Government of **Western Australia**
Department of **Water and Environmental Regulation**

healthy RIVERS

Vasse River

Field summary of river condition

Summary of river condition: Vasse River 2017/18

An assessment of ecological condition of the Vasse River was conducted in the 2017/18 spring to summer season. The assessment supports the implementation of the Revitalising Geographe Waterways program, which aims to improve water quality, waterway health and management of Geographe waterways. Key actions of the program include implementation of best management practices in agriculture to reduce nutrient export, streamside revegetation, and fencing of streamside vegetation to prevent damage by stock.

Maintaining ecological health in the Vasse River is essential for maintaining its social, agricultural, cultural and biodiversity values. By monitoring river health we can identify key ecosystem features, threats, and processes, and thereby implement targeted waterway improvement. By regularly assessing its condition we can track changes over time to ensure that the river is managed sustainably into the future.

For more information on Revitalising Geographe Waterways water quality initiatives visit: rgw.dwer.wa.gov.au

The Vasse River system has been extensively modified, with the majority of the catchment cleared for agriculture, primarily for livestock and irrigated horticulture. These land uses have impacted the river in some areas by degrading protective riparian zones, altering natural flow regimes, and adding nutrients and organic matter.

The upper section of the Vasse River has been diverted directly to Geographe Bay, significantly altering the hydrology of the lower sections of the river.

Methods

Ecological assessments were made using the South West Index of River Condition (SWIRC). The SWIRC is a toolkit developed by the Department to provide standardised methods for collecting, analysing and scoring river condition in south west WA. An overview of the SWIRC methods is available by searching 'south west index of river condition' at www.water.wa.gov.au .

The SWIRC can be tailored to meet different objectives based on the data collected and the analysis undertaken. This assessment focussed on the field-based elements of the SWIRC including:

- fish and crayfish
- aquatic macroinvertebrates
- aquatic habitat
- water quality (dissolved oxygen, temperature, specific conductivity and pH)
- fringing vegetation,
- channel morphology,
- erosion,
- connectivity and
- local land use.

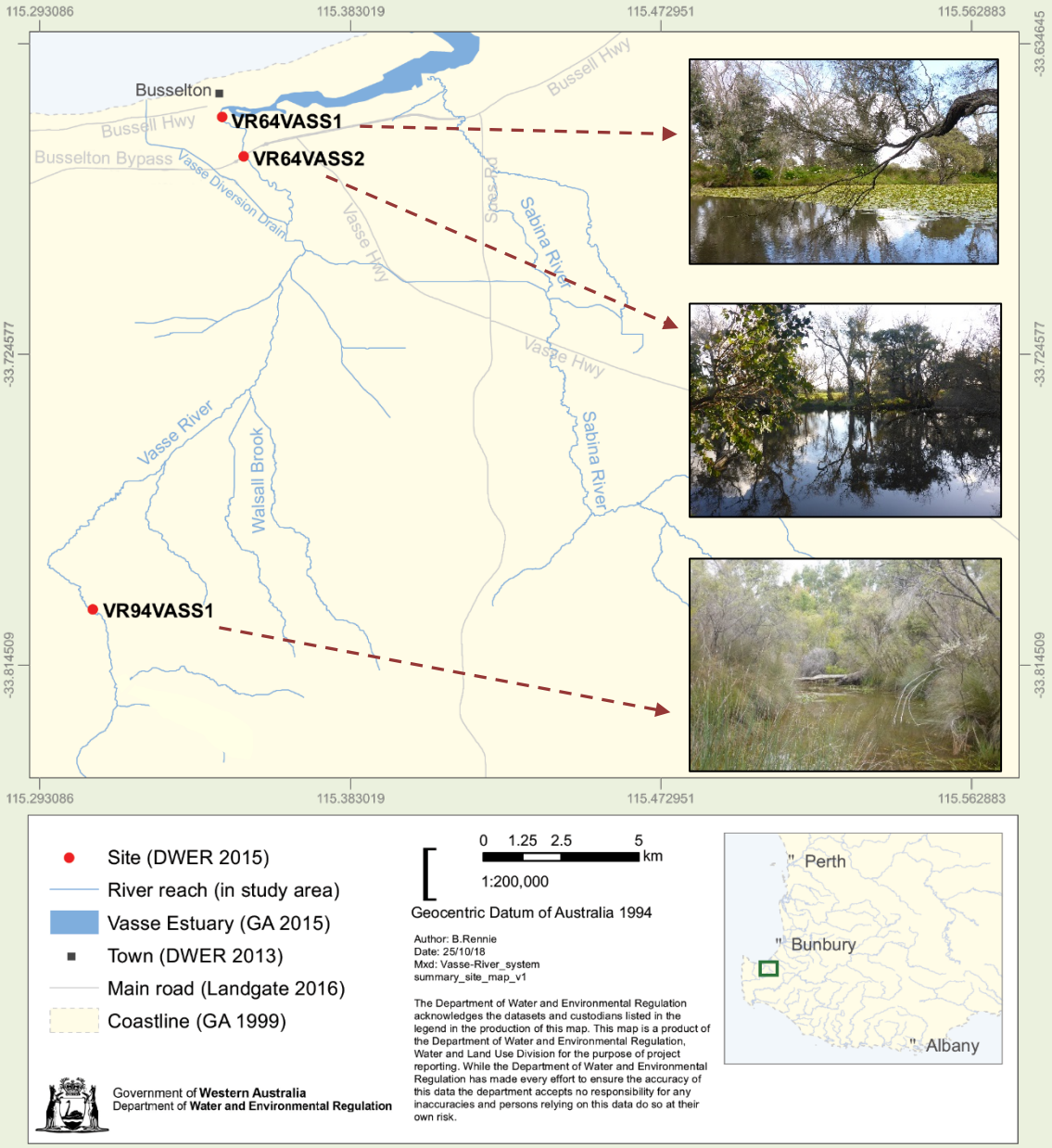
The main site assessments were undertaken at three sites along the river from 9 to 12 October 2017. The assessments were undertaken along 100 m of river length at each site.

