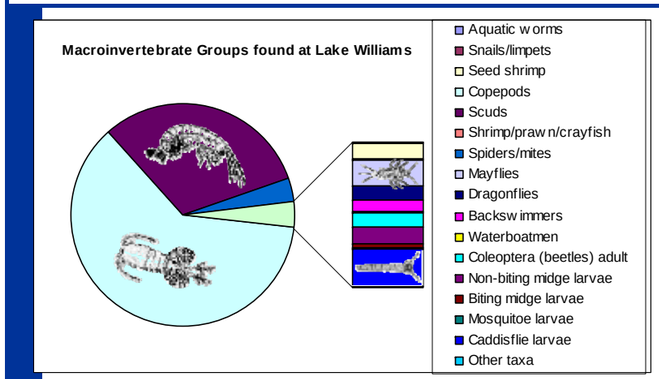
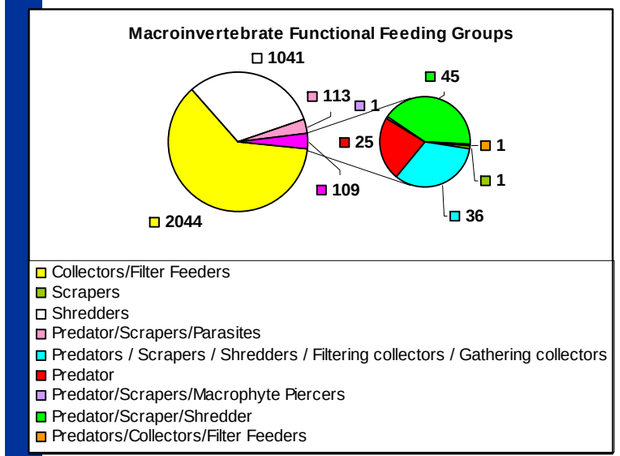
Lake Williams

South Coast Wetland Monitoring Project **June 2008**



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 Williams are displayed in the below graph. There appears to be a higher number of collectors / filter feeders which could relate to high amount of suspended decomposing fine particulate organic matter in the wetland. Shedders also appear to be high which could be due to the availability of vegetation in the wetland eg. *Triglochin sp. (water ribbons) and Myriophyllum sp.*



Conclusion

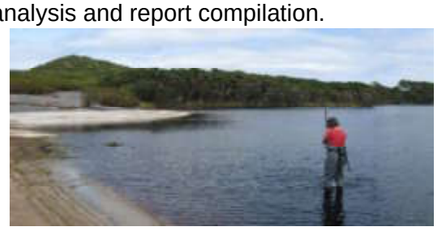
Lake Williams receives fresh water from surface runoff and sub surface flow from surrounding land and ranges in salinity between fresh and marginal. The lake was once part of an old valley system that flowed to the ocean which has now been blocked by sand dune formation. Nutrient levels were consistently high, particularly the form of phosphorus available for plant growth. Primary productivity however appeared to be low which is due to the limited light availability due to the naturally dark coloured water. The main consideration for Lake Williams is to maintain the integrity and protection of the 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

The Department of Water would like to sincerely thank and acknowledge the following people for their assistance and contribution toward the South Coast Wetland Monitoring Program and production of this report.

- Ruhi Ferdowsian (Department of Agriculture and Food, Albany) for providing knowledge of the hydrogeology associated with Lake William's.
- Ania Lorenz, Sherrie Randall, Kevin Hopkinson, and Albany Department of Water team who conducted the monitoring.
- Kevin Hopkinson, Naomi Arrowsmith, Andrew Maughan and others for their support and editing assistance.
- 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.

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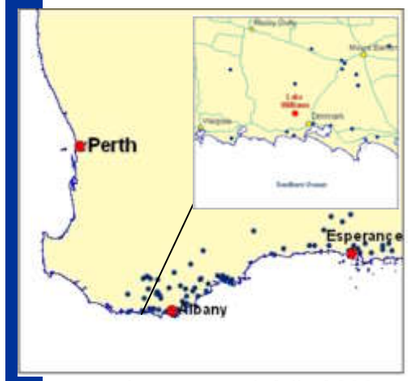
This report card summarises the Department of Water's current state of knowledge of the physical, chemical and biological characteristics of Lake Williams based on the knowledge gained from investigation and monitoring conducted by the Department of Water through the South Coast Wetland Monitoring Program.

