

Denmark Agriculture College Swamp



Denmark Ag College Swamp when dry 13th March 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 Denmark Agriculture College Wetland are displayed in the graph Macroinvertebrate Functional Feeding Groups.

Conclusion

Denmark Agriculture College Swamp was once a degraded wetland which has been under various stages of rehabilitation since 1994. It is a surface water fed wetland and consistently fresh. The swamp is perched above the groundwater in colluvial sediments. Total nutrient concentrations were high with available forms of nitrogen often above guideline levels but available forms of phosphorus usually below the guideline. Further investigation and monitoring will assist with further educational and management initiatives.

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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- 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.



Temporary Marker Location

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

Denmark Agriculture College Swamp

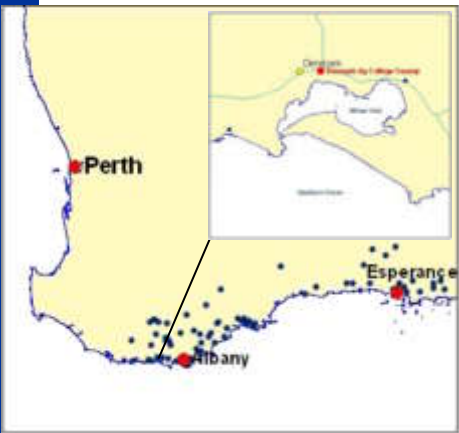
This report card summarises the Department of Water's current state of knowledge of the physical, chemical and biological characteristics of Denmark Agriculture College Swamp based on the knowledge gained from investigation and monitoring conducted by the Department of Water through the South Coast Wetland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

Accompanying this document are appendices providing 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 Denmark Agriculture College Swamp

Denmark Agriculture College Swamp is located near the coast approximately 6km east of Denmark in Western Australia within the Wilson Inlet catchment



and sub catchment of the Denmark River. The wetland is at approximately 10m AHD (Australian Height Datum) and the area receives an annual average rainfall of 980mm.

Denmark Agriculture College Swamp is located within a catchment of approximately 2.65km² on Denmark Agricultural College land which is vested in the Department of Education. The wetland was once regarded as a degraded swamp however since 1994 rehabilitation work (by Greenskills Denmark) has included revegetation and fencing, has been conducted to improve the wetland condition. A caravan is situated on the site for education and site demonstration purposes.

Vegetation predominantly consists of *Agonis flexuosa* (peppermint trees), *Banksia seminuda*, *Melaleuca pressiana*, *Eucalyptus globuosa* (Blue Gums) in the upper storey, *Melaleuca raphiophylla* (freshwater paperbark) with *Astartea sp.* in the mid storey and *Juncus pallidus*, *Acacia sp.* and various grasses in the understorey. Aquatic plants including *Azolla sp.* and *Lemna spp* (duckweed) regularly cover the swamp.

GPS Location Coordinates			
Wetland Suite	Easting	Northing	MGA Zone
No suite listed	534621	6131510	50



The swamp



Vegetation at Denmark Agriculture College Swamp.
Note: vegetation growing throughout the swamp as it regularly dries out during summer.



Lemna spp. (duckweed) and Azolla sp. covers the swamp



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

Water quality monitoring commenced in November 1999 including physical, chemical and biological parameters as outlined in the appendices.

Wetland Classification

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

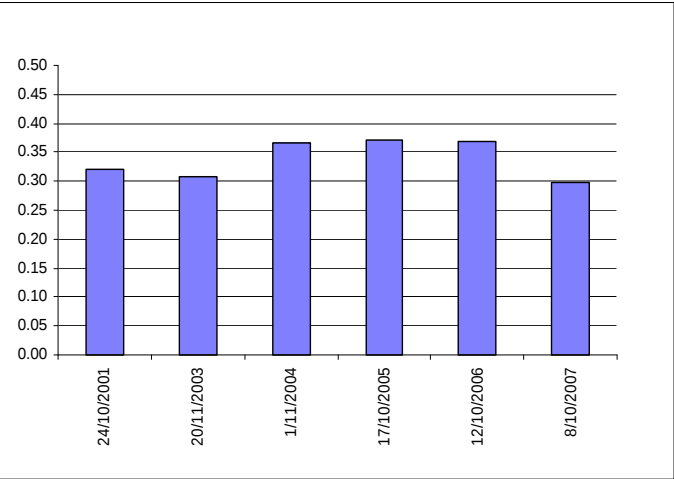
Wetland type	Water Salinity	Consistency of Salinity	Size (Metres)	Shape
Floodplain	Fresh	Stasohaline	Microscale 260 x 70	Elongate

Salinity

Salinity over the sample period was fresh ranging between 0.29-0.37mS/cm. Fluctuations in salinities relate to seasonal fluctuations in rainfall, evaporation and hence water levels variation.

Denmark Agriculture College Swamp receives fresh surface runoff and sub surface flow from surrounding land.

The swamp is situated on colluvial sands (sands that have migrated down slope through gravity), overlaying tertiary sediments containing sands, fine clays and siltstone and is perched above the groundwater.

