

ENVIRONMENTAL CONDITION OF RIVERS AND STREAMS IN THE OVENS CATCHMENT

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1 INTRODUCTION

This publication provides an overview of the environmental condition of rivers and streams in the Ovens catchment prior to the bushfires in the summer of 2003. It covers the catchments of the King and Ovens rivers as well as Black Dog and Indigo creeks (Figure 1).

The Ovens River is considered to be one of the more important tributaries of the Murray-Darling Basin, both for the volume and quality of its waters, and its good ecological condition. It is one of the least regulated rivers in the Murray-Darling system, contributing around 14 per cent to the average total flows of the Murray River, despite its relatively small size (0.75 per cent of the total Murray-Darling Basin)¹. Only two small water storage impoundments occur in the catchment, one on the Buffalo River (Lake Buffalo) and one on the King River (Lake William Hovell). In recognition of its high environmental value, and in particular its importance as habitat for native fish, the lower reaches of the Ovens River have been designated a Heritage River, giving it special protection status. The Ovens River as a whole is also identified in the

Victorian River Health Strategy² as one of two rivers in the State of particularly high cultural, economic and ecological importance at both the regional and state-wide levels.

In the mountainous upper reaches, the Ovens River and its tributaries flow through state or national forests and reserves. The lower foothills and plains, however, have been heavily cleared for grazing, crops, and pine plantations. In addition to livestock and softwood timber production, the Ovens Valley is a major producer of tobacco, hops and wine grapes. All these land uses have contributed to an increase in sediment and nutrient loads to the Ovens River, particularly in its lower reaches.¹ This trend has raised concerns about the river system's long-term health and its contribution to algal blooms in Lake Mulwala and the Murray River.

The Ovens Basin Water Quality Strategy¹, developed in 2000 in response to these concerns, outlines the key issues affecting water quality in the Ovens Basin and presents management directions for improving the waters of the Ovens River and its tributaries.

As this overview and the detailed study³ that accompanies it was undertaken prior to the

¹ *Ovens Basin Water Quality Strategy: An action plan within the North East Regional Catchment Strategy*, Department of Natural Resources and Environment, 2000.

² *Healthy Rivers, Healthy Communities & Regional Growth: Victorian River Health Strategy*, Department of Natural Resources and Environment, 2002.

³ EPA Victoria, *Environmental Condition of the Rivers and Streams in the Ovens Catchment*, Publication 909, 2003.

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bushfires in the summer of 2003, it may assist management plans and monitoring programs in the catchment for both the strategy¹ and Bushfire Recovery programs.

Scope

The assessment is based on biological indicators, which are considered to be the best available

indicators of overall environmental condition, and also incorporates water and habitat quality assessments. As far as the data allows it relates observed environmental quality with broad scale catchment issues rather than assessing specific point source impacts.

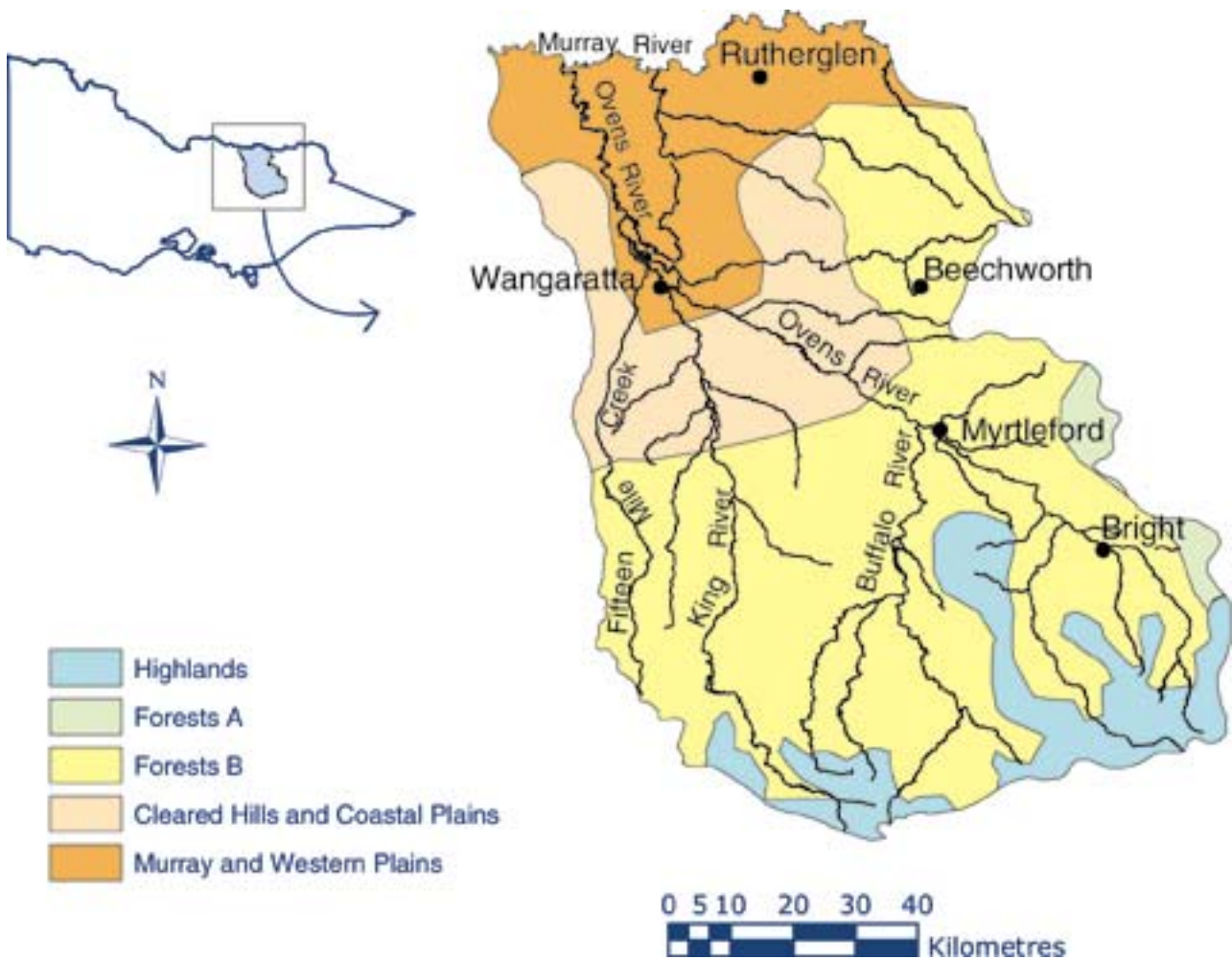


Figure 1: Biological regions in the Ovens catchment

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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, such as aquatic macroinvertebrates, respond to all these stresses and provide a direct measure of overall ecological health.

