

Lake Monjilup

South Coast Wetland Monitoring Project

June 2008

which rates as average based on the Ribbons of Blue Wetland Habitat Score.

Conclusion

Lake Monjilup is a brackish to saline wetland and is influenced by both groundwater and surface water from the catchment including the northern creek line from the upper catchment which is affected by secondary salinisation. Total nutrients and available nutrients in the swamp were consistently high resulting in high productivity. The main consideration for Lake Monjilup is to maintain the integrity and protection of this wetland and surrounding vegetation as it is important for preservation, recreation and parkland. In protecting this wetland it is also important to consider catchment inputs of nutrients and salts.

Some knowledge gaps were identified during the investigation, monitoring and data analysis for this wetland which should be addressed to improve understanding of the water quality and biodiversity and to detect changes over time. The monitoring period was relatively short and some effects of previous and current land use change and management may not yet be evident. Macroinvertebrates would need to be identified to family or species level to allow more detailed analysis of ecological condition and relationship to other wetland characteristics. The hydrology of the wetland and its catchment is not fully understood or monitored, particularly the interaction between groundwater and surface water. A future monitoring program should be developed to address these issues.

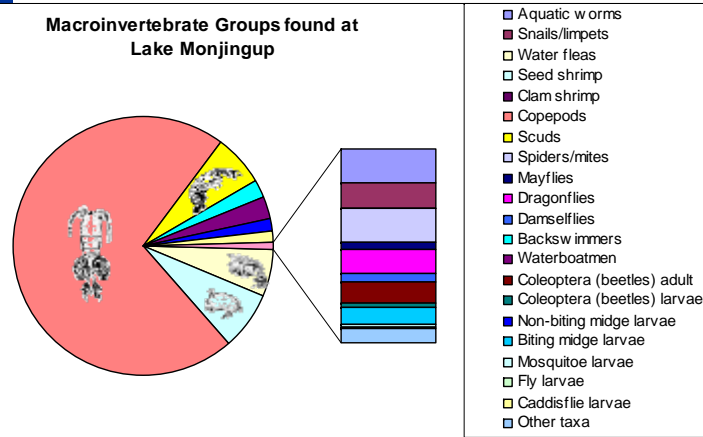
Acknowledgements

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- Sherrie Randall and Tracy Calvert for data analysis and report compilation.

For further information please contact Tracy Calvert at the Department of Water Albany (08) 9842 5760.

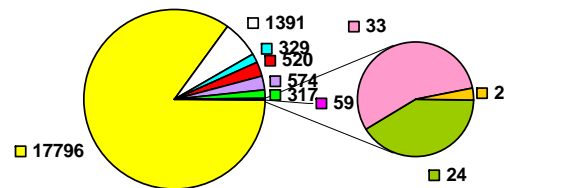
Macroinvertebrate Groups found at Lake Monjilup



Each group of Macroinvertebrate play a different role in the food chain, some feed on organic material (Shredders), others feed on fine organic particles (Collectors/filter feeders), others graze on algae (Scrapers), some feed on each other (Predators), others are parasitic (Parasites) and some are Macrophyte piercers that feed off living plants and algae fluids. These groups are called Functional Feeding Groups (FFG). Some Macroinvertebrates fit into more than one of these groups, for example the Water Boatman is a Predator, a Scraper and a Macrophyte piercer.

A healthy wetland should have a representative of each functional feeding group. A loss or dominance in a particular group may indicate a change in ecology of the wetland. The composition of these groups at Lake Monjilup are displayed in the below graph.

Macroinvertebrate Functional Feeding Group



- Collectors / Filter Feeders
- Scrapers
- Shredder
- Predator / Scrapers / Parasites
- Predators / Scrapers / Shredders / Filtering collectors / Gathering collectors
- Predator
- Predator / Scrapers / Macrophyte Piercers
- Predator / Scraper / Shredder
- Predators / Collectors / Filter Feeders

There appears to be a high number of collectors / filter feeders which could relate to high amount of suspended decomposing fine particulate organic matter in the wetland.

