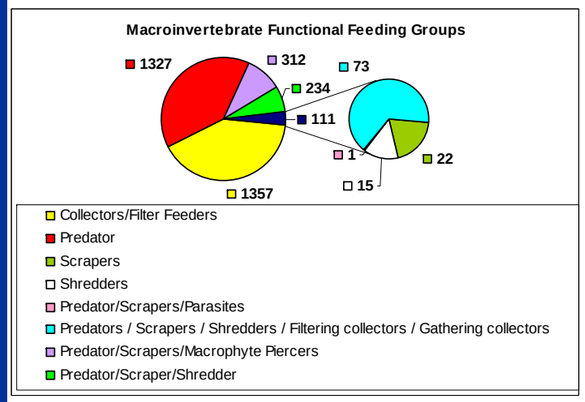
Swan Lake

South Coast Wetland Monitoring Project **June 2008**

change in ecology of the wetland. The composition of these groups at Swan Lake are displayed in the below graph.



Collectors / Filter Feeders and Predators appear to be the most dominant groups yet the groups appear to be fairly evenly represented.

Conclusion

Swan Lake is a brackish to moderately saline wetland receiving water from surface runoff, sub surface flow and via the three drainage lines entering from the north. Despite the lake being perched above the groundwater, saline water enters the lake through sub-surface flow and seeps along the water courses. Nutrient levels are usually reasonably low although the available forms of nitrogen have ben high on occasions. The main consideration for Swan Lake is the *Microcystis flos-aquae* blooms that appear to occur over summer months. This is of particular concern as the lake is a popular recreational and skiing lake and contact with toxic algae should be avoided.

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.

Lisa Braun filtering water for chlorophyll a and nutrients

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 Swan Lake.
- 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.

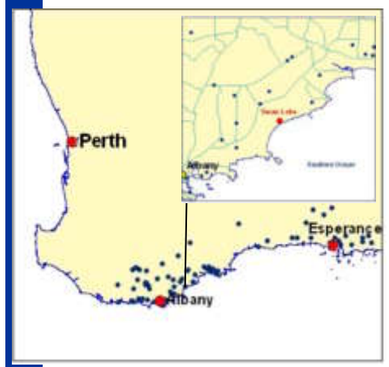
South Coast Wetland Monitoring Project **June 2008**

This report card summarises the Department of Water's current state of knowledge of the physical, chemical and biological characteristics of Swan Lake 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 Swan Lake



Swan Lake is located near the coast approximately 73km east of Albany in Western Australia within the catchment of Mullocullop Creek. The wetland is at approximately 15m AHD (Australian Height Datum) and the area receives an annual average rainfall of 645mm.

	GPS Location Coordinates		
Wetland Suite	*Easting*	*Northing*	*MGA Zone*
Swan Lake Suite	634795	6156816	50

Swan Lake is located near the coast approximately 73km east of Albany in Western Australia within the catchment of Mullocullop Creek. The wetland is at approximately 15m AHD (Australian Height Datum) and the area receives an annual average rainfall of 645mm.

Swan Lake is located on Crown Reserve and a number of private properties within a catchment of approximately 11km^2. The Lake lies within unfenced wetland vegetation buffer zone that extends approximately 0-750m from the wetland edge. There is public access to the lake which is popular for recreation and skiing.

Vegetation in the upper storey consists of *Eucalyptus occidentalis* (Yate), *Agonis* flexuosa, *Melaleuca cuticularis* (saltwater paperbark) in the mid storey and sparse *Baumea articulata* in the understorey.

Swan Lake

Riparian Vegetation around Swan Lake

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Swan Lake

South Coast Wetland Monitoring Project **June 2008**

Approximately 60% of the catchment has been cleared of native vegetation for livestock and now tree plantation.

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

Wetland Classification

Wetland type	*Water Salinity*	*Consistency of Salinity*	*Size (Metres)*	*Shape*
Lake	Subhaline - Hyposaline	Poikilohaline	Mesoscale 980 x 755	Irregular

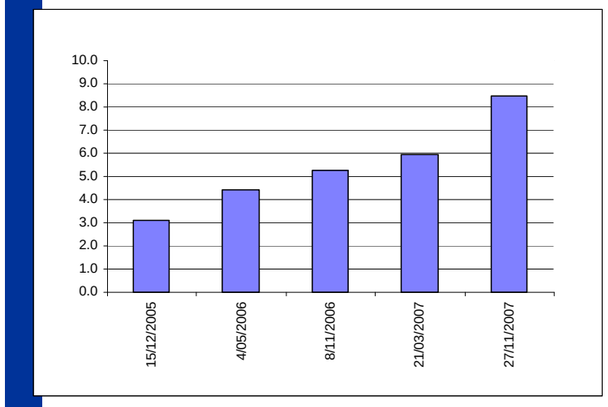
Classification of Swan Lake has been evaluated on the basis of guidelines developed by V & C Semeniuk Research Group. For further explanation please refer to the appendices.

Salinity

Salinity over the sample period ranged between Brackish (3.13mS/cm) and moderately saline (5.97mS/cm). Fluctuations in salinities relate to seasonal fluctuations in rainfall, evaporation and water levels.

Historically the lake would have acted like an estuary and drained to the ocean however it is likely that wind migration of sand dunes and infilling of creek lines has separated the lake from the ocean.