The study examined several macroinvertebrate indicators as measures of biological condition, and used habitat health indices and physical and chemical water quality measurements to aid in the interpretation of these results.

The biological indices used in the assessment are: AUSRIVAS, Key Families, SIGNAL, Number of Families and EPT Index.

The key physical and chemical water quality indicators considered are nutrients (total phosphorus and nitrogen), turbidity, and salinity.

Even with good water quality and adequate flows, a healthy aquatic ecosystem cannot be supported if suitable habitat is not present. A healthy streamside (riparian) zone plays an important role in stabilising stream banks and reducing the flow of nutrients and fine sediment to waterways. Streamside vegetation also lowers the water table and provides a source of food and habitat for stream biota.

Two measures that provide semi-quantitative assessments of habitat condition, the USEPA (United States Environmental Protection Agency) Rapid Habitat Assessment (RHA) Protocol and the

Index of Stream Condition (ISC), are used to evaluate this component of river health.

Descriptions of all these indices can be found in the detailed study.³

Environmental quality objectives

Through State environment protection policies (SEPPs), EPA sets environmental quality objectives in order to maintain healthy ecosystems and bring about improvements in degraded water bodies.

The surface waters of the Ovens catchment are covered by the SEPP Waters of Victoria (SEPP WoV)⁴.

The biological objectives in SEPP WoV have been used to assess the condition of rivers and streams in the Ovens catchment^{4,5}. Because the nutrient and other water quality data used in this study only represent a snapshot of the local water quality conditions at the time of biological sampling, they are not assessed against the SEPP WoV nutrient^{4,6} and water quality objectives^{4,7}. Where snapshot water quality parameters exceed SEPP levels, these are discussed in terms of their potential contribution to the overall health of a site.

A fundamental feature of the biological objectives is that they are based on biological regions.⁵ All five biological regions are represented in the Ovens

⁴ EPA Victoria, *State environment protection policy (Waters of Victoria)*, Government Gazette No. S 107, 2003.

⁵ EPA Victoria, *Biological Objectives for Rivers and Streams – Ecosystem Protection*, Publication 793.1, 2003.

⁶ EPA Victoria, *Nutrient Objectives for Rivers and Streams – Ecosystem Protection*, Publication 791.1, 2003.

⁷ EPA Victoria, *Water Quality Objectives for Rivers and Streams – Ecosystem Protection*, Publication 792.1, 2003.

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catchment: Highlands, Forests A, Forests B, Cleared Hills and Coastal Plains, and Murray and Western Plains (Figure 1). These regions are further described in the detailed study.³

Data sources

Data was obtained from biological monitoring and water quality snapshots undertaken by EPA between 1998 and 2002. Some of this data was collected under the National River Health Program (NRHP) and the Murray-Darling Basin Commission's Sustainable Rivers Audit Pilot. Another primary source of information is the Index of Stream Condition (ISC) assessment (<http://www.vicwaterdata.net/>).

3 ENVIRONMENTAL CONDITION

Seventy-three sites in the Ovens catchment have been assessed. The results are presented in Figure 2 and Table 1. Sites were assigned to the biological regions⁵ and assessed against the biological objectives specific to the region in which they occur. None of the assessed sites was located in the Forests A biological region.

Highlands

A very small portion of the Ovens catchment corresponds to the Highlands biological region, most of which falls within the Alpine and Mt Buffalo National Parks. Two highland sites were assessed, both of them on the Buffalo Plateau. **Crystal Brook at Mt Buffalo (CCB)** was in excellent condition, having met all the SEPP biological objectives. **Running Jump Creek Tributary upstream of Tatra (CBY)** met all the edge habitat objectives, but the absence of riffle data from one season precludes a

full assessment of this site. Nonetheless, the snapshot water quality data and the habitat scores suggest that the site can support a healthy biological community.

Forests B (Uplands)

This region includes the upper reaches of the Ovens and King rivers and their tributaries, the Buffalo River and its tributaries, and the upper reaches of Reedy, Indigo, Black Dog and Fifteen Mile creeks. Most of the upland areas of these waterways are forested. However, extensive clearing has occurred in the lower foothills, especially in the upper reaches of Reedy, Indigo and Black Dog creeks and parts of the King River. The two medium sized regional towns of Bright and Myrtleford are located in the lower foothills.

All the sites in the upper reaches of the King and Buffalo rivers were in very good to excellent condition based on the biological indices, the snapshot water quality data and the habitat assessments. A small number of sites showed slight levels of impairment. At **Dandongdale River at Cobbler's Lake Road (CDU)**, a below reference AUSRIVAS score for the edge habitat was atypical of these forested headwater reaches. A closer examination of the available edge habitat and the macroinvertebrates present at the site may help establish the reasons for this unusual score.

Further downstream, **King River at Gentle Annie Lane (CDG)** and **Edi Cutting (CCL)** and **Black Range Creek at Carboor Road (CDY)** did not meet the AUSRIVAS objective for one of the two habitats. A fourth site, **Black Range Creek at Pigram's Farm (CDZ)** received an above reference AUSRIVAS edge

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rating, a score that is often indicative of nutrient enrichment. While the snapshot water quality data did not show elevated nutrient levels at CDZ, high phosphorous levels at CDY suggest that water quality may be an issue in Black Range Creek. Extensive clearing for grazing and cropping in the area surrounding these sites may be contributing to reduced biological health, despite the presence of good local habitat at most of these sites.

