



Addendum to Report Series WRA 99/15
(Ecological Flow Requirements for
the Great Forester River)

Water Assessment Branch
Department of Primary Industries and Water
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The Department of Primary Industries and Water

The Department of Primary Industries and Water provides leadership in the sustainable management and development of Tasmania's resources. The Mission of the Department is to advance Tasmania's prosperity through the sustainable development of our natural resources and the conservation of our natural and cultural heritage for the future.

The Water Resources Division provides a focus for water management and water development in Tasmania through a diverse range of functions including the design of policy and regulatory frameworks to ensure sustainable use of the surface water and groundwater resources; monitoring, assessment and reporting on the condition of the State's freshwater resources; facilitation of infrastructure development projects to ensure the efficient and sustainable supply of water; and implementation of the *Water Management Act 1999*, related legislation and the State Water Development Plan.

Addendum

This report outlines the Environmental Water Requirements (EWR's) of the Great Forester River for all months during wet and dry years. Previously EWR's have focused on the irrigation period (December to April) when the river is subject to the highest stress and demand. This assessment has been undertaken as part of the formal review of the Great Forester Catchment Water Management Plan. Currently comprehensive studies are being undertaken within the Great Forester catchment under the TEFLOWS project to provide a holistic approach for defining environmental water requirements. The TEFLOWS project will build on the known flow requirements of freshwater-dependent biota and processes, and will contribute to the development of appropriate indicators to measure the success of implemented environmental flows.

Annual flow variability in the Great Forester River mean that EWR's based only on the median reference flow has little ecological relevance for drier years. Recognising this, the 1998 IFIM data was used to re-calculate the risk associated with a range of flows based on dry year conditions. This was achieved by using the 20th percentile flow as the reference flow (rather than the 50th percentile or median flow), since this flow has been adopted nationally as a standard reference flow in dry systems. The minimum Environmental Water Requirements (EWR's) of instream fauna have been reassessed using 100-year natural flow records for the Great Forester catchment (Source: NAP region hydrological model Great Forester catchment) as the reference flow.

Two scenarios have been considered in determining the Environmental Water Requirements (EWR's) of the Great Forester River during wet and dry years. In the first scenario the risk analysis was determined without the requirements for brown trout (*Salmo trutta*) whilst for the second scenario the requirements for brown trout were included. For the Great Forester catchment brown trout have been identified as a recreational value rather than an ecological value.

Ecological values specifically targeted included:

- Maintain habitat for common jollytail (*Galaxias maculatus*), spotted galaxias (*Galaxias truttaceus*), shortfinned eel (*Anguilla australis*), river blackfish (*Gadopsis marmoratus*), and platypus (*Ornithorhynchus anatinus*) populations; and
- Maintain habitat for macroinvertebrate populations found in the Great Forester River.

The resulting median 'wet year' EWR's without brown trout are provided in Table 1 and 'wet year' EWR's with brown trout in Table 2. The resulting 'dry year' EWR's without brown trout are provided in Table 3 and the 'dry year' EWR's with brown trout in Table 4 for the Prosperity Road and Old Waterhouse Road sites.

The environmental requirements for river blackfish (*Gadopsis marmoratus*) and macroinvertebrate taxa govern the flow recommendations (ie 'Low Risk' flows) at Prosperity Road for 'dry years' and 'wet years' in the absence of brown trout (*Salmo trutta*). With the inclusion of brown trout (Scenario 2), the environmental requirements for river blackfish, Macroinvertebrate taxa, brown trout adults and brown trout juveniles govern the flow recommendations at Prosperity Road for 'wet years'. For 'dry years' under Scenario 2 the environmental requirements for river blackfish, brown trout adults and brown trout juveniles govern the flow recommendations at Prosperity Road. The macroinvertebrate taxa that have determined the EWR's for any or all months at Prosperity Road during wet and dry years include; *Tamasia variegata*, *Austrolimnius* spp. (larvae and adult), *Scirtidae* spp., *Austrophlebioides* spp., *Gripopterygidae* spp., *Psidium casernatum*, *Austrosimulium furiosum*, *Orthocladinae* spp. and *Cheumatopsyche* spp.

