

2021 Ecological indicator report for the Vasse Wonnerup wetlands – Aquatic plants

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Methods

Aquatic plant sampling was undertaken in the Vasse Wonnerup wetlands in spring on 23rd and 24th November 2021. No summer sampling was completed in the 2021-2022 season. Monitoring included 16 sites with 8 in each estuary following the methodology Paice and Chambers (2023). Plant density as 'percent volume inhabited' (PVI) was assessed at five points along a transect from bank to bank across the estuary at each site. PVI is a measure of the proportion of volume of water taken up by plant material measured as a function of plant cover and the ration of height to depth.

Plant density data was used to calculate the Macrophyte Index using two metrics: the key species metric and the macrophyte dominance metric. Index scores and metric values were assessed against condition categories to provide ratings that reflect the ecological health of aquatic plant communities from A (very good) to E (very poor). Methodology for development of this index, condition categories and testing procedure is explained in detail in Paice and Chambers (2023).

The Index is based on the condition of these communities during spring, when maximum biomass and diversity is present in the system. This is to allow annual comparison of indicators when macroinvertebrate populations are at their highest to monitor the aim "to maintain diversity and dominance of macrophytes". Aquatic plants have an annual life cycle, with senescence each year in summer as water level declines and temperature and salinity increase. Problem growth of macroalgae and phytoplankton can occur during this time. Future summer monitoring of aquatic plant communities will also contribute to our understanding of system health.

Key findings and observations 2021

- Healthy macrophyte communities were present across the Vasse-Wonnerup wetlands with high to very high density of key species but moderate growth of macroalgae throughout the Vasse Estuary and in the upper Wonnerup.
- High key species density on the upper Vasse is encouraging given concerns about elevated macroalgal growth in that region.
- Although key species density in the upper Vasse was high, *Althenia cylindrocarpa* was uncommon compared with historical distribution.
- The lower Vasse had excellent density of macrophytes in 2021 (highest reported) and greater dominance over macroalgae compared with previous years.
- The upper Wonnerup had healthy macrophyte growth despite higher than usual macroalgal levels. Extensive growth of *Lamprothamnium macropogon* continued in this region and *Ruppia spp.* density was higher than previous years.
- The lower Wonnerup had a healthy aquatic plant community with high density of all key species and low macroalgal growth in 2021.