Accompanying this document are appendices which 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 Williams



Lake Williams is located on the coast approximately 11km west of Denmark in Western Australia within an ill-defined coastal catchment. The wetland is at approximately 20m AHD (Australian Height Datum) and the area receives an annual average rainfall of 900mm.

	GPS Location Coordinates		
Wetland Suite	*Easting*	*Northing*	*MGA Zone*
Overton Suite	524652	6125062	50

Lake Williams is located in the William Bay National Park which is vested with the Department of Environment and Conservation. The wetland has a catchment of approximately 6km^2 and is surrounded by native vegetation extending to the coast.

Lake Williams

Vegetation surrounding Lake Williams

Vegetation predominantly consists of *Taxandria juniperina* in the upper storey, *Callistachys lanceolata, Rhadinothamnus anceps (blister bush), Taxandria marginate* in the mid storey and various rushes including *Baumea articulata* and Velvet Rush in the understorey. *Triglochin sp. (water ribbons) and Myriophyllum sp* has been observed growing in the water.

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Approximately 20% of the catchment has been cleared of native vegetation for cropping, livestock and now tree plantations.

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

Lake Williams was formed due to subsidence of land and migration of coastal clays. The lake is situated within an old valley system that previously flowed to the ocean but has since been cut off due to sand dune formation and migration. Lake Williams receives fresh surface runoff and sub surface flow from surrounding land. The coarse sediments, steep gradient to the ocean and the high rainfall zone makes it unlikely that there the wetland would ever be affected by contact with saline groundwater.

Wetland Classification

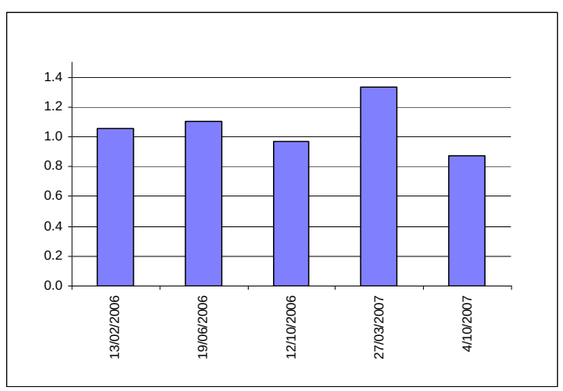
Wetland type	*Water Salinity*	*Consistency of Salinity*	*Size (Metres)*	*Shape*
Lake	Hypersaline - Brine	Poikilohaline	Macroscale 1540 x 1255	Irregular - Round

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

Triglochin sp. (water ribbons) growing in Lake Williams

Salinity

Salinity over the sample period ranged between fresh (0.87mS/cm) and marginal (1.3mS/cm). Fluctuations in salinities relate to seasonal fluctuations in rainfall, evaporation and water levels.

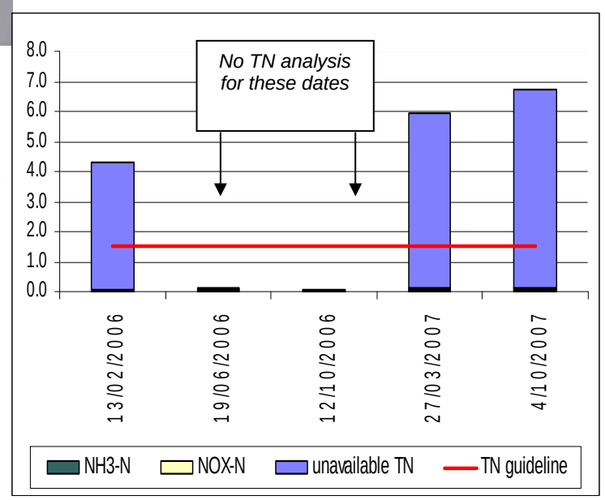


Salinity (mS/cm) over the sample period

Nutrients

Total Nitrogen (TN) concentrations ranged between 1.4-2.0mg/L which exceeded the guidelines developed for ecosystem protection for southwest Australian wetlands for slightly disturbed systems of 1.5mg/L on all sample occasions.