The environmental requirements for spotted galaxias (*Galaxias truttaceus*), macroinvertebrate taxa and macroinvertebrate taxa abundance govern the flow recommendations (ie 'Low Risk' flows) at Old Waterhouse Road for 'dry years' and 'wet years' in the absence of brown trout (*Salmo trutta*). With the inclusion of brown trout (Scenario 2) the environmental requirements for brown trout, macroinvertebrate taxa and macroinvertebrate taxa abundance govern the flow recommendations at Old Waterhouse Road for 'dry years' and 'wet years'. The macroinvertebrate taxa that have determined the EWR's for any or all months at Old Waterhouse Road during wet and dry years include; *Ecnomus* spp., *Simsonia* spp. (larvae), *Oligochaeta*, *Hydracarina*, *Notalina* spp., *Psidium casernatum*, *Ceratopogonidae* spp., *Tanypodinae* spp. and *Aphiloreithrus* spp.

However, while it is important to consider the implication of varying flow regimes on individual taxa (macroinvertebrates and fish) we consider these flows are necessary also to adequately protect other significant aquatic fauna such as Australian grayling (*Prototroctes maraena*) and giant freshwater crayfish (*Astacopsis gouldi*). It is strongly recommended that flows remain in the 'Low Risk' category with brown trout included (Scenario 2) to ensure these values are maintained within the Great Forester River.

The management of the environmental requirements originally was at the gauging station Great Forester 2.5 km Upstream of Forester Road Bridge. Since the inception of the plan an additional site has been commissioned on the Great Forester River at Prosperity Road. The water management plan provided a flow for management purposes at the gauging station Great Forester 2.5 km Upstream of Forester Road Bridge. Table 5 provides the corresponding management flows for the full year environmental requirements assessed using a 20 percentile reference condition flow in the IFIM methodology.

Scaling of Environmental Water Requirements to Stream Gauging station

McKenny and Read (1999) provided Environmental Water Requirement recommendations for two study reaches in the Great Forester mainstream. Survey sites are located at Prosperity Road in the upper catchment and Old Waterhouse Road in the mid to lower catchment. As the stream gauging site, between these two survey sites was used as the trigger site for operational water management, a scaling of the Environmental Water Requirements for both study sites to the stream gauging station was required. As part of the Water Management Planning process a number of sites were examined for their suitability as water management planning monitoring points as initially six Water Management areas were proposed. Site investigation involved intensive stream gauging at different discharges at a number of sites (Tye and Clayton, 2001). These investigations determined that simple areal scaling of flows from the EWR sites to the gauging station would produce erroneous EWR figures for the gauging station. The rationale for this was that the scaling of flows from the stream gauge using scaling by catchment area leads to incorrect flow estimates, underestimating flows for sites upstream of the flow gauge and overestimating for sites downstream of the stream gauge. Subsequent hydrological analysis determined that an appropriate and accurate scaling factor for flows at Prosperity Road was achieved by used a natural flow ratio of 0.4176. For Waterhouse Road the natural flow ratio for scaling was determined as 1.2639. This provides the basis for accurately scaling both EWR recommendations to the stream gauging compliance point. Comprehensive details on the investigation and analysis are documented in Tye and Clayton (2001).

Table 1. Environmental Water Requirements (MI/day) assessed using the 50th percentile reference flow and IFIM method, excluding brown trout for the Great Forester River at Prosperity and Old Waterhouse Roads (showing governing taxa).