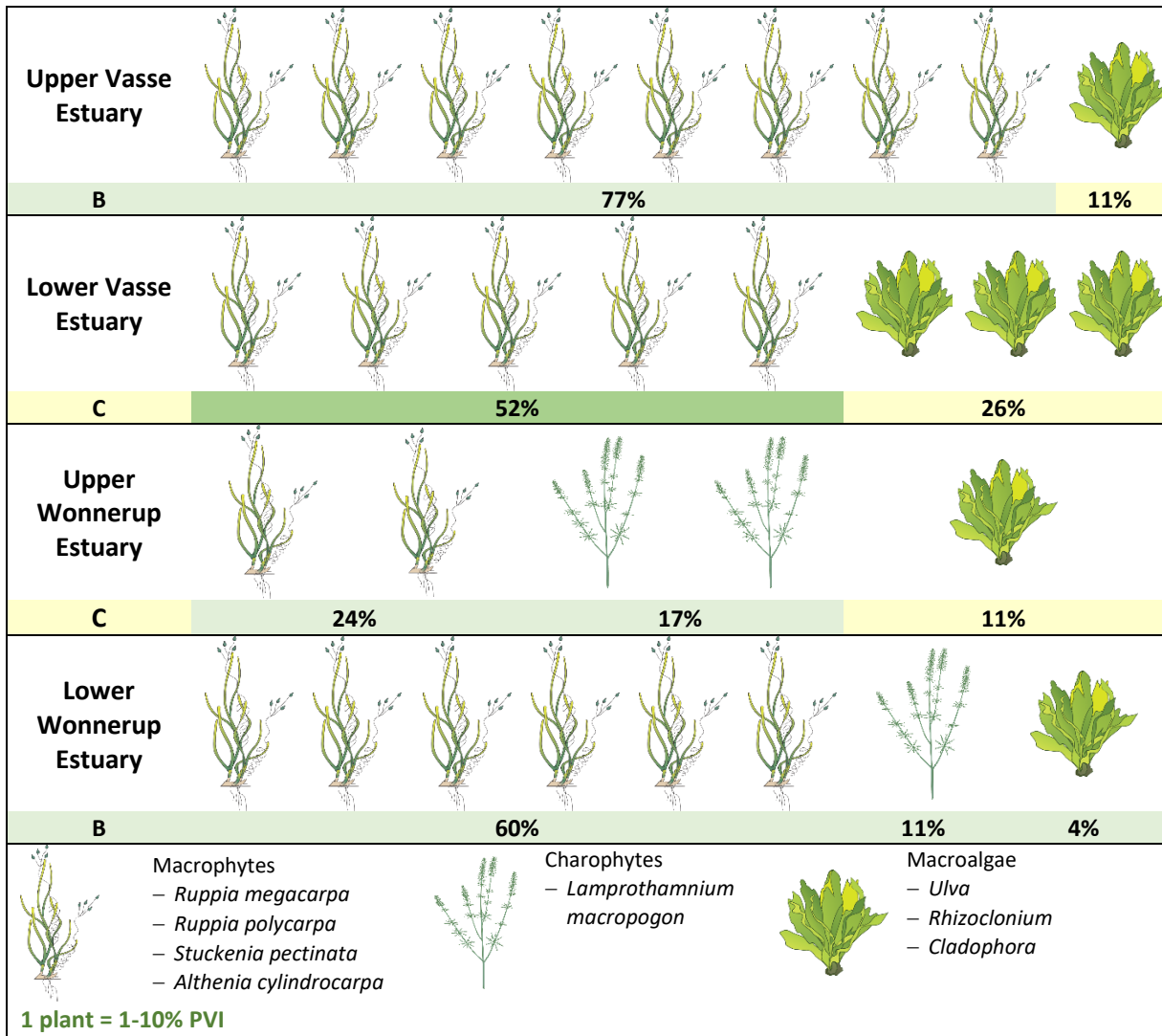
Whole-system condition rating

Indicator	Condition	Score	Description
Macrophyte Index	B	74	Healthy macrophyte community with some macroalgae present
Key Species	B	75	Key species density high
Macrophyte Dominance	C	73	Macroalgae growth may impact macrophytes

Ecological region condition ratings

Ecological region	Indicator	Score	Rating
Upper Vasse	Macrophyte Index	79	B
	Key species	77	B
	Macrophyte dominance	82	C
Lower Vasse	Macrophyte Index	69	C
	Key species	84	A
	Macrophyte dominance	54	C
Upper Wonnerup	Macrophyte Index	68	C
	Key species	67	B
	Macrophyte dominance	70	C
Lower Wonnerup	Macrophyte Index	83	B
	Key species	75	B
	Macrophyte dominance	91	B

Summary of PVI results



Aquatic plant community description overview

In spring 2021 aquatic plant communities were relatively healthy across the whole of the Vasse-Wonnerup wetlands with high density of key species overall. While macrophytes remained dominant, macroalgal growth was at levels with potential to impact macrophyte community health.

Elevated density of macroalgae occurred in the upper and lower Vasse and the upper Wonnerup regions. Despite this, growth of key species in these regions was high to very high. The lower Wonnerup had both high macrophyte species density and low macroalgae.

In the upper Vasse Estuary plant community health in 2021 was relatively good compared to 2019 and 2020. Macroalgae growth was elevated and included *Ulva*, *Cladophora* and *Rhizoclonium*, but this was lower than 2020 and did not prohibit development of high density of key species. *Ruppia* spp. were the major key species present, and it is notable that *Althenia cylindrocarpa* was only found at one transect point in 2021 whereas it has historically been widespread. In contrast *Stuckenia pectinata*, which is not a key species in the upper Vasse, was common and had the highest recorded density.

The lower Vasse Estuary had moderate healthy community of aquatic plants in 2021, with the index rating at borderline B-C. This was due to moderately high levels of macroalgal growth, which was mostly *Ulva* although *Cladophora* and *Rhizoclonium* were also present. Key species density was excellent despite the presence of macroalgae and *Stuckenia pectinata* was the most common species throughout this region. 2021 had the highest density of macrophytes in the lower Vasse since 2017 and both species density and macrophyte dominance were better than previous years.