Additionally, long term water quality loggers were deployed at two sites (Upper Vasse and Lower Vasse 2, see map) to measure dissolved oxygen, temperature, specific conductivity and pH every 30 minutes from 11 October 2017 to 27 March 2018.



Sites

Upper Vasse VR94VASS1	Lower Vasse 2 VR64VASS2	Lower Vasse 1 VR64VASS1
		
Upper Vasse River – near Price Road.	Lower Vasse River – near the Busselton Bypass road.	Lower Vasse River – near the city centre. Site was under heavy cover of the invasive Mexican lily.



Summary of results

The findings showed that the Vasse River has significant ecological value, including a high diversity of native fish and crayfish, with a low abundance of exotic species.

Upper Vasse - V94VASS1

The Upper Vasse site has high ecological value. It is a good example of landholders implementing best management practice by fencing off the riparian zone to protect it from damage by stock. This has enabled protection of remnant natural vegetation, regeneration of vegetation, as well as protection of the bank structure and instream habitat.

The upper Vasse River site is an example of where fencing out of stock and reestablishment of a riparian zone has benefited water quality, and all other aspects of ecological health.

As a result, this site had complex habitat and optimal water quality. This was reflected in the fish, crayfish, and aquatic macroinvertebrates found. The fish and crayfish community was healthy and dominated by native species. The macroinvertebrate community had a diverse community structure, incorporating taxa that are sensitive to poor water quality.

Of particular note was the absence of the exotic eastern gambusia (*Gambusia holbrooki)*. This species is abundant across many systems in the south west and is present in the lower Vasse River. It tends to be common in degraded ecosystems. However, the exotic yabby (*Cherax destructor*) was recorded and presents a threat to our native crayfish.

This site provides valuable fish and crayfish nursery habitat, as well as being a summer refuge. Fostering these summer refuges is especially important as our climate dries and continues to threaten native fish in south west WA.

Overall this site is an example of how best management practices can be used to create valuable river habitat that has high ecological, social, ecological, and economic value.

