Lake Byleveld

The high number of Predator/Scraper/Shredders may be due to the type of rush *Baumea articulata* on the fringes of the wetland which provides a good protective case for the Trichoptera (caddisflie larvae). This rush also collects a film of algae at its base when submerged in water, which also provides a food source for the Scrapers.

Conclusion

Lake Byleveld receives fresh water inputs from surface runoff and sub surface flow and ranges between fresh and marginal salinity. Connection with the groundwater is not likely as the wetland recharges the groundwater which discharges to the ocean via a steep gradient. Nutrient concentrations occasionally exceeded guideline levels but were generally not of concern, potentially due to the relatively uncleared catchment. The main consideration for Lake Byleveld is to maintain the integrity and protection of this system.

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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- William Bay National Parks Association Inc. for their time and commitment in helping with the monitoring program.
- Ruhi Ferdowsian (Department of Agriculture and Food, Albany) for providing knowledge of the hydrogeology associated with Lake Byleveld.
- Ania Lorenz, Sherrie Randall, Kevin Hopkinson, and Albany Department of Water team who conducted the monitoring.
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- Sherrie Randall and Tracy Calvert for data analysis and report compilation.

Gavin Wilson from WBNPA helping surveying Lake Byleveld March 2007

WBNPA identifying macroinvertebrates at Lake Byleveld January 2006

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

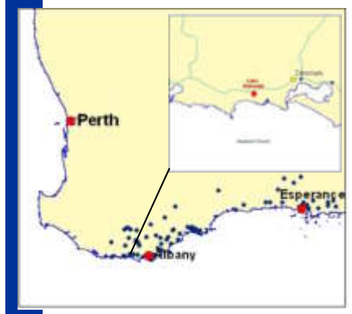
South Coast Wetland Monitoring Project June 2008

This report card summarises the Department of Water's current state of knowledge of the physical, chemical and biological characteristics of Lake Byleveld 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 the South Coast Natural Resource Management Inc. - supported by the Australian Government and the Government of Western Australia.

About Lake Byleveld



Lake Byleveld is located on the coast approximately 13.8km west of Denmark, in Western Australia in the Kent River Basin but in an ill-defined coastal catchment. The wetland is at approximately 32m AHD (Australian Height Datum) and the area receives an annual average rainfall of 900mm.

Lake Byleveld is situated in the William Bay National Park managed by the Department of Environment and Conservation. Lake Byleveld has a catchment of approximately 6km^2 and the wetland and surrounded by native vegetation extending to the coast.

Vegetation predominantly consists of *Taxandria juniperina* in the upper storey and *Baumea articulata* and various sedges and rushes in the understorey. Other plants that exist in the bushland around the lake include *Eucalyptus occidentalis* (Yate), *Eucalyptus Cornuta* and *Melaleuca cuticularis* (saltwater paperbark).

	GPS Location Coordinates		
Wetland Suite	**Easting**	**Northing**	**MGA Zone**
William Bay	520799	6127126	50

Lake Byleveld

Taxandria juniperina near sample point

Taxandria juniperina and Baumea articulata at Lake Byleveld

Approximately 35% of the catchment has been cleared of native vegetation for cropping, livestock and tree plantations.

Water quality monitoring commenced in November 2005 which included physical, chemical and biological parameters as outlined in the appendices.

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Lake Byleveld

South Coast Wetland Monitoring Project — **June 2008**

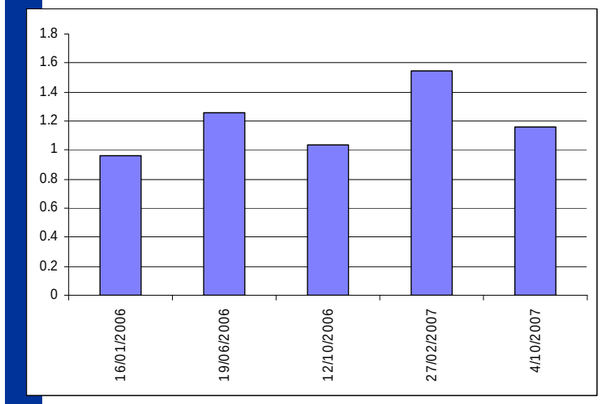
Wetland Classification

Wetland type	*Water Salinity*	*Consistency of Salinity*	*Size (Metres)*	*Shape*
Lake	Fresh	Stasohaline	Microscale 570 x 385	Irregular

Classification of Lake Byleveld has been evaluated on the basis of guidelines developed by V & C Semeniuk Research Group. For further explanation please refer to the appendices.

Salinity

Salinity over the sample period ranged between fresh (0.96mS/cm) and marginal (1.5mS/cm). Fluctuations in salinities relate to seasonal fluctuations in rainfall, evaporation and hence water level variation.