Most of the sites on the upper Ovens River also appeared to support a healthy macroinvertebrate community. A few sites showed some level of impairment, scoring below the SEPP objectives for one or more of the biological indices. Increased pressure from land clearing for agricultural purposes and recent population growth in the area may be contributing to riparian zone degradation, poor bank stability, increased run-off and a subsequent reduction in adequate stream habitat. For example, extreme bank erosion at **Ovens River at McMahons Lane** (CAF), a factor which contributed to its low RHA score, has led to increased sedimentation and a loss of macroinvertebrate families, especially sensitive groups.

Many of the tributaries to the upper Ovens River were in poor ecological condition. **Roberts Creek at Roberts Creek Road** (CCR), **Buckland River at Mt Buffalo Road** (CCQ), and **Barwidgee Creek at Myrtleford** (CCN) and **Myrtleford Road** (CCD) all failed to meet the SEPP objectives for two or more of the biological indices. Low RHA and marginal ISC scores at most sites suggest that poor habitat is contributing to reduced riverine health in these sub-catchments. **Happy Valley Creek at Mudgeegonga Road** (CCO) met all the biological objectives except SIGNAL. However, very high levels for all the

snapshot water quality parameters, in addition to poor ISC and marginal RHA scores, suggest that this site is actively degrading. A more detailed investigation is warranted at this site, as well as mitigative measures to avoid further degradation.

Interestingly, in 1998 when most of these upper Ovens River tributaries were sampled, flow levels were unusually low. While it is unclear how drought conditions affect macroinvertebrate communities, it is likely that loss of available habitat due to reductions in flow contribute to loss of macroinvertebrate families. Small sub-catchments are also particularly susceptible to impacts from surrounding land uses. As a result, even small changes in flow levels may be particularly damaging to these waterways.

Ovens River upstream of Myrtleford (CAB) was in excellent biological condition, but impacts were detected at sites further downstream. Both the **Ovens River downstream of Buffalo Creek at Myrtleford** (CBA) and **Buffalo River at Merriang Road** (CAA) did not meet the SIGNAL or AUSRIVAS objectives for one of the two habitats. Increased run-off from impermeable surfaces, septic tanks, stormwater, and other discharges associated with urbanisation around Myrtleford could all be contributing to a reduced macroinvertebrate community. Run-off from intensive agricultural development in the Myrtleford area, particularly tobacco farming, could also be playing a part in the reduced biological health of these sites. Some of these impacts may be influencing sites further downstream, such as **Ovens River at Whorouly South – Gapsted Road** (CBJ) where a low riffle SIGNAL score indicates loss of pollution sensitive

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families, despite good local habitat and snapshot water quality conditions.

Three sites in the Beechworth region suggest that the ecological health of the waterways in this area is poor. **Spring Creek at Beechworth** (CDB) and **Reedy Creek at Wooragee** (CCE) scored below the SEPP objectives for AUSRIVAS, SIGNAL and EPT for one or both habitats. Low RHA scores suggest that these sites cannot support a healthy macroinvertebrate community. Elevated nutrient levels on sampling days at both sites, as well as high turbidity and salinity at CCE suggest that poor water quality may also be contributing to reduced biological condition.

Indigo Creek at Pooleys Road (CCZ) was only sampled in one season, and therefore results should be interpreted with caution. However, an above reference AUSRIVAS rating, as well as high nitrogen and salinity levels at the time of sampling, suggest this site is impacted. Further investigation is needed to clarify the ecological condition of Indigo Creek.

As with the tributaries of the upper Ovens River, these small sub-catchments are particularly susceptible to the pressures created by extensive clearing for grazing and cropping.

Fifteen Mile Creek at Fairfield Park (CDD) and **Greta South** (CBF) did not meet the SEPP objectives for two of the biological indices. Marginal RHA and ISC scores at both sites indicate that poor habitat conditions are impacting the macroinvertebrate community. Elevated levels of phosphorous at CDD and turbidity at CBF at the time of sampling suggest that reduced water quality may also be contributing to degraded ecological conditions at these sites. These reaches of the Fifteen Mile Creek sub-

catchment are heavily grazed, and widespread stock access to the waterway is a major source of nutrient enrichment, bank erosion and sedimentation. In addition, water extraction by farms all along the creek is likely to be reducing the availability of water for environmental flows, further impacting the biotic community.

Cleared Hills and Coastal Plains (Midlands)

This region includes the lower reaches of the King River, the mid-reaches of Fifteen Mile Creek and the Ovens River (upstream of Wangaratta), and Hodgsons Creek. The primary land use in this area is dryland pasture.

Fifteen Mile Creek at Glenrowan-Milawa Road (CDC) reflected the poor ecological condition of upstream sites. The SIGNAL and Number of Families scores did not meet the SEPP objectives, and high nutrient and turbidity levels from the snapshot water quality data suggest that poor water quality is a cause of degraded biological conditions. As with the upstream reaches of Fifteen Mile Creek, extensive stock access and water extractions are likely factors contributing to the degraded environmental quality at this site.

King River at Docker (CBH) did not share the healthy conditions evident in the upper King River. Poor habitat, including unstable banks and moderate erosion, appears to be reducing the diversity of macroinvertebrates as reflected by low AUSRIVAS and Number of Families ratings and a marginal RHA score. These conditions are not symptomatic of the whole area. Downstream of Docker, **King River at Oxley** (CCJ) displayed a healthy habitat that supports a diverse macroinvertebrate community. These results underscore the importance of local

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streamside zone conditions to the biological health of a river.