Prosperity Road	Low Risk	Medium Risk	High Risk
January	22.46 River Blackfish	22.46 – 16.42	16.42 River Blackfish
February	18.14 River Blackfish	18.14 – 12.96	12.96 River Blackfish
March	16.42 River Blackfish	16.42 – 12.10	12.10 River Blackfish
April	25.92 River Blackfish	25.92 – 19.01	19.01 River Blackfish
May	44.93 Macroinvertebrates	44.93 – 33.70	33.70 Macroinvertebrates
June	62.21 Macroinvertebrates	62.21 – 50.11	50.11 Macroinvertebrates
July	95.04 Macroinvertebrates	95.04 – 54.43	54.43 Macroinvertebrates
August	113.18 Macroinvertebrates	113.18 – 56.16	56.16 Macroinvertebrates
September	95.04 Macroinvertebrates	95.04 – 55.30	55.30 Macroinvertebrates
October	76.03 Macroinvertebrates	76.03 – 50.98	50.98 Macroinvertebrates
November	44.06 Macroinvertebrates	44.06 – 31.97	31.97 Macroinvertebrates
December	30.24 River Blackfish	30.24 – 21.60	21.60 River Blackfish
Old Waterhouse Road	Low Risk	Medium Risk	High Risk
January	64.8 <i>Galaxias truttaceus</i>	64.8 – 34.6	34.6 Macroinvertebrates
February	57.0 <i>Galaxias truttaceus</i>	57.0 – 29.4	29.4 Macroinvertebrates
March	53.6 <i>Galaxias truttaceus</i>	53.6 – 30.2	30.2 Macroinvertebrates
April	82.1 Macroinvertebrates	82.1 – 42.3	42.3 Macroinvertebrates
May	199.6 Macroinvertebrates	199.6 – 184.9	184.9 Macroinvertebrates
June	326.6 Invert abundance	326.6 – 203.9	203.9 Macroinvertebrates
July	382.8 Invert abundance	382.8 – 204.8	204.8 Macroinvertebrates
August	408.7 Invert abundance	408.7 – 203.0	203.0 Macroinvertebrates
September	398.3 Invert abundance	398.3 – 203.9	203.9 Macroinvertebrates
October	348.2 Invert abundance	348.2 – 204.8	204.8 Macroinvertebrates
November	193.5 Macroinvertebrates	193.5 – 179.7	179.7 Macroinvertebrates
December	141.7 Macroinvertebrates	141.7 – 103.7	103.7 Macroinvertebrates

Table 2. Environmental Water Requirements (MI/day) assessed using the 50th percentile reference flow and IFIM method, including brown trout for the Great Forester River at Prosperity and Old Waterhouse Roads (showing governing taxa).

Prosperity Road	Low Risk	Medium Risk	High Risk
January	22.46 River Blackfish	22.46 – 16.42	16.42 River Blackfish
February	18.14 River Blackfish	18.14 – 13.82	13.82 <i>Salmo trutta</i> juvenile
March	16.42 River Blackfish	16.42 – 12.96	12.96 <i>Salmo trutta</i> juvenile
April	25.92 River Blackfish	25.92 – 19.01	19.01 River Blackfish
May	53.57 <i>Salmo trutta</i>	53.57 – 38.88	38.88 <i>Salmo trutta</i>
June	73.44 <i>Salmo trutta</i>	73.44 – 53.57	53.57 <i>Salmo trutta</i>
July	95.04 Macroinvertebrates	95.04 – 60.48	60.48 <i>Salmo trutta</i>
August	113.18 Macroinvertebrates	113.18 – 62.21	62.21 <i>Salmo trutta</i>
September	95.04 Macroinvertebrates	95.04 – 61.34	61.34 <i>Salmo trutta</i>
October	78.62 <i>Salmo trutta</i>	78.62 – 57.02	57.02 <i>Salmo trutta</i>
November	50.98 <i>Salmo trutta</i>	50.98 – 37.15	37.15 <i>Salmo trutta</i>
December	34.56 <i>Salmo trutta</i>	34.56 – 22.46	22.46 <i>Salmo trutta</i>
Old Waterhouse Road	Low Risk	Medium Risk	High Risk
January	105.4 <i>Salmo trutta</i>	105.4 – 76.9	76.9 <i>Salmo trutta</i>
February	91.6 <i>Salmo trutta</i>	91.6 – 70.0	70.0 <i>Salmo trutta</i>
March	84.7 <i>Salmo trutta</i>	84.7 – 66.5	66.5 <i>Salmo trutta</i>
April	115.8 <i>Salmo trutta</i>	115.8 – 80.4	80.4 <i>Salmo trutta</i>
May	199.6 Macroinvertebrates	199.6 – 184.9	184.9 Macroinvertebrates
June	326.6 Invert abundance	326.6 – 203.9	203.9 Macroinvertebrates
July	382.8 Invert abundance	382.8 – 204.8	204.8 Macroinvertebrates
August	408.7 Invert abundance	408.7 – 203.0	203.0 Macroinvertebrates
September	398.3 Invert abundance	398.3 – 203.9	203.9 Macroinvertebrates
October	348.2 Invert abundance	348.2 – 204.8	204.8 Macroinvertebrates
November	193.5 Macroinvertebrates	193.5 – 179.7	179.7 Macroinvertebrates
December	141.7 Macroinvertebrates	141.7 – 103.7	103.7 Macroinvertebrates