Lower Vasse - VR64VASS1 and VR64VASS2

The two lower Vasse sites had high ecological value worthy of protection, including a fish and crayfish community dominated by native species and with evidence of successful recruitment. The sites are situated in a relatively deep, permanent section of the Vasse River, representing a critical summer refuge in the system, particularly in our climate dries.

However, there was evidence of a number of changes to the river in this reach posing a threat to river values. This included reduced density and extent of the natural riparian zone, which was in turn linked to poor water quality and reduced instream habitat (riparian vegetation serves a range of functions including filtering sediment or organic input and providing instream habitat and shading).

Water quality issues included high nutrient concentrations and low dissolved oxygen over summer. These two issues are often interrelated, as nutrients support the growth of algae and bacteria which consume oxygen. Decomposing algae also supports growth of bacteria, which adds to the oxygen demand. Further, the resulting low dissolved oxygen levels are conducive to the release of nutrients from sediment, which begins the cycle again. This is a long-term and well-known problem in the Lower Vasse River.

Loss of habitat included a reduced cover of vegetation in the fringing zone, reduced abundance of woody debris, and excessive sedimentation (smothering habitat).

The lower Vasse River showed evidence of impacts including degraded water quality and macroinvertebrate community. However, implementation of riparian zone vegetation improvement, and catchment wide best management practices to reduce nutrient input could help address these to ensure the fish and crayfish community is protected.

At Lower Vasse 1 there was an invasion of the exotic Mexican lily (*Nymphaea mexicana*). Although this plant may offer additional habitat complexity and structure for biota (when not in excess), it is an invasive exotic that has detrimental impacts on river ecology. Specifically, other studies have found very low oxygen concentrations under dense stands of this plant, owing to a lack of photosynthetic activity within the water, limited replenishment from the air, and high levels of decomposition (oxygen being consumed as bacteria breakdown plant material).

Despite the heavy cover of Mexican lily, the Lower Vasse 1 site had a notably higher abundance of most fish species. This is likely due to the additional habitat complexity, and more abundant food sources of invertebrates in the lilies (including terrestrial invertebrates such as spiders and frogs), and also due to a small adjacent backwater (increased habitat diversity).

At both sites the impacts of poor water quality and degraded instream conditions were evident in the macroinvertebrate community, which was dominated by taxa that are tolerant of polluted conditions. Native species that are more sensitive to environmental degradation have been lost from these sites.

The fish and crayfish community in the lower Vasse River appear to be in good condition. Both sites had a diverse range of native species (including freshwater species and freshwater/estuarine species) and there was evidence of recruitment (e.g. presence of juveniles and gravid females).

The presence of exotic fish and crayfish was minimal. This is a good finding as the presence of exotics is both a reflection of some degree of ecological degradation, as well as an impact in itself. Exotic pest species compete with native species for resources, and can prey on them. They tend to have wide environmental tolerance and invasive life-history traits, therefore they tend to be associated with degraded habitats. Generally the healthier the system, the better equipped the native species are to outcompete and resist impacts by exotic species.

At Lower Vasse 1 only one exotic *G. holbrooki* (eastern gambusia) was caught, while at Lower Vasse 2 they were observed, but were not caught. *Carassius auratus* (goldfish) which are present in the Lower Vasse River (and considered to be a threat), were not detected in this sampling. This is a positive finding, however, it is not an indication that they are not still a problem in Vasse River.

Vasse River system - Key Messages

The site in the Upper Vasse River is an example of how best management practices can be used to create a valuable river habitat that has high ecological, social and economic value. While the native fish community in the Lower Vasse River appears healthy, without intervention, stress from poor water quality, habitat change and exotics are likely to increase. This would likely reach a point beyond the tolerance of the fish and crayfish community. Therefore we need to build resilience in the health of the river before this occurs, at which point restoration will be even more difficult and costly, and fish communities may not recover.

Catchment wide implementation of the best management practices outlined in the Revitalising Geographe Waterways program will help to address this, including:

- Reducing inputs of nutrients, organic load, and sediment from the catchment through fertiliser and effluent management and stock exclusion from riparian areas.
- Improvement of the riparian zone by revegetation to increase the density, diversity and width of the fringing vegetation.
- Regular (every ~3 years) ecological monitoring (using the SWIRC) to track condition over time to support adaptive management.