Sites along the middle reaches of the Ovens River also showed varied results. Low ISC scores but good to excellent RHA scores at **Ovens River at Oxley Flats** (CDO) and **near Everton** (CDP) suggest that extensive clearing for grazing and cropping in the surrounding catchment, rather than modifications to the immediate riparian zone and in-stream habitat, can also lead to a loss of macroinvertebrate families. These impacts were not detected at **Ovens River at River Road Reserve** (CDS), which was found to be in excellent biological health.

Tributaries to the Ovens and King rivers in this region appear moderately degraded, although conditions at some of these sites should be interpreted with caution as the data is from a single season only. Below objective SIGNAL scores were found at **Hodgsons Creek at Farmers Road** (CAI), **Burgoogie Creek at Ovens Valley Highway** (CAI) and **Boggy Creek at Top Plain Road** (CCK). These results were indicative of mild pollution, even though high phosphorous and salinity levels were only detected in the snapshot water quality samples at CAI. Marginal to poor RHA scores at all of the sites suggest that poor habitat may also be contributing to the loss of macroinvertebrate families. As with tributaries to the upper Ovens River, the small size of these waterways may make them particularly susceptible to impacts from surrounding land uses. For example, severe bank erosion at Boggy Creek (CCK) is a likely cause of the higher than usual turbidity levels at the time of sampling and may be eliminating many of the less tolerant macroinvertebrate families.

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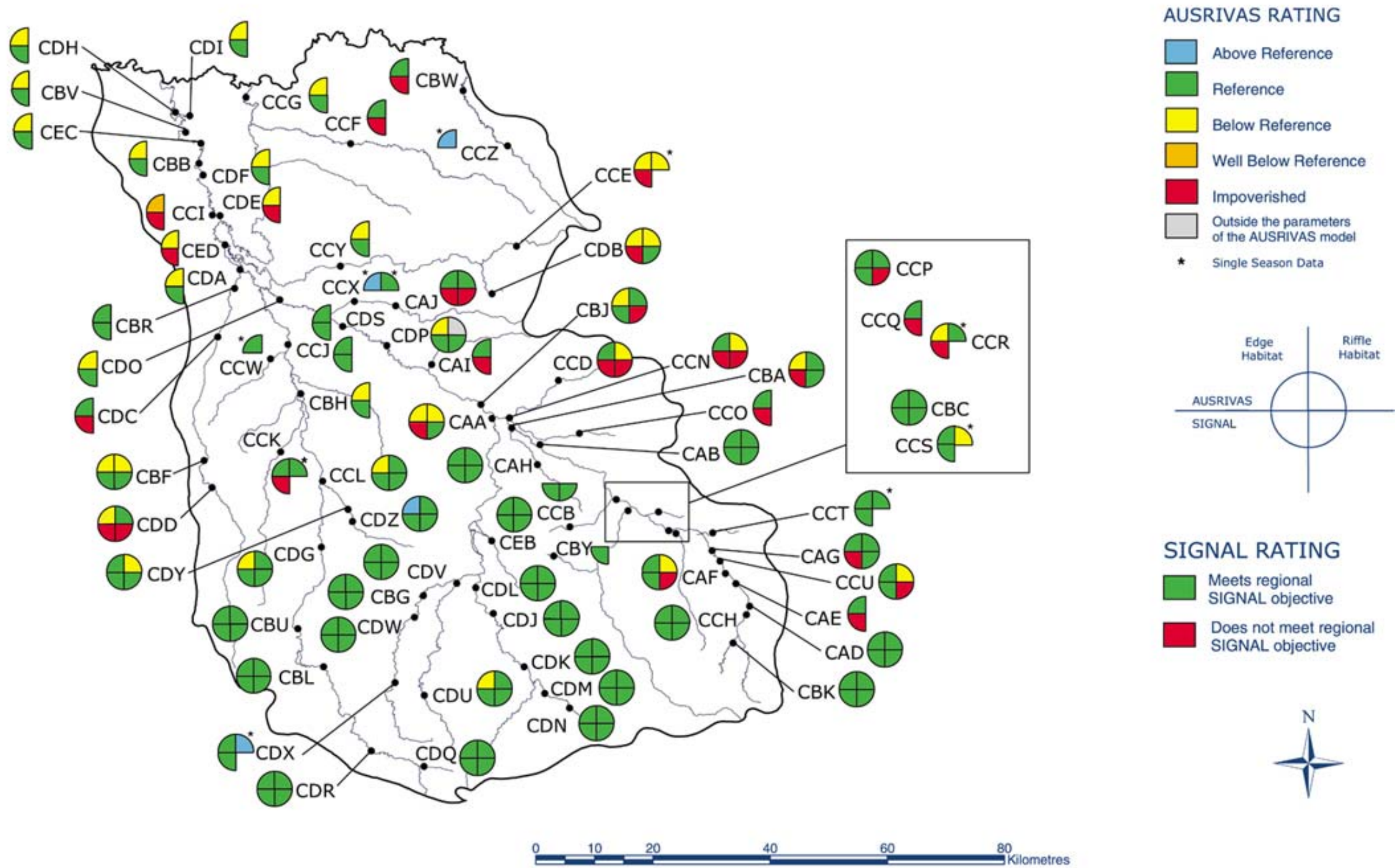


Figure 2: AUSRIVAS and SIGNAL ratings for sites in the Ovens catchment

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Murray and Western Plains (Lowlands)

This region encompasses the lower reaches of the Ovens River, from just upstream of its junction with the King River to where it flows into the Murray River, and includes the Heritage section of the Ovens River. It also takes in the lower reaches of Fifteen Mile, Reedy, Black Dog and Indigo creeks.

The lowland reaches of the Ovens catchment are dominated by broad acre cropping and dryland pasture. The town of Wangaratta straddles the Ovens River between its junction with the King River and Fifteen Mile Creek.