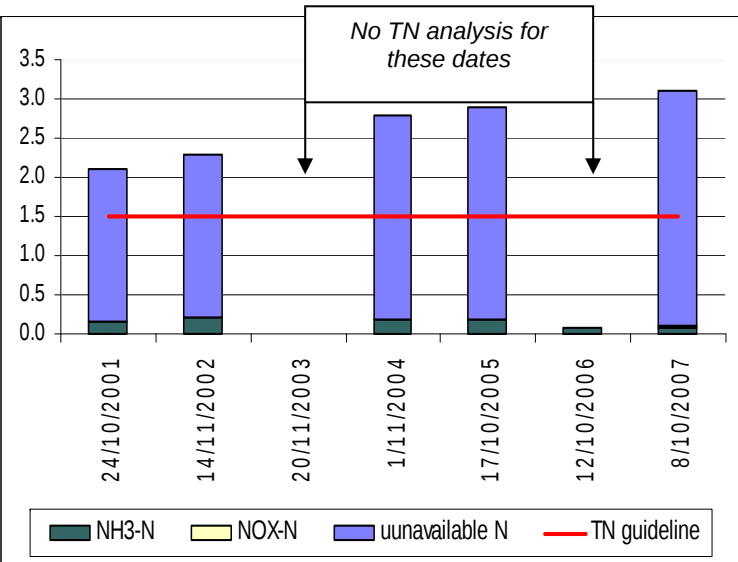


Salinity (mS/cm) over the sample period

Nutrients

Total Nitrogen (TN) concentrations ranged between 2.1-3.1mg/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 (NH₃-N) ranged between 0.07-0.2mg/L which exceeded the recommended guideline value of 0.04mg/L on all sample occasions. Total oxidised nitrogen (NOx-N) ranged between 0.01-0.042mg/L which did not exceed the recommended guideline value of 0.1mg/L on any sample occasion.



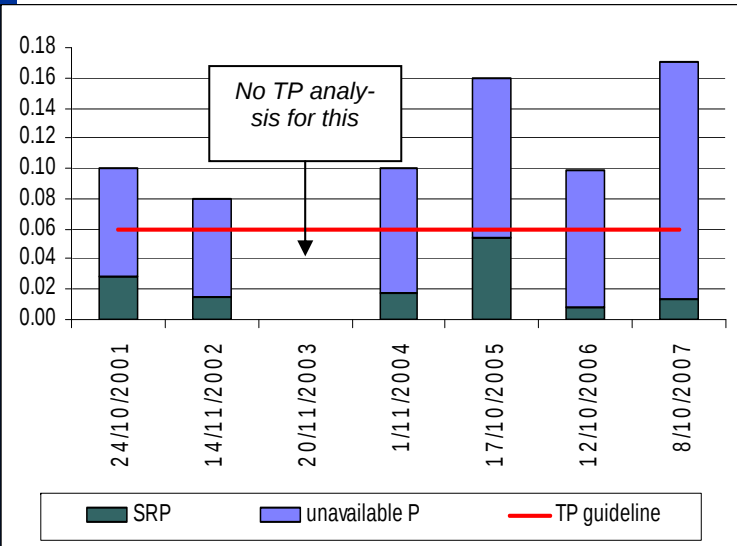
Nitrogen fractions in mg/L over the sample period with TN guideline illustrated

Total Phosphorus (TP) concentration ranged between 0.099-0.17mg/L which exceeded the water quality guidelines of 0.06mg/L on all sample occasions.

Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged between 0.014-0.054mg/L which exceeded the recommended water quality guideline value of 0.03mg/L on one of the six sample occasions.

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.

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

The aquatic plants for example would be utilising available nutrients to grow while contributing nutrients back into the swamp when it dies and decays.



Floating aquatic plants on the 8th October 2007

Nutrients stores in the catchment may enter Denmark Agriculture College Swamp through surface runoff and sub surface flow from the surrounding land.

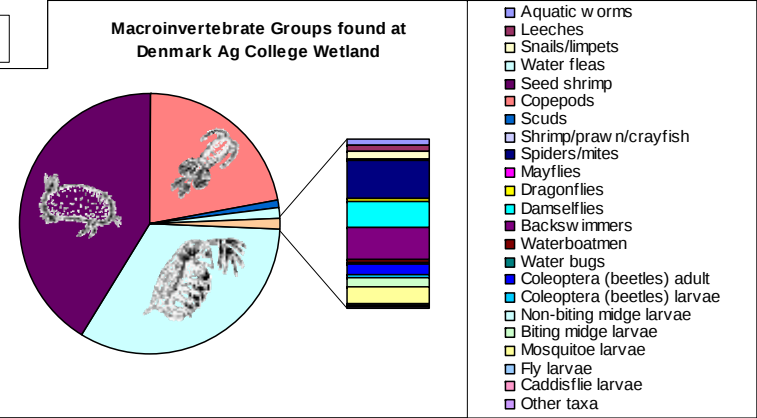
Macroinvertebrates

Twenty three groups of macroinvertebrates were found at Denmark Agriculture College Wetland during the monitoring period of which the most abundant included Cladocera (water fleas), Ostracoda (seed shrimp), Copepoda (copepods), Chironomidae (non-biting midge larvae), and Amphipoda (scuds).

Other groups of less abundance were found including; Oligochaeta (aquatic worms), Hirudinea (leeches), Gastropoda (snails/limpets), Decapoda (shrimp/prawn/crayfish), Acarina (spiders/mites), Ephemeroptera (mayflies), Epiproctophora (dragonflies), Zygoptera (damselflies), Notonectidae

(backswimmers), Corixidae (waterboatmen), Hemiptera (water bugs), Coleoptera (beetles) adult, Coleoptera (beetles) larvae, Ceratopogonidae (biting midge larvae), Culicidae (mosquito larvae), Other Diptera (fly larvae), Trichoptera (caddisfly larvae) and Other taxa.

The diversity of macroinvertebrates found over the sample period ranged between fourteen to eighteen groups with a median of fifteen, which rates 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.