Dissolved inorganic nitrogen fractions of ammonia (NH_3-N) ranged between 0.037-0.076mg/L which exceeded the recommended guideline value of 0.04mg/L on four of the five sample occasions. Total oxidised nitrogen (NOx-N) ranged between 0.01-0.056mg/L which did not exceed the recommended guideline value of 0.1mg/L on any sample occasion.



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

Total Phosphorus (TP) concentration ranged between 0.097-0.19mg/L which exceeded the water quality guidelines of 0.06mg/L on all sample occasions.

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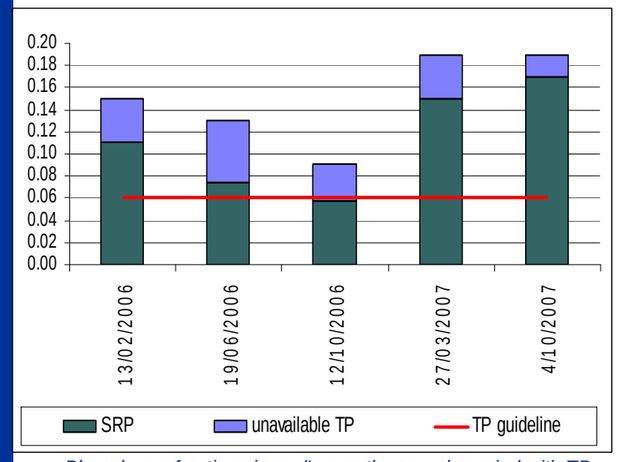
Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged between 0.05-0.17mg/L which exceeded the recommended water quality guideline value of 0.03mg/L on all sample occasions. Of the total phosphorus there was a very high percentage (57-90%) of available phosphorus on all sampling occasions.



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

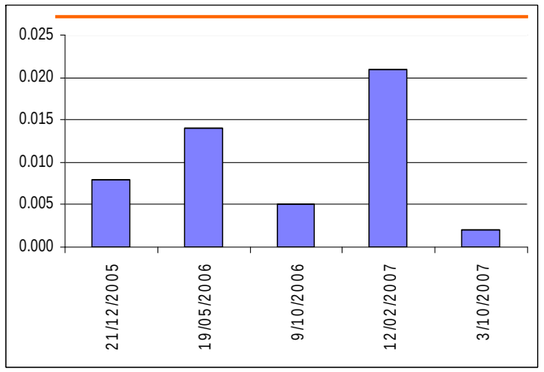
Nutrients are recycled naturally through the swamp due to uptake and assimilation of nutrients by plants and animals and through release of nutrients for example through microbial breakdown of organic material.

Catchment nutrients stores may enter Lake Williams through surface runoff and sub surface flow from the surrounding land.

Chlorophyll a

Despite high amounts of available nutrients, Chlorophyll *a* concentrations on all sample occasions were low (0.001-0.003mS/cm) and did not exceed the recommended water quality guideline of 0.03mg/L. Low concentrations of chlorophyll *a* relate to the highly coloured nature of the wetland which reduces light penetration through the water column and the ability for algae to photosynthesis and grow.

Highly coloured nature of the water at Lake Williams



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

Macroinvertebrates

Seventeen groups of macroinvertebrates were found at Lake Williams during the monitoring period of which the most abundant included; Copepoda (copepods), Amphipoda (scuds), and Acarina (spiders/mites).

Other groups of less abundance were found including; Oligochaeta (aquatic worms), Gastropoda (snails/limpets), Ostracoda (seed shrimp), Decopoda (shrimp/prawn/crayfish), Ephemeroptera (mayflies), Epiproctophora (dragonflies), Notonectidae (backswimmers), Corixidae (waterboatmen), Coleoptera (beetles) adult, Chironomidae (non-biting midge larvae), Ceratopogonidae (biting midge larvae), Culicidae (mosquitoe larvae), Trichoptera (caddisflie larvae) and Other taxa.

The diversity of macroinvertebrates found over the sample period ranged between ten to thirteen groups with a median of twelve 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.