The most impacted segment of the Ovens River occurs just downstream of Wangaratta. **Ovens River at Warby Ranges Road** (CED), **at Ovens Track** (CCI) and **at Boland Road** (CDE) all failed to meet any of the SEPP objectives for SIGNAL, AUSRIVAS and Number of Families. It seems likely that increased run-off and associated contaminants from impermeable surfaces in the area around Wangaratta, discharges from the Wangaratta sewage treatment plant, trade waste effluents, the spread of exotic vegetation, water extractions, and heavy grazing in the outskirts of Wangaratta are all contributing to reduced macroinvertebrate diversity and a shift towards pollution-tolerant groups. Interestingly however, the biological indicator results from these sites are not corroborated by the habitat assessments and snapshot water quality measurements. No water quality issues were identified during sampling and the habitat assessments indicate very good habitat condition. Further investigation is needed to clarify the cause of biotic community degradation in this part of the Ovens River.

Also downstream of Wangaratta, **Fifteen Mile Creek at Ussher's Drive** (CDA) scored below the SEPP objectives for AUSRIVAS and Number of Families. At this site high nutrient levels at the time of sampling suggest that water quality degradation is contributing to the loss of macroinvertebrate families. By contrast, **Fifteen Mile Creek at Cruse Street** (CBR) appeared to be in reasonable condition, despite its location on the outskirts of Wangaratta. Both AUSRIVAS and SIGNAL scores were above the SEPP objectives, but the Number of Families index scored below the objective. Good in-stream habitat is apparent at the site. Very poor snapshot water quality results, however, suggest that upstream impacts within the Fifteen Mile Creek sub-catchment are affecting the site's overall biological condition.

Six sites were assessed within the Heritage listed reaches of the Ovens River: **Ovens River at Cinnamonds** (CDF), **at Peechelba** (CBB), **at Carmody Road** (CEC), **at Robinson Road** (CBV), **at Talbot Bend** (CDI) and **at Wallis' property** (CDH). Despite excellent habitat conditions in this area and generally reasonable water quality, these sites all scored below the SEPP objective for AUSRIVAS, and all but CDF failed to meet the Number of Families objective.

The lower sections of the Ovens River are characterised by a deeply incised channel with steep banks, a gravel bottom, and a wide floodplain. In contrast to many of the lowland rivers in Western Victoria, edge habitats that typically support a diverse macroinvertebrate community, such as shallow backwaters, macrophytes, trailing bank vegetation and undercut banks, are absent in this section of the Ovens River and other lowland tributaries to the Murray River. The lower than expected biological ratings for these sites may be

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more indicative of the uniqueness of these habitats than poor ecosystem health. Further refinement of the AUSRIVAS models for lowland rivers may better characterise these sites.

The biological condition of the lower reaches of Black Dog and Indigo creeks indicate mild impairment. **Black Dog Creek at Dugays Bridge Road** (CCG), and **at Rutherglen – Springhurst Road** (CCF) and **Indigo Creek at Murray Valley Highway** (CBW) all scored below SEPP objectives for either SIGNAL or AUSRIVAS. Poor to marginal habitat quality ratings at most of these sites suggest that these waterways may not be capable of supporting a healthy macroinvertebrate community in their present condition. Also of concern are the very high nutrient levels detected in the snapshot water quality measurements. Closer examination of these sites should help identify the sources of degradation.

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Table 1: Results for the SEPP biological objectives, ISC, and RHA for sites in the Ovens catchment