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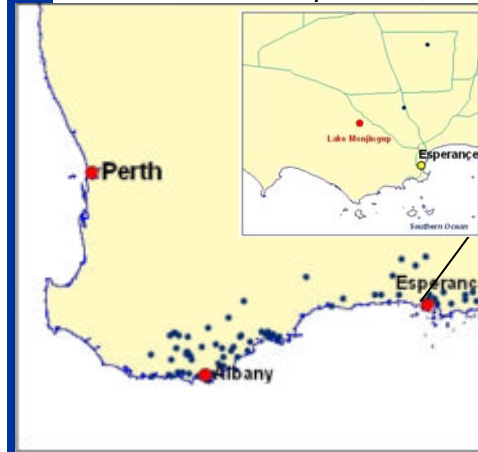
This report card summarises the current state of knowledge of physical, chemical and biological characteristics of Lake Monjilup based on the knowledge gained from investigation and monitoring conducted by the Department of Water through the South Coast Wetland Monitoring Program.

Accompanying this document are appendices that provide more detailed information about the wetland monitoring program, terminology of wetland classification, parameters monitored, methodology and the ANZECC&ARMCANZ guidelines used in this report.

Funding for this program has been provided through South Coast Natural Resource Management Inc. - supported by the Australian Government and the Government of Western Australia.

About Lake Monjilup

Lake Monjilup is located approximately 10.7km north west of Esperance, Western Australia, within the Coastal catchment and the smaller sub-catchment of Bandy Creek Catchment. The wetland lies at approximately 40m AHD (Australian Height Datum) and receives an annual average rainfall of 590mm.



Lake Monjilup is located on Crown Reserve (Reserve No.23043 for the purpose of preservation, recreation and parkland) which is vested with the Shire of Esperance within a small catchment of approximately 206.3km². The Swamp lies within a partially fenced wetland vegetation buffer zone that ranges between 140-1700m from the wetland edge.

Vegetation predominantly consists of mature *Melaleuca cuticularis* (saltwater paperbark) in the upper storey and *Gahnia trifida* and *Baumea articulata* in the understorey. There is a grassed picnic area on the eastern side of the lake and some areas that have been revegetated.



Grassed picnic area on the eastern shore of Lake Monjilup with *Melaleuca cuticularis* in the background.

Approximately 70% of the catchment has been cleared of native vegetation for agriculture including cropping and plantation timber.

Water quality monitoring commenced on the 19/12/2000 and included physical, chemical and biological parameters as outlined in the appendices.

Wetland Classification

Classification of Lake Monjilup has been



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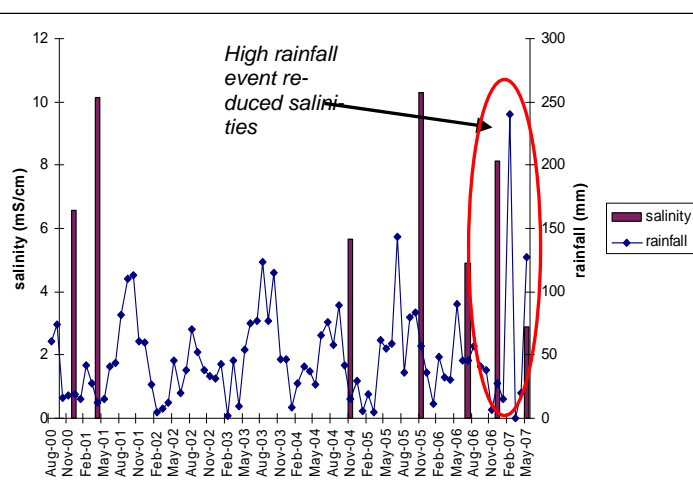
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Wetland type	Water Salinity	Consistency of Salinity	Size (Metres)	Shape
Lake	Subhaline - Hyposaline	Poikilohaline	Microscale 303 x 225	Irregular

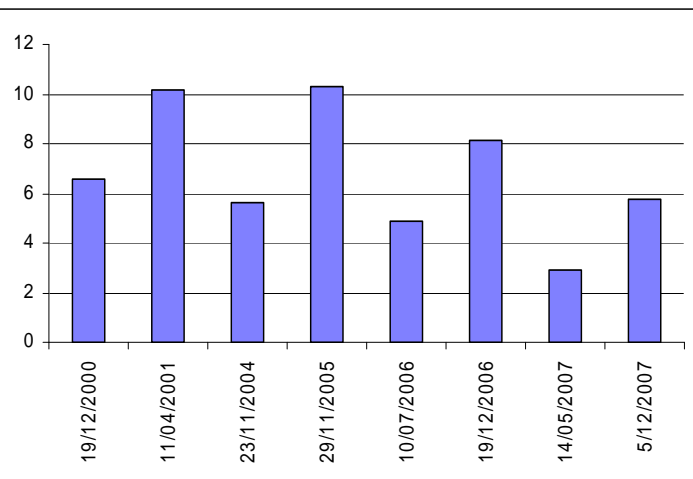
evaluated on the basis of guidelines developed by V & C Semeniuk Research Group (1997). For further explanation please refer to the appendices.