Table 3. Environmental Water Requirements (ML/day) assessed using the 20th percentile reference flow and IFIM method, excluding brown trout for the Great Forester River at Prosperity and Old Waterhouse Roads (showing governing taxa).

Prosperity Road	Low Risk	Medium Risk	High Risk
January	16.42 River Blackfish	16.42 – 12.10	12.10 River Blackfish
February	12.96 River Blackfish	12.96 – 6.91	6.91 River Blackfish
March	12.96 River Blackfish	12.96 – 6.91	6.91 River Blackfish
April	19.87 River Blackfish	19.87 – 14.69	14.69 River Blackfish
May	30.24 River Blackfish	30.24 – 21.60	21.60 River Blackfish
June	45.79 Macroinvertebrates	45.79 – 32.83	32.83 Macroinvertebrates
July	54.43 Macroinvertebrates	54.43 – 47.52	47.52 Macroinvertebrates
August	64.80 Macroinvertebrates	64.80 – 43.2	43.2 Macroinvertebrates
September	55.30 Macroinvertebrates	55.30 – 47.52	47.52 Macroinvertebrates
October	44.93 Macroinvertebrates	44.93 – 33.70	33.70 Macroinvertebrates
November	28.51 River Blackfish	28.51 – 20.74	20.74 River Blackfish
December	20.74 River Blackfish	20.74 – 14.69	14.69 River Blackfish
Old Waterhouse Road	Low Risk	Medium Risk	High Risk
January	52.7 <i>Galaxias truttaceus</i>	52.7 – 30.2	30.2 Macroinvertebrates
February	44.1 <i>Galaxias truttaceus</i>	44.1 – 29.4	29.4 Macroinvertebrates
March	44.9 <i>Galaxias truttaceus</i>	44.9 – 29.4	29.4 Macroinvertebrates
April	59.6 <i>Galaxias truttaceus</i>	59.6 – 31.1	31.1 Macroinvertebrates
May	140.8 Macroinvertebrates	140.8 – 102.8	102.8 Macroinvertebrates
June	198.7 Macroinvertebrates	198.7 – 186.6	186.6 Macroinvertebrates
July	305.0 Invert abundance	305.0 – 203.0	203.0 Macroinvertebrates
August	337.8 Invert abundance	337.8 – 203.0	203.0 Macroinvertebrates
September	309.3 Invert abundance	309.3 – 203.0	203.0 Macroinvertebrates
October	198.7 Macroinvertebrates	198.7 – 185.8	185.8 Macroinvertebrates
November	115.8 Macroinvertebrates	115.8 – 94.2	94.2 Macroinvertebrates
December	62.2 <i>Galaxias truttaceus</i>	62.2 – 86.4	32.0 Macroinvertebrates

Table 4. Environmental Water Requirements (MI/day) assessed using the 20th percentile reference flow and IFIM method, including brown trout for the Great Forester River at Prosperity and Old Waterhouse Roads (showing governing taxa).