Site	Site Code	AUSRIVAS O/E score (Band)		Key Families Combined Habitats	SIGNAL		Number of Families		EPT Taxa		ISC Reach	ISC Score	RHA Score	Total N (µg/L)	Total P (µg/L)	Turbidity (NTU)	EC25 (µS/cm)
		Edge	Riffle		Edge	Riffle	Edge	Riffle									
Highlands																	
Running Jump Ck Tributary, u/s Tatra	CBY	No AUSRIVAS Model		17 ²	6.3	6.5 ²	23	17 ²	7	6 ²	N/E	N/E	165	123	11	1.2	10
Crystal Brook at Mt Buffalo	CCB	No AUSRIVAS Model		21	6.9	6.9	21	24	8	10	N/E	N/E	164	77	10	0.5	10
Forests B																	
Buffalo R at Merriang Rd	CAA	0.84 (B)	0.80 (B)	N/R	5.7	6.0	32	25	10	11	33	32*	148	229	13	1.0	40
Ovens R, u/s Myrtleford	CAB	0.93 (A)	0.89 (A)	N/R	6.2	6.7	34	28	12	14	5	33	125	144	12	0.7	38
Ovens R, d/s Fish Farm	CAD	1.04 (A)	0.97 (A)	N/R	6.2	6.5	32	32	14	15	6	37	148	77	18	1.0	37
Ovens R, d/s Smoko	CAE	0.93 (A)	N/A	N/R	5.6	N/A	37	N/A	11	N/A	6	37	128	70	16	1.1	35
Ovens R at McMahons Ln	CAF	1.08 (A)	0.78 (B)	N/R	6.0	5.9	35	25	15	11	6	37	99	83	31	1.9	36
Ovens R at Old Harrierville Rd	CAG	0.95 (A)	0.98 (A)	N/R	5.7	6.2	30	32	10	14	6	37	133	46	14	1.2	38
Buffalo Ck at Buffalo Ck Rd	CAH	1.01 (A)	1.03 (A)	N/R	6.1	6.7	33	37	12	17	42	35*	140	115	9	0.8	16
Ovens R, d/s Buffalo Ck at Myrtleford	CBA	0.84 (B)	0.96 (A)	N/R	5.6	6.4	30	26	11	12	5	33	102	122	7	1.9	36
Ovens R at Bright	CBC	0.93 (A)	1.04 (A)	N/R	6.2	6.1	31	35	12	15	6	37	134	79	13	1.4	41
Fifteen Mile Ck at Greta Sth	CBF	0.82 (B)	0.75 (B)	N/R	5.8	6.0	31	31	8	11	9	27*	99	178	18	5.2	55
Rose R at Metong North	CBG	0.93 (A)	0.93 (A)	N/R	6.0	6.9	34	32	12	16	37	36*	157	104	9	1.8	33
Ovens R at Whorouly Sth - Gapsted Rd bridge	CBJ	0.83 (B)	0.97 (A)	N/R	5.8	5.8	25	30	9	11	4	27*	128	216	17	1.1	43
Ovens R at Harrierville	CBK	0.99 (A)	0.98 (A)	N/R	6.6	6.7	33	36	16	17	N/E	N/E	151	66	12	0.7	49
King R, u/s Lake William Hovell	CBL	0.99 (A)	1.04 (A)	N/R	6.3	6.6	29	36	12	16	25	41*	178	71	12	0.4	27
King R at Edge of Forest, Cheshunt Sth	CBU	0.95 (A)	0.97 (A)	N/R	5.9	6.3	34	30	11	13	24	43	181	117	9	2.6	26
Barwidgee Ck at Myrtleford Rd	CCD	1.07 (A)	0.80 (B)	N/R	5.6	5.5	37	33	9	10	40	29*	126	481	29	2.9	138
Reedy Ck at Wooragee	CCE	0.84 (B)	0.55 (B) ²	N/R	5.6	5.8 ²	36	13 ²	7	5 ²	20	37*	94	1020	33	9.4	132
Ovens R, u/s Fish Farm	CCH	0.95 (A)	0.99 (A)	N/R	6.4	6.4	25	34	10	16	6	37	156	80	14	0.9	37
King R at Edi Cutting	CCL	0.86 (B)	0.97 (A)	N/R	6.0	6.1	31	27	12	13	23	33*	131	135	11	0.9	31
Barwidgee Ck at Myrtleford	CCN	0.95 (A)	0.74 (B)	N/R	5.5	5.3	31	27	8	8	39	29*	103	232	19	2.6	108
Happy Valley Ck at Mudgegong Rd	CCO	0.88 (A)	N/A	N/R	5.2	N/A	36	N/A	9	N/A	41	24*	108	634	92	9.6	110
Ovens R at Braithwaite Pumping Station	CCP	0.93 (A)	1.04 (A)	N/R	6.0	5.8	31	33	12	12	5	33	93	114	7	1.4	39
Buckland R at Mt Buffalo Rd	CCQ	0.99 (A)	N/A	N/R	5.7	N/A	31	N/A	8	N/A	43	30*	110	247	5	1.5	34
Roberts Ck at Roberts Creek Rd	CCR	0.67 (B)	0.95 (A) ²	N/R	5.5	6.3 ²	22	25 ²	4	9 ²	N/E	N/E	113	176	25	3.8	44
Morses Ck at Hawthorne Ck	CCS	0.93 (A)	0.82 (B) ²	N/R	5.8	6.1 ²	34	17 ²	10	5 ²	45	31*	92	117	6	1.7	46
German Ck, Nth of Germantown	CCT	0.93 (A)	0.83 (A) ²	N/R	6.0	6.4 ²	37	17 ²	13	9 ²	N/E	N/E	128	134	12	1.8	39
Ovens R at Mills View	CCU	0.95 (A)	0.81 (B)	N/R	6.1	5.9	37	22	12	10	6	37	149	100	12	1.0	37
Indigo Ck at Pooleys Rd	CCZ	1.22 (X) ²	N/A	N/R	5.3 ²	N/A	26 ²	N/A	7 ²	N/A	47	34*	140	800	26	5.8	375
Spring Ck at Beechworth	CDB	0.80 (B)	0.68 (B)	N/R	5.7	6.0	29	26	6	9	N/E	N/E	101	380	28	4.4	56
Fifteen Mile Ck at Fairfield Park	CDD	0.75 (B)	0.97 (A)	N/R	5.7	5.8	29	36	7	13	10	30*	108	204	29	3.6	57
King R at Gentle Annie Ln	CDG	0.81 (B)	0.95 (A)	N/R	5.8	6.2	26	28	11	12	23	33*	148	195	17	1.1	30
Buffalo R, u/s Durling Track	CDJ	0.97 (A)	0.94 (A)	N/R	6.3	6.3	33	30	10	13	35	36*	191	114	13	0.9	38
Buffalo R at Camp Creek Track	CDK	0.97 (A)	1.05 (A)	N/R	6.7	6.6	29	41	14	19	35	36*	195	120	13	1.2	35
Buffalo R at Blades Picnic Ground	CDL	1.12 (A)	1.00 (A)	N/R	6.5	6.4	33	33	13	14	35	36*	178	115	14	1.0	42
Buffalo R, u/s Catherine R	CDM	1.10 (A)	1.12 (A)	N/R	6.6	6.7	40	42	16	18	35	36*	180	130	13	1.1	40