The upper Wonnerup macrophyte community had moderately good condition in 2021 with an index value just below the C-B border. This lower macrophyte index rating compared with 2018-2020 is due to higher macroalgae growth. *Ulva* was common throughout this region and observed growing throughout the water column, while *Cladophora* was also widespread at low density. *Lamprothamnium macropogon* was common and widespread as seen in previous years, however *Ruppia* spp. density was higher than previous years.

The lower Wonnerup region had a healthy macrophyte community with good macrophyte index and metric ratings. High density of key species has been maintained since 2020, and low growth of macroalgae since 2018 in this region. *Ruppia megacarpa* continues to dominate deeper channel sections in this region, with *Stuckenia pectinata* and *Lamprothamnium macropogon* more common in shallow expanses.

2017-2021 Results summary

Ecological region	Year	Macrophyte Index	Key species	Macrophyte dominance
Upper Vasse	2021	B	B	C
	2020	D	C	D
	2019	C	C	C
	2018	B	B	C
	2017	C	C	C
Lower Vasse	2021	C	A	C
	2020	D	C	D
	2019	C	B	D
	2018	C	B	C
	2017	E	D	E
Upper Wonnerup	2021	C	B	C
	2020	B	B	A
	2019	B	B	A
	2018	B	B	B
	2017	C	C	C
Lower Wonnerup	2021	B	B	B
	2020	B	B	A
	2019	B	C	B
	2018	B	B	A
	2017	C	B	C

2017-2021 Macrophyte Index testing outcomes

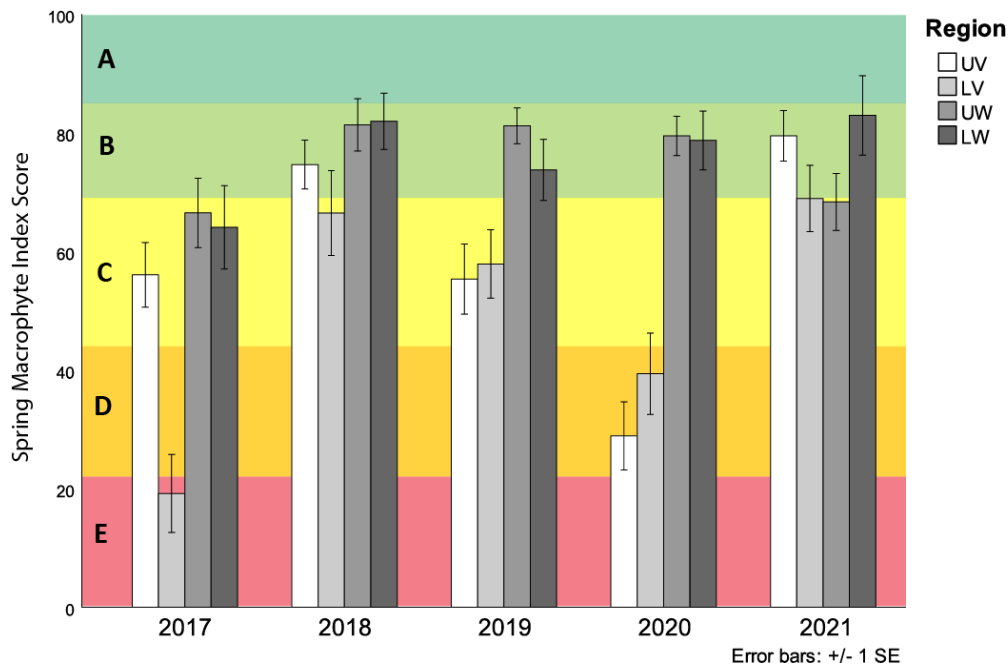


Figure 1. Spring macrophyte index scores relative to condition categories in ecological regions of the Vasse-Wonnerup Wetlands 2017-2021. Values are average of transect points in each region \pm SE. (Regions: UV = upper Vasse, LV = lower Vasse, UW = upper Wonnerup, LW = lower Wonnerup).