Salinity

Salinity over the sample period fluctuated between brackish (2.89mS/cm) and saline (10.31mS/cm). Fluctuations in salinities relate to seasonal fluctuations in rainfall which in turn determines the amount of catchment inputs to the wetland. A drainage line mobilises salts from secondary salinised land to the north which flows through the lake and then towards Lake Warden. During all rainfall events salts flow into Lake Monjilup which increases salinity however during high rainfall events the higher water volumes may reduce salinities. The storm event in February 2007 which brought approximately 240mm of rainfall influenced the reduction of salinity recorded on the 14/05/07.



Low salinities in May 2007 relate to high rainfall event February 2007



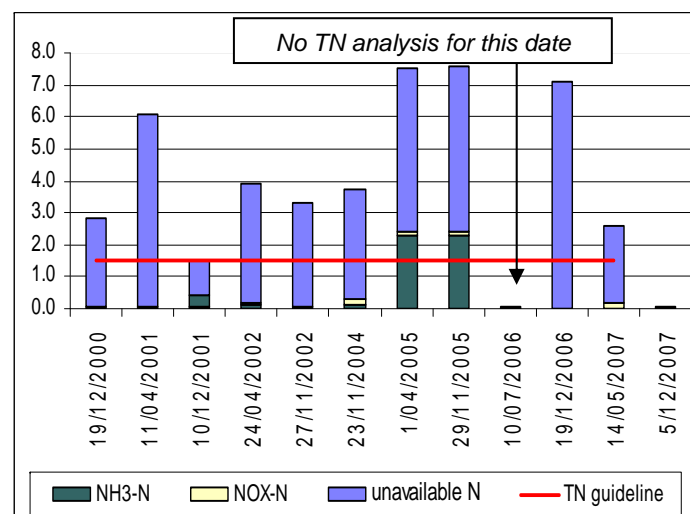
Salinities (mS/cm) over the sample period

Knowledge extrapolated from the Department of Environment and Conservation Lake Warden Natural Diversity Recovery Catchment Program considers that Lake Monjilup lies between two underlying Granite highs or ridges that discharge fresh water into the lake from surrounding deep sands and sloping shallow granite gravelly saprolite soils (Massenbauer 2008). Fresh inputs from groundwater dilute the salinity of in-flowing catchment drainage.

Nutrients

Total Nitrogen (TN) concentrations were high ranging from 1.5-7.6mg/L. TN concentrations on all sampling occasions exceeded the guidelines developed for ecosystem protection for southwest Australian wetlands for slightly disturbed systems of 1.5mg/L.

Dissolved inorganic nitrogen fractions of ammonia (NH₃-N) and total oxidised nitrogen (NO_x-N), ranged from 0.025-2.3mg/L and 0.01-0.38mg/L respectively. Seven of the twelve NH₃-N fraction samples exceeded the recommended guideline value of 0.04mg/L. In comparison, the NO_x-N fraction did not exceed the recommended value of 0.1mg/L on any occasion. Overall, there was a low percentage (1.4-21.8%) of available nitrogen (NH₄-N and NO_x-N) making up the total nitrogen (TN) on all sampling occasions.



