.16	0.315	1	52
Wentworth R at Jones Road	WYF	1.13 (A)	1.06 (A)	N/R	6.2	6.9	33	39	15	20	25	44*	173	0.16	0.013	3	61
Dargo R, d/s Wallace Ck	WYE	1.08 (A)	0.88 (A)	N/R	6.1	6.6	35	31	14	16	27	44*	153	0.21	0.026	1	48
Dargo River at Dargo	WYM	1.14 (X)	0.96 (A)	N/R	5.9	6.1	38	30	12	12	26	36	115	0.17	0.012	2	62
Dargo River at Lower Dargo Rd	WYN	1.14 (X)	0.98 (A)	N/R	5.9	6.0	33	34	10	13	26	36	142	0.19	0.015	1	72
Cobbannah Ck at Dargo Rd	WYS	0.57 (C)	N/A	N/R	5.2	N/A	26	N/A	3	N/A	23	24*	164	0.24	0.017	9	141
Tambo R u/s mine	XYI	0.68 (B)	0.85 (B)	N/R	5.9	6.8	30	34	11	16	12	N/E	164	0.48	0.061	7	127
Tambo R d/s Straights Ck	XYK	0.69 (B)	0.78 (B)	N/R	6.4	6.5	27	33	14	14	12	N/E	181	0.27	0.045	5	106
Tambo R at Wilga weir	XYJ	0.90 (A)	0.98 (A)	N/R	6.5	6.2	35	37	14	14	12	N/E	176	0.36	0.028	4	137
Tambo R at Tongio	XYD	0.87 (A)	0.84 (B)	N/R	5.7	5.6	30	28	11	11	10	34*	141	0.20	0.017	1	188
Tambo R at Swifts Ck	XYT	1.03 (A)	0.88 (A)	N/R	5.9	5.4	37	32	13	12	9	33	170	0.12	0.011	2	263
Tambo R near Doctors Flat	XZB	1.01 (A)	0.83 (B)	N/R	5.8	5.6	32	25	12	10	9	33	165	0.21	0.021	2	327
Tambo R d/s Boonibirrah	XYA	0.94 (A)	0.90 (A)	N/R	5.4	5.8	31	27	10	12	9	33	163	0.21	0.017	2	342
Tambo R at Angora	XYE	0.90 (A)	0.81 (B)	N/R	5.3	5.3	29	24	9	9	9	33	136	0.20	0.014	2	340
Tambo R at Barangarook	XYF	0.94 (A)	0.90 (A)	N/R	5.3	5.6	33	26	10	11	9	33	141	0.20	0.013	1	345
Tambo R at Pretty Flat Rd	XYG	0.99 (A)	0.91 (A)	N/R	5.3	5.5	33	27	9	10	9	33	127	0.19	0.013	2	346
Tambo R at Millers Access Rd	XYB	0.94 (A)	0.84 (B)	N/R	5.3	5.4	30	24	9	10	8	31*	155	0.23	0.016	2	339
Tambo R d/s Sandy Ck Junction	XZA	1.12 (A)	0.94 (A)	N/R	5.4	5.6	36	28	11	11	8	31*	145	0.22	0.017	2	356
Tambo R Barks Shed Ck	XYU	1.20 (X)	1.11 (A)	N/R	5.6	5.9	48	33	13	14	7	36	136	0.37	0.015	1	291

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Site	Code	Bio1	Bio2	N/R	v1a	v1b	v2a	v2b	v3a	v3b	v4	ISC	RHA	wq1	wq2	c1	c2
Tambo R d/s Peters Ck	XYV	0.90 (A)	0.94 (A)	N/R	5.4	5.6	28	29	9	11	6	47*	170	0.26	0.016	1	197
Tambo R at Ramrod Ck	XYQ	0.86 (B)	0.89 (A)	N/R	5.4	N/A	34	N/A	10	N/A	6	47*	118	0.23	0.015	2	145
Little River at Ensay South	XYC	0.99 (A)	0.86 (B)	N/R	5.7	5.7	39	26	12	10	18	25*	92	0.42	0.041	2	309
Swifts Ck at Swifts Creek	XYH	0.99 (A)	0.93 (A)	N/R	5.3	5.5	31	32	7	11	19	25*	103	0.25	0.032	1	745
Timbarra R d/s Wilkinson Ck	XYX	1.07 (A)	1.15 (X)	N/R	6.1	6.3	35	37	14	18	14	48*	176	0.22	0.016	3	65
Haunted Stream at Stirling	XYY	0.87 (A)	0.91 (A)	N/R	6.3	6.3	31	33	11	15	17	47*	170	0.46	0.023	2	97
Nicholson River at Deptford	XYZ	0.89 (A)	1.04 (A)	N/R	6.0	6.1	37	27	11	13	3	41*	181	0.27	0.018	2	111
Lower Reaches																	
Mitchell R at Lamberts Flat	WYR	1.17 (X)	N/A	N/R	5.6	N/A	38	N/A	11	N/A	7	37*	148	0.14	0.016	1	70
Mitchell R at Perry's Crossing	WYI	1.00 (A)	1.01 (A)	N/R	5.3	6.0	28	24	7	10	6	27	119	0.14	0.012	1	88
Mitchell R d/s Lindenow	WYA	0.93 (A)	N/A	N/R	5.6	N/A	24	N/A	8	N/A	5	25*	136	0.11	0.115	1	65
Mitchell R at Soldiers Rd	WYQ	0.87 (A)	N/A	N/R	5.5	N/A	26	N/A	6	N/A	5	25*	113	0.34	0.018	3	112
Iguana Ck at Dargo Rd	WYK	1.04 (A)	N/A	N/R	5.4	N/A	40	N/A	5	N/A	22	38*	99	0.64	0.033	13	608
Flaggy Ck at Wy Yung-Calulu Rd	WYO	0.68 (B)	N/A	N/R	5.1	N/A	23	N/A	1	N/A	-	N/E	86	0.42	0.015	3	3904
Boggy Ck at Counihan's bridge	WYP	1.03 (A)	N/A	N/R	5.5	N/A	35	N/A	6	N/A	19	34*	107	1.11	0.098	7	1528
Clifton Creek	WYH	0.83 (B)	N/A	N/R	5.8	N/A	23	N/A	5	N/A	16	N/E	120	0.42	0.017	30	1090
Toms Ck at Bengworden	WYJ	0.68 (B)	N/A	N/R	4.9	N/A	21	N/A	1	N/A	1	38*	121	3.19	0.180	17	2025
Tambo R at Bruthen Bridge	XYR	1.19 (X)	N/A	N/R	5.2	N/A	30	N/A	8	N/A	5	30	89	0.22	0.014	2	157
Tambo R at Stephenson Rd	XYN	1.04 (A)	N/A	N/R	5.2	N/A	30	N/A	6	N/A	4	29*	78	0.38	0.023	3	280
Nicholson R at Atkinson Rd	XYM	0.86 (B)	0.93 (A)	N/R	5.7	N/A	30	N/A	8	N/A	2	35*	153	0.28	0.013	3	125
Nicholson R u/s Morgan's Ck	XYL	1.00 (A)	O/S	N/R	5.9	6.0	37	28	10	12	2	35*	136	0.29	0.010	3	139
Morgans Ck at Bellbird Rd	XYO	0.92 (A)	N/A	N/R	5.2	N/A	28	N/A	3	N/A	-	N/E	71	1.45	0.053	21	1155