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Buffalo R off Buffalo Rd	CDN	1.06 (A)	1.06 (A)	N/R	7.1	6.9	37	36	16	18	35	36*	183	145	19	1.3	47
King R at King Hut Track	CDQ	0.97 (A)	1.02 (A)	N/R	6.8	7.2	29	42	14	21	25	41*	188	67	14	0.9	16
King R at Pineapple Flat	CDR	1.10 (A)	0.98 (A)	N/R	6.6	7.1	36	38	14	19	25	41*	191	65	20	1.0	30
Dandongadale R at Cobbler's Lake Rd	CDU	0.78 (B)	0.94 (A)	N/R	6.5	7.0	26	35	11	17	N/E	N/E	174	79	11	0.9	22
Dandongadale R at Pine Plantation Track	CDV	0.93 (A)	0.92 (A)	N/R	6.3	6.3	32	31	11	13	N/E	N/E	173	114	13	0.8	42
Rose R at Rose River Road	CDW	1.00 (A)	1.00 (A)	N/R	6.2	6.5	33	36	11	15	37	36*	146	261	26	1.7	63
Rose R at Bennies	CDX	0.93 (A)	1.22 (X) ²	N/R	6.2	6.9 ²	35	29 ²	12	12 ²	37	36*	174	108	12	0.7	26
Black Range Ck at Carboor Rd	CDY	0.91 (A)	0.82 (B)	N/R	5.8	6.1	31	25	11	11	29	34*	113	312	50	4.7	78
Black Range Ck at Pigram's Farm	CDZ	1.13 (X)	0.97 (A)	N/R	6.0	6.2	43	34	11	14	29	34*	141	179	24	4.3	87
Yarrabula Ck off Yarrabula Rd	CEB	1.01 (A)	1.04 (A)	N/R	6.5	6.7	30	33	13	15	N/E	N/E	166	78	7	0.7	27
Cleared Hills and Coastal Plains																	
Burgoogee Ck at Ovens Valley Hwy	CAI	0.94 (A)	N/A	N/R	5.3	N/A	33	N/A	5 ³	N/A	32	36*	91	1275	50	6.6	1102
Hodgsons Ck at Farmers Rd	CAJ	1.11 (A)	1.01 (A)	N/R	5.3	5.2	35	30	8 ³	8 ³	31	36*	99	328	12	3.4	309
King R at Docker	CBH	0.66 (B)	N/A	N/R	6.1	N/A	20	N/A	8 ³	N/A	22	37	99	220	15	2.6	37
King R at Oxley	CCJ	0.90 (A)	N/A	N/R	5.7	N/A	27	N/A	7 ³	N/A	21	35*	114	204	16	6.5	62
Boggy Ck at Top Plain Rd	CCK	0.86 (A)	0.89 (A) ²	N/R	5.3	5.9 ²	27	20 ²	6 ³	9 ^{2,3}	27	28*	79	435	30	10.9	163
Croppers Ck at Tetley Ln	CCW	1.09 (A) ²	N/A	N/R	5.2 ²	N/A	22 ²	N/A	3 ^{2,3}	N/A	N/E	N/E	113	1400	75	13.0	272
Hodgsons Ck at Kays Road bridge	CCX	1.19 (X) ²	0.85 (A) ²	N/R	5.4 ²	6.1 ²	25 ²	19 ²	4 ^{2,3}	6 ^{2,3}	30	28*	84	510	15	6.7	234
Fifteen Mile Ck at Glenrowan - Milawa Rd	CDC	0.89 (A)	N/A	N/R	5.4	N/A	25	N/A	5 ³	N/A	8	35*	82	886	63	36.4	248
Ovens R at Oxley Flats	CDO	0.81 (B)	N/A	N/R	6.2	N/A	24	N/A	7 ³	N/A	3	25*	140	169	14	1.5	54
Ovens R near Everton	CDP	0.73 (B)	O/S	N/R	6.2	5.8	23	26	8 ³	10 ³	4	27*	119	200	21	1.1	45
Ovens R at River Road Reserve	CDS	1.08 (A)	N/A	N/R	5.8	N/A	31	N/A	9 ³	N/A	4	27*	137	172	19	1.5	43
Murray and Western Plains																	
Ovens R at Peechelba East	CBB	0.68 (B)	0.78 (B) ^{1,3}	N/R	5.5	5.4 ^{1,3}	21	14 ^{1,3}	3 ³	7 ^{1,3}	1	30	150	259	35	5.9	35
Fifteen Mile Ck at Cruse St	CBR	0.90 (A)	0.61 (B) ^{2,3}	N/R	5.7	5.4 ^{2,3}	21	11 ^{2,3}	4 ³	2 ^{2,3}	8	35*	125	2860	1125	13.5	930
Ovens R at Robinson Rd	CBV	0.82 (B)	N/A	N/R	5.6	N/A	20	N/A	4 ³	N/A	1	30	142	312	37	4.3	81
Indigo Ck at Murray Valley Hwy	CBW	0.89 (A)	N/A	N/R	5.1	N/A	25	N/A	3 ³	N/A	46	34*	110	1520	162	20.0	655
Black Dog Ck at Rutherglen - Springhurst Rd	CCF	0.87 (A)	N/A	N/R	5.2	N/A	26	N/A	3 ³	N/A	13	37*	86	1705	101	17.5	418
Black Dog Ck at Dugays Bridge Rd	CCG	0.78 (B)	N/A	N/R	5.3	N/A	27	N/A	3 ³	N/A	N/E	N/E	105	1215	96	21.5	198
Ovens R at Ovens Track	CCI	0.55 (C)	N/A	N/R	5.2	N/A	19	N/A	3 ³	N/A	2	27*	111	321	30	5.3	119
Reedy Ck at Carraragumungee Estate Rd	CCY	0.85 (B)	0.71 (B) ³	N/R	5.4	5.7 ³	29	19 ³	7 ³	7 ³	17	35*	69	342	14	2.8	102
Fifteen Mile Ck at Ussher's Dr	CDA	0.60 (B)	N/A	N/R	5.4	N/A	15	N/A	2 ³	N/A	8	35*	134	1730	545	17.0	465
Ovens R at Boland Rd	CDE	0.78 (B)	0.67 (B) ³	N/R	5.1	5.6 ³	21	17 ³	4 ³	8 ³	2	27*	130	276	38	4.4	66
Ovens R at Cinnamonds	CDF	0.78 (B)	0.58 (B) ^{1,3}	N/R	5.5	5.1 ^{1,3}	24	13 ^{1,3}	6 ³	5 ^{1,3}	1	30	145	281	37	7.4	67
Ovens R at Wallis' property	CDH	0.62 (B)	N/A	N/R	5.7	N/A	19	N/A	3 ³	N/A	1	30	155	304	38	7.5	73
Ovens R at Talbot Bend	CDI	0.82 (B)	N/A	N/R	5.4	N/A	21	N/A	5 ³	N/A	1	30	151	517	59	8.0	71
Ovens R at Carmody Rd	CEC	0.72 (B)	N/A	N/R	6.1	N/A	21	N/A	3 ³	N/A	1	30	149	272	36	4.8	72
Ovens R at Warby Range Rd	CED	0.63 (B)	N/A	N/R	5.1	N/A	18	N/A	5 ³	N/A	2	27*	139	242	34	4.3	66