Salinity (mS/cm) over the sample period

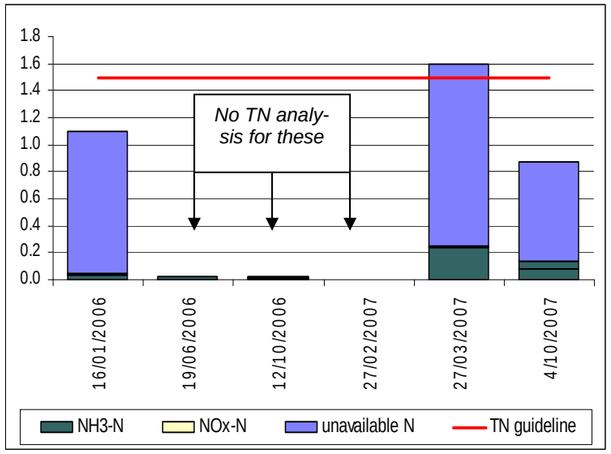
Lake Byleveld lies within a fault between adjacent granite hills and formed due to subsidence of land and migration of coastal clays. Due to faulting, a deep outlet channel was formed on the eastern side of the lake which previously flowed to the ocean but has since been cut off due to migration and sand dune formation.

Lake Byleveld receives fresh surface runoff and sub surface flow from surrounding land and since the clogging of the former discharge channel, water stores in Lake Byleveld and recharges the groundwater. The steep gradient to the ocean makes it unlikely that there is groundwater connection or a problem with salinity in the lake in the near future.

Nutrients

Total Nitrogen (TN) concentrations ranged between 0.87-1.6mg/L which exceeded the guidelines developed for ecosystem protection for southwest Australian wetlands for slightly disturbed systems of 1.5mg/L on one sample occasion.

Dissolved inorganic nitrogen fractions of ammonia (NH_3-N) ranged between 0.01-0.24mg/L which exceeded the recommended guideline value of 0.04mg/L on two of the four sample occasions. Total oxidised nitrogen (NOx-N) ranged between 0.01-0.061mg/L which exceeded the recommended guideline value of 0.1mg/L on one of the five sample occasions.



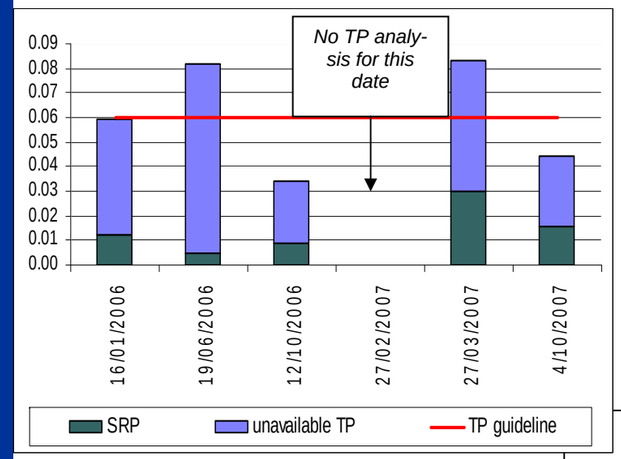
Nitrogen fractions in mg/L over the sample period with TN guideline illustrated

Total Phosphorus (TP) concentration ranged between 0.034-0.083mg/L which exceeded the water quality guidelines of 0.06mg/L on two of the five sample occasions.

Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged between 0.005-0.016mg/L which did not exceed the recommended water quality guideline value of 0.03mg/L on any sample occasion.

Lake Byleveld

South Coast Wetland Monitoring Project — June 2008



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

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

Nutrients stores in the catchment sediments may also enter Lake Byleveld through surface runoff and sub surface flow.

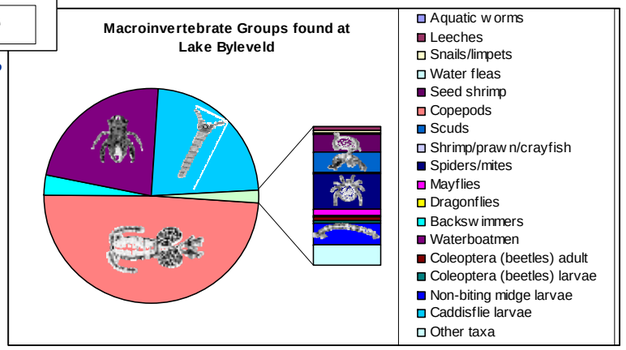
Macroinvertebrates

Eighteen groups of macroinvertebrates were found at Lake Byleveld during the monitoring period of which the most abundant included Copepoda (copepods), Corixidae (waterboatmen), Notonectidae (backswimmers), and Trichoptera (caddisflie larvae).

Other groups of less abundance were found including; Oligochaeta (aquatic worms), Hirudinea (leeches), Gastropoda (snails/ limpets), Cladocera (water fleas), Ostracoda (seed shrimp), Amphipoda (scuds), Decopoda (shrimp/prawn/crayfish), Acarina (spiders/ mites), Ephemeroptera (mayflies), Epiproctophora (dragonflies), Coleoptera (beetles) adult, Coleoptera (beetles) larvae, Chironomidae (non-biting midge larvae), and Other taxa.

The diversity of macroinvertebrates found over the sample period ranged between seven to seventeen groups with a median of thirteen, which rates as average based on the Ribbons of Blue Wetland Habitat Score.

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 Byleveld are displayed in the below graph.

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.