Prosperity Road	Low Risk	Medium Risk	High Risk
January	16.42 River Blackfish	16.42 – 12.96	12.96 <i>Salmo trutta</i> juvenile
February	12.96 River Blackfish	12.96 – 11.23	11.23 <i>Salmo trutta</i> juvenile
March	12.96 River Blackfish	12.96 – 11.23	11.23 <i>Salmo trutta</i> juvenile
April	19.87 River Blackfish	19.87 – 14.69	14.69 River Blackfish
May	34.56 <i>Salmo trutta</i>	34.56 – 22.46	22.46 <i>Salmo trutta</i>
June	55.30 <i>Salmo trutta</i>	55.30 – 39.74	39.74 <i>Salmo trutta</i>
July	68.26 <i>Salmo trutta</i>	68.26 – 49.25	49.25 <i>Salmo trutta</i>
August	76.03 <i>Salmo trutta</i>	76.03 – 55.30	55.30 <i>Salmo trutta</i>
September	69.12 <i>Salmo trutta</i>	69.12 – 50.11	50.11 <i>Salmo trutta</i>
October	54.43 <i>Salmo trutta</i>	54.43 – 38.88	38.88 <i>Salmo trutta</i>
November	30.24 <i>Salmo trutta</i>	30.24 – 20.74	20.74 <i>Salmo trutta</i>
December	20.74 River Blackfish	20.74 – 14.69	14.69 River Blackfish
Old Waterhouse Road	Low Risk	Medium Risk	High Risk
January	82.9 <i>Salmo trutta</i>	82.9 – 65.7	65.7 <i>Salmo trutta</i>
February	66.5 <i>Salmo trutta</i>	66.5 – 52.7	52.7 <i>Salmo trutta</i>
March	67.4 <i>Salmo trutta</i>	67.4 – 54.4	54.4 <i>Salmo trutta</i>
April	95.9 <i>Salmo trutta</i>	95.9 – 72.6	72.6 <i>Salmo trutta</i>
May	140.8 Macroinvertebrates	140.8 – 102.8	102.8 Macroinvertebrates
June	198.7 Macroinvertebrates	198.7 – 186.6	186.6 Macroinvertebrates
July	305.0 Invert abundance	305.0 – 203.0	203.0 Macroinvertebrates
August	337.8 Invert abundance	337.8 – 203.0	203.0 Macroinvertebrates
September	309.3 Invert abundance	309.3 – 203.0	203.0 Macroinvertebrates
October	198.7 Macroinvertebrates	198.7 – 185.8	185.8 Macroinvertebrates
November	128.7 <i>Salmo trutta</i>	128.7 – 94.2	94.2 Macroinvertebrates
December	99.4 <i>Salmo trutta</i>	99.4 – 74.3	74.3 <i>Salmo trutta</i>

Table 5. Flows at Great Forester 2.5 km Upstream of Forester Rd Bridge for Management of the Low Risk Environmental Water Requirements (Ml/day) assessed using a 20th Percentile reference flow and IFIM method, excluding and including brown trout for the Great Forester River at Prosperity and Old Waterhouse Roads.

Great Forester 2.5 km us Forester Rd Bridge Road	Low Risk Excluding Trout	Low Risk Including Trout
January	41	52
February	33	42
March	33	42
April	47	62
May	92	97
June	133	145
July	186	202
August	211	225
September	189	205
October	132	144
November	80	87
December	49	64

References

McKenny, C. & Read, M. (1999) Ecological flow requirements for the Great Forester River. Department of Primary Industries, Water and Environment, Report Series WRA 99/15.

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