Draft SEPP Biological Objectives
MEETS DRAFT BIOLOGICAL OBJECTIVE
DOES NOT MEETS DRAFT BIOLOGICAL OBJECTIVE
single season – spring
N/A = habitat not available
O/S = outside the experience of the model
* = some indices were estimated
N/R = not required when AUSRIVAS results available
N/E = reach not evaluated for ISC

ISC/RHA rating
Excellent
Good
Marginal
Poor
Very poor

Water quality assessment
Greater than the 75% percentile draft SEPP objective

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4   MAIN FACTORS INFLUENCING ENVIRONMENTAL CONDITION

Two main contributing factors to poor ecological condition were identified: habitat and water quality degradation. Both these factors can have major impacts upon the ecology of a stream.

Habitat Degradation

The vegetation in the streamside zone is most important to the maintenance of healthy in-stream habitat. The quantity and quality of streamside vegetation in the upper to mid reaches of the Tambo River and the lower reaches and tributaries of both the Mitchell and Tambo rivers has been reduced by land clearing and stock access to the stream bank. This has resulted in erosion and a subsequent increase in suspended sediments, loss of shading, loss of in-stream woody debris essential for habitat, and invasion by exotic species (especially willows, poplars and blackberry).

The East Gippsland Catchment Management Authority (EGCMA) plays a major role in management programs in the Mitchell, Tambo and Nicholson catchments. Current high priority programs include controlling exotic pest vegetation (especially willows), restoring habitat for fish and re-introducing native streamside and in-stream vegetation.

River stabilisation is also an important program. Much of the work in recent years has concentrated on repairing damage caused by the June 1998 floods and has focussed on stabilising the banks of the Mitchell River.

Water Quality Degradation

Deterioration in water quality influences the health and composition of aquatic communities. Elevated nutrient levels lead to nuisance growth of algae and subsequent lowering of dissolved oxygen concentration as the algae decay. Increased salinity can cause the loss of saline sensitive species, and high turbidity results in low light levels in the water.

Water quality generally declines with increasing distance downstream from the rivers' headwaters since urban settlements, agriculture and industry are often located in lowland areas. In the Mitchell catchment, biological, habitat and water quality indicators clearly showed a decline in environmental condition between upland and lowland sites, and with increasing distance downstream. This gradient was less apparent in the Tambo River where much of the catchment in the upper to mid reaches has been cleared for agriculture.

5   DIRECTIONS IN MANAGEMENT AND MONITORING

This assessment has attempted to relate observed environmental quality to likely sources and catchment issues. While not the focus of this study, a number of issues were highlighted that are relevant to consider in current and future management and monitoring programs.

• Degradation in water quality and habitat contribute to poor ecological and physical condition of rivers in the Mitchell and Tambo catchments. Management programs should consider all relevant contributors to ensure improved river condition outcomes.

- The grazing of stock in streamside zones damages natural streamside vegetation and prevents its regeneration, leading to increased erosion and nutrient-rich run-off reaching waterways. Where stock are allowed to enter waterways, the stream channel can be damaged and turbidity increased, while animal wastes can lead to reduced water quality and the possibility of algal blooms as a result of nutrient enrichment. It is important to restrict or prevent stock access to streamside zones and waterways to bring about improved water quality and habitat condition.

- Existing rehabilitation and restoration programs involve a considerable investment of resources. If support for these programs is to be maintained, their effectiveness needs to be demonstrated. A review of current investment in program monitoring and assessment could be considered, as this feedback is essential for demonstrating the value of programs, improving current programs and adapting to new challenges.

- Intermittent streams are poorly represented in the reference site data set used to derive the draft SEPP biological objectives. There is a need for further study of these stream types and, possibly, the development of a separate AUSRIVAS model for intermittent streams.