2017-2021 Species density in ecological regions

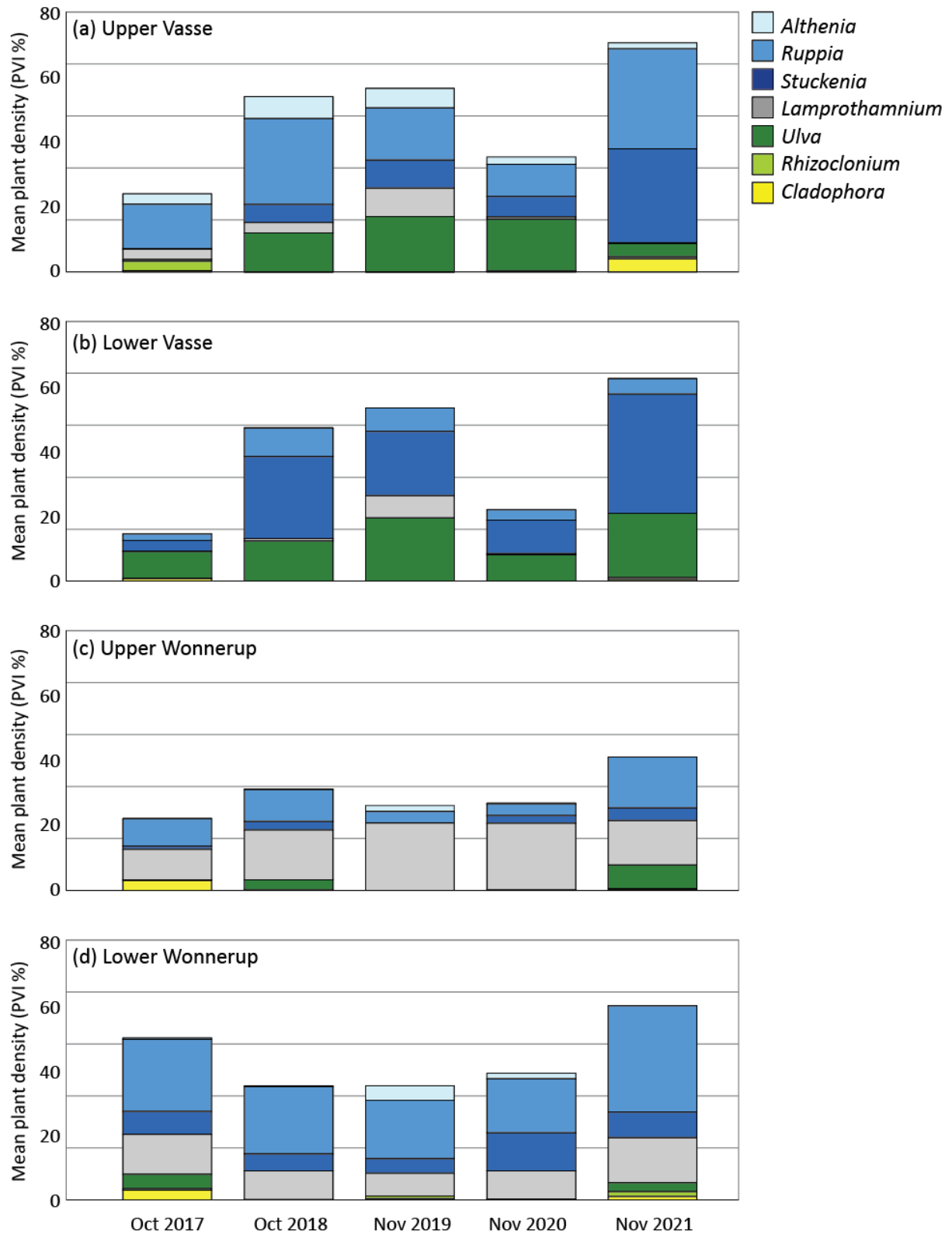


Figure 2. Mean species density of aquatic plants in each ecological region of the Vasse-Wonnerup Wetlands in spring as percent volume inhabited (PVI) from 2017-2021.