Salt may enter Swan Lake through surface and sub surface flow and through the three drainage channels entering the lake. Although the lake is perched above and recharges the groundwater, saline groundwater may discharge to the creek lines to the north.

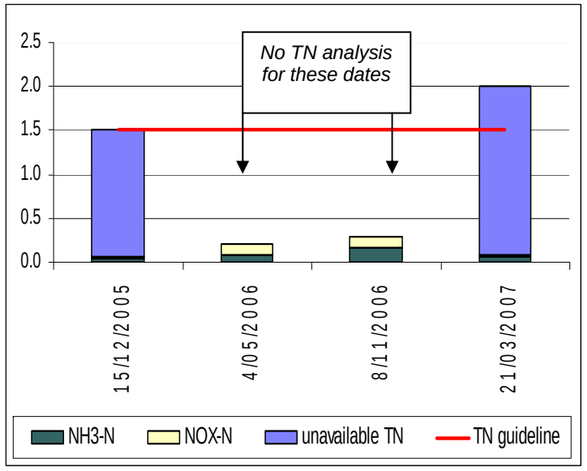


Salinity (mS/cm) over sample period

Nutrients

Total Nitrogen (TN) concentrations ranged between 0.85-2mg/L which exceeded the guidelines developed for ecosystem protection for southwest Australian wetlands for slightly disturbed systems of 1.5mg/L on one of the three sample occasions.

Dissolved inorganic nitrogen fractions of ammonia (NH_3-N) ranged between 0.01-0.17mg/L which exceeded the recommended guideline value of 0.04mg/L on two of the five sample occasions. Total oxidised nitrogen (NOx-N) ranged between 0.01-0.13mg/L which exceeded the recommended guideline value of 0.1mg/L on two of the five sample occasions.



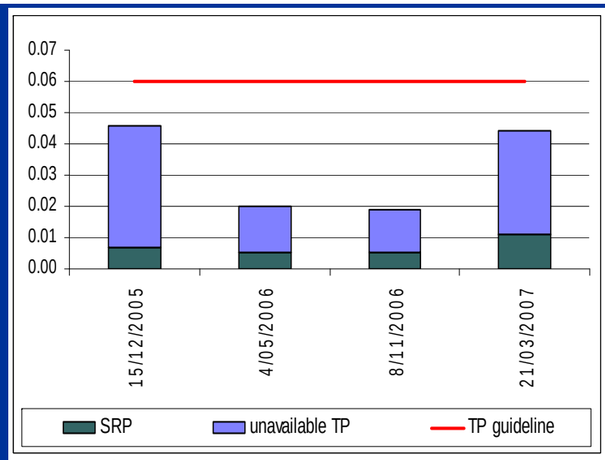
Nitrogen fractions in mg/L over the sample period with TN guideline illustrated

Total Phosphorus (TP) concentration ranged between 0.016-0.046mg/L which did not exceed the water quality guidelines of 0.06mg/L on any sample occasion.

Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged between 0.005-0.01mg/L which did not exceed the recommended water quality guideline value of 0.03mg/L on any sample occasion.

Swan Lake

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 may enter Swan Lake through surface and sub surface drainage flow from the surrounding land and through the three drainage channels.

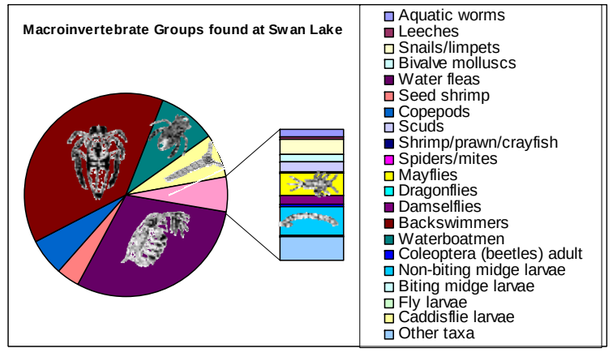
The low levels of nutrients may mean they have been readily taken up for growth by plants and algae. During sampling in March 2007 there was a thick scum of *Microcystis flos-aquae,* a cyanobacterium which can be toxic at high densities to humans and animals. Another bloom was observed after summer 2008 also.

Microcystis flos-aquae *(cyanobacterium) accumulation on shoreline of Swan Lake*

Macroinvertebrates

Twenty one groups of macroinvertebrates were found at Swan Lake during the monitoring period of which the most abundant included; Cladocera (water fleas), Ostracoda (seed shrimp), Copepoda (copepods), Notonectidae (backswimmers), Corixidae (waterboatmen), and Trichoptera (caddisflie larvae).

Other groups of less abundance were found including; Oligochaeta (aquatic worms), Hirudinea (leeches), Gastropoda (snails/limpets), Bivalvia (bivalve molluscs), Amphipoda (scuds), Decopoda (shrimp/prawn/crayfish), Acarina (spiders/mites), Ephemeroptera (mayflies), Epiproctophora (dragonflies), Zygoptera (damselflies), Coleoptera (beetles) adult, Chironomidae (non-biting midge larvae), Ceratopogonidae (biting midge larvae), Other Diptera (fly larvae), and Other taxa.



The diversity of macroinvertebrates found over the sample period ranged between nine to twenty one groups with a median of eleven 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