Nitrogen fractions in mg/L over the sample period with TN guideline illustrated

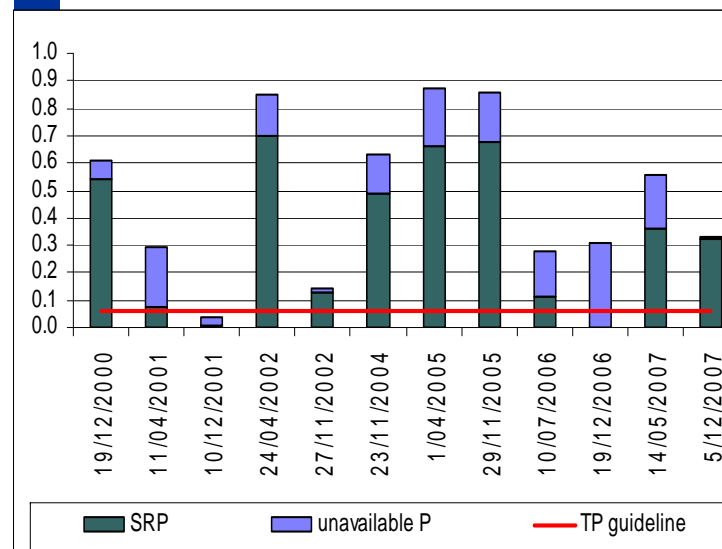
Total Phosphorus (TP) concentrations ranged from 1.5mg/L-3.5mg/L. TP concentrations on all sampling occasions exceeded water quality guidelines of 0.06mg/L.

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Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged from 1.0-2.6mg/L. In relation to water quality guidelines SRP exceeded the recommended value of 0.03mg/L on all sampling occasions. Of the total phosphorus there was a very high percentage (24.3-97%) of available phosphorus on all sampling occasions.



Phosphorus fractions in mg/L over the sample period with TP guideline illustrated

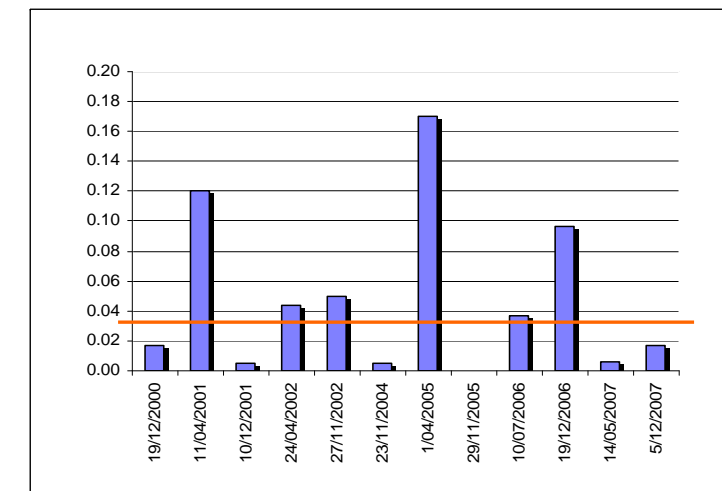
Nutrients are recycled naturally through the lake due to uptake and assimilation of nutrients by plants and animals and through release of nutrients for example through microbial breakdown of organic material.

Catchment nutrient stores may enter Lake Monjilup through surface and sub surface flow from the surrounding land, via the creek line and through groundwater.

High proportions of total nitrogen may relate to the occurrence of algae blooms and stores of nitrogen within phytoplankton. Low proportions of available nitrogen can indicate the majority is being readily taken up by plants and animals while the remainder may be bound up in organic matter, or as dirt or dead cells that contain nitrogen.

Chlorophyll a

Chlorophyll a concentrations over the sample period ranged from 0.005-0.17 mg/L. Chlorophyll a exceeded the water quality guideline of 0.03mg/L on six of the twelve sampling occasions. A higher concentration of chlorophyll a is indicative of high nutrient content providing adequate food source for algal growth in Lake Monjilup.



Chlorophyll a (mg/L) over sample period in comparison to recommended guideline value of 0.03mg/L.



Dark coloured water of Lake Monjilup

Macroinvertebrates

Twenty groups of macroinvertebrates were found at Lake Monjilup during the monitoring period of which the most abundant included; Copepoda (copepods), Ostracoda (seed shrimp), Cladocera (water fleas), Amphipoda (scuds), Corixidae (waterboatmen), Notonectidae (backswimmers), Chironomidae (non-biting midge larvae), Trichoptera (caddisfly larvae).

Other groups of less abundance were found including; Oligochaeta (aquatic worms), Acarina (spiders/mites), Gastropoda (snails/limpets), Ephemeroptera (mayflies), Epiproctophora (dragonflies), Zygoptera (damselflies), Coleoptera (beetles) adult, Coleoptera (beetles) larvae, Ceratopogonidae (biting midge larvae), Culicidae (mosquito larvae), Other Diptera (fly larvae) and Other taxa.

The diversity of macroinvertebrates found over the sample period ranged between four to nineteen groups with a median of thirteen,