Key for Biological Indicators	
Meets SEPP biological objective	¹ single season, autumn
Does not meet SEPP biological objective	² single season, spring
O/S = outside the experience of the model	³ no SEPP objective
N/R = not required when AUSRIVAS results available	N/A = habitat not available

Key for ISC and RHA ratings	
Excellent	N/E = reach not evaluated for ISC
Good	* some subindices estimated
Marginal	
Poor	
Very Poor	

ENVIRONMENTAL CONDITION OF RIVERS AND STREAMS IN THE OVENS CATCHMENT

4 MAIN FACTORS INFLUENCING ENVIRONMENTAL CONDITION

In general, the rivers and streams in the Ovens catchment were found to be in good environmental condition, although conditions do typically decline from the headwaters to the lowland reaches. In particular, the biological integrity of many of the smaller tributaries in the catchment appears mildly to greatly impaired.

In those reaches where biological condition was degraded, two main contributing factors were identified: habitat and water quality degradation. Both of these factors can have major impacts upon the ecology of a stream, and they rarely occur in isolation.

Low flows resulting from water extraction and drought conditions also appear to contribute to riverine degradation, particularly in the smaller sub-catchments. Generally however, environmental flows in the Ovens catchment are good since there are relatively few storages and the Ovens River is largely unregulated.

Habitat Degradation

The maintenance of healthy in-stream habitat is dependent on an intact riparian zone. The quantity and quality of streamside vegetation in the middle to lower reaches of the Ovens and King rivers and their lower tributaries, as well as Fifteen Mile, Indigo and Black Dog creeks has been greatly reduced. Land clearing, stock access to the stream bank, crops planted and harvested up to the river's edge, invasion of exotic plant species (especially willows, poplars and blackberry) and, in some cases, urban development are all contributing factors. These

activities have resulted in both stream bank and local catchment erosion, and a subsequent increase in nutrients and suspended sediments entering the waterways. In addition, the lack of adequate riparian vegetation has led to reductions in shading, and loss of leaf litter and woody debris which provide essential sources of food and habitat for aquatic organisms.

The North East Catchment Management Authority (NECMA) plays a major role in riverine management programs in the Ovens Basin. Current high priority programs include stream bank stabilisation; reducing gully erosion through stabilisation, fencing and revegetation, especially in the smaller sub-catchments; protection of remnant native vegetation; and improved management practices on agricultural land. All of these activities will contribute to improved river health.

Water Quality Degradation

Deterioration in water quality influences the health and composition of aquatic communities. Elevated nutrient levels can lead to excessive plant growth and subsequent lowering of dissolved oxygen concentrations. Increased salinity and high turbidity can result in the loss of macroinvertebrate families with low salinity and sedimentation tolerances.

Overall, water quality conditions in the Ovens catchment were good, especially in the headwater reaches. A general decline in water quality with increasing distance downstream was observed. This pattern is typical of many catchments because urban settlements, agriculture and industry are often located in the lowland areas. Small sub-catchments within the Ovens Basin and stream

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reaches downstream of towns appear to be most heavily impacted by water quality degradation.

Increased levels of treatment and greater reuse of reclaimed water on land are helping to improve water quality near towns. The NECMA is also undertaking water quality improvement activities throughout the Ovens Basin. Two major priority areas are the reduction of total phosphorus loads and a decrease in saline discharges into the waterways of the Ovens catchment. Particular attention is being given to the development of urban stormwater management plans and improved agricultural practices throughout the catchment.

5 DIRECTIONS IN MANAGEMENT AND MONITORING

This assessment relates observed environmental quality to likely causes 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 a number of the rivers in the Ovens catchment. This is particularly evident around urbanised areas such as Wangaratta and Myrtleford.
- 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. Many creeks, such as Fifteen Mile Creek, are particularly degraded as a result of widespread

cattle access. Restriction or prevention of stock access to streamside zones and waterways will improve water quality and in-stream habitat condition.

- Small sub-catchments are especially susceptible to impacts resulting from land use changes because they do not have the same capacity to 'buffer' potential impacts as larger catchments. This is particularly evident in the small streams of the Beechworth area and tributaries in the middle and upper reaches of the Ovens River. Improving bank stabilisation and reducing erosion is of particular importance in these sub-catchments.
- Existing rehabilitation and restoration programs involve a considerable investment of resources. Effectiveness of these programs needs to be demonstrated through monitoring and assessment programs.
- The need for further development of some of the models used to assess biological condition is evident from this study. Of concern are the lower than expected AUSRIVAS scores for the otherwise apparently healthy Heritage listed section of the Ovens River. These results suggest that a refinement of the lowland models (Murray and Western Plains) is needed to develop a more accurate picture of the environmental condition of Murray lowlands rivers.
- During the sampling period the Ovens catchment was experiencing reduced flows due to drought conditions. It is unclear what the immediate and long-term effects of drought conditions are on the biological health of

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aquatic ecosystems. It is well established, however, that systems which are already impacted will take longer to recover from a drought. While a better understanding of drought effects is clearly needed, improvements to habitat and water quality, and a reduction in water extractions will go a long way to help ensure the long-term health of rivers and streams in the Ovens catchment. For example, the Streamflows Management Plan being developed for the upper Ovens River will ensure a better balance between water extractions and environmental flow requirements throughout the catchment.

- Bushfires in the summer of 2003 burnt a large portion of the forests in the headwaters of the Ovens catchment. Ash and sediment laden runoff from burnt areas in the Buckland Valley, following a large rain event in February 2003, led to the movement of a massive sediment slug through the Ovens River and subsequent fish kills. While the data in this report was collected prior to the fires, State monitoring efforts are attempting to assess post-fire impacts on aquatic habitats and track their recovery. This assessment provides a baseline for the condition of rivers and streams prior to the fires. Together with post-fire monitoring, it will lead to a better understanding of the impacts of fire on aquatic ecosystems and how to manage these impacts in the future.