Raw data is available through the department regional office. For more information contact:

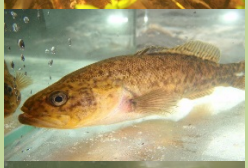
- DWER GeoCapes District Office: (08) 9781 0111
- DWER Healthy Rivers Program: (08) 6364 7863, dwer.wa.gov.au

This work is supported by the State Government's Regional Estuaries Initiative: rei.dwer.wa.gov.au

Vasse River Health Summary Table

	Upper Vasse (VR94VASS1)	Lower Vasse 2 (VR64VASS2)	Lower Vasse 1 (VR64VASS1)
			
Water quality	Good water quality. Dissolved oxygen concentrations acceptable over the warmer months.	Low dissolved oxygen concentrations over the warmer months (often below 2 mg/L). High nitrogen and phosphorus concentrations.	Low dissolved oxygen concentrations over the warmer months likely a problem (not measured). High nitrogen and phosphorus concentrations.
Riparian vegetation	Good coverage of vegetation in the streamside zone (0-10 m from river). Moderate vegetation cover in the broader riparian zone (up to 100m from river). Vegetation providing shading and bank stabilisation.	Reduced coverage of vegetation in the streamside zone (0-10 m from river) and in the broader riparian zone (up to 100m from river). Vegetation providing some shading and sufficient bank stabilisation.	Reduced coverage of vegetation in the streamside zone (0-10 m from river) and in the broader riparian zone (up to 100m from river). Vegetation providing some shading and sufficient bank stabilisation.
Aquatic biota	3 native fish species 2 native crayfish 1 exotic species (yabby) Evidence of recruitment. No eastern gambusia recorded.	5 native fish species 1 native crayfish No exotics captured. Community included a mix of freshwater and fresh-estuarine species. Evidence of recruitment.	5 native fish species 1 native crayfish 1 exotic fish species (eastern gambusia) Community included a mix of freshwater and fresh-estuarine species. Evidence of recruitment.
Macroinvertebrates	Varied community composition, including four sensitive taxa.	Dominated by taxa tolerant of poor water quality. Only one sensitive taxa recorded.	Indicative of degraded aquatic conditions - dominated by taxa tolerant of poor water quality. No sensitive taxa.
Aquatic habitat	Wide range of habitat types, including channel riffle, small anabranch, small pools, with fringing vegetation and macrophytes adding structure and complexity.	Weir pool habitat consisting of wide channel, limited variation.	Weir pool habitat consisting of wide channel, with small backwater, overall limited variation.
Sediment quality	Natural/minimal deposition, no odours.	Obvious signs of excessive sediment deposition with anoxic odours.	Obvious signs of excessive sediment deposition with anoxic odours.

Vasse River - Fish and crayfish collected in October 2017

	VR94VASS1 Upper Vasse (Price Road)	VR64VASS2 Lower Vasse 2 (at Bypass Hwy)	VR64VASS1 Lower Vasse 1 (Mexican lilies)
Native species			
 ***Cherax cainii*, smooth marron** (endemic freshwater crayfish, south west WA)	18	0	0
 ***Cherax quinquecarinatus*, restricted gilgie** (endemic freshwater crayfish, south west WA)	19	35	22
 ***Nannoperca vittata*, western pygmy perch** (endemic freshwater fish, south west WA)	150	26	5
 ***Galaxias occidentalis*, western minnow** (endemic freshwater fish, south west WA)	4	10	208
 ***Bostockia porosa*, nightfish** (endemic freshwater fish, south west WA)	21	28	38
 ***Pseudogobius olorum*, Swan River goby** (native freshwater-estuarine fish)	0	64	198
 ***Leptatherina wallacei*, western hardyhead** (native freshwater-estuarine fish)	0	23	285
Exotic species			
 ***Gambusia holbrooki*, *eastern gambusia*** (exotic fish, not native to Australia)	0	0	1
 ***Cherax destructor*, *yabby*** (exotic crayfish, not native to WA)	5	0	0