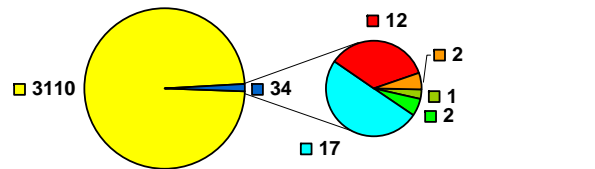


Howick Swamp

Macroinvertebrate Functional Feeding Group



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

Conclusion

Howick Swamp was extremely saline and influenced by both groundwater and surface water including the northern creek line from the upper catchment which is affected by secondary salinisation. Total nutrients in the swamp were consistently high. The main issues to consider are nutrient inputs and extreme salinities which may affect the ecological function of the swamp.

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.



Howick Swamp December 2007

- John Simons (Department of Agriculture and Food, Esperance) for providing knowledge of the hydrogeology associated with Ben Benjenup Lake and editing assistance.
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- Sherrie Randall and Tracy Calvert for data analysis and report compilation.



Howick Swamp Temporary Marker Location

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

Howick Swamp

This report card summarises the current state of knowledge of physical, chemical and biological characteristics of Howick 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 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 Howick Swamp

Howick Swamp is located approximately 82km east of Esperance, Western Australia, within Esperance Coast catchment and the smaller sub-catchment of Alexander River. The wetland is situated approximately 13km from the south coast and lies at 70m AHD (Australian Height Datum). The area receives an annual average rainfall of 550mm.



Wetland Suite	GPS Location Coordinates		
	Easting	Northing	MGA Zone
Howick Suite	477963	6264244	51



Howick Swamp

Howick Swamp is located on Crown land which is under the jurisdiction of the Department of Planning and Infrastructure within a catchment of approximately 557km². The Lake lies within a wetland vegetation buffer zone that ranges between approximately 280-830m from the wetland edge.

Vegetation predominantly consists of *Eucalyptus occidentalis* *Melaleuca cuticularis* and understorey consisting mainly Saltbush, Samphire and *Gahnia trifida* (sedge). There are a number of dead *Melaleuca cuticularis* (saltwater paperbark) on the fringes of the lake with some regeneration occurring.



Melaleuca cuticularis, samphire and saltbush on the swamp margins

Approximately 90% of the catchment area has been cleared for farming practices including cattle farming.

Water quality monitoring commenced on the 15/02/2006 and included physical, chemical and biological parameters as outlined in the appendices.

Howick Swamp

Wetland Classification

Wetland type	Water Salinity	Consistency of Salinity	Size (Metres)	Shape
Lake	Mesosaline— Hypersaline—Brine	Poikilohaline	Mesoscale 1107 x 716	Ovoid

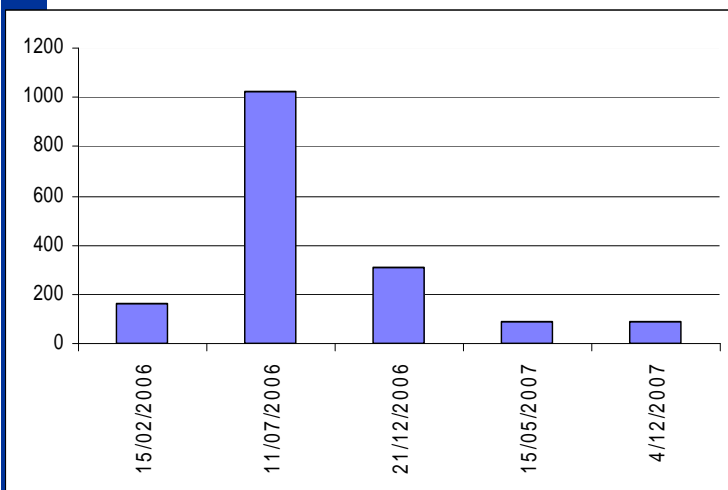
Classification of Howick Swamp has been evaluated on the basis of guidelines developed by V & C Semeniuk Research Group (1997). For further explanation please refer to the appendices.

Salinity

Salinity over the sample period was brine ranging between 84.7 and 1020mS/cm. Howick Swamp is a large shallow basin and fluctuations in salinities relate to rainfall, evaporation and water level variations.

Howick Swamp is connected to groundwater. The groundwater level in a monitoring bore situated to the north of the swamp (EG36) was 13.6m below ground surface at 69m AHD in 2008 and the water level in monitoring bore (EG41) situated to the south of the swamp was 16.4m below ground surface at 64m AHD in 2008. In comparison the swamp bed is at 66m AHD, which indicates the water body is a window to the watertable.

Groundwater salinities of the nearby groundwater monitoring bores (EG36 and EG41) when monitored in February and August 2007 were highly saline at 23.85mS/cm and 26.64mS/cm respectively. The extreme salinities within the lake are due to evaporation and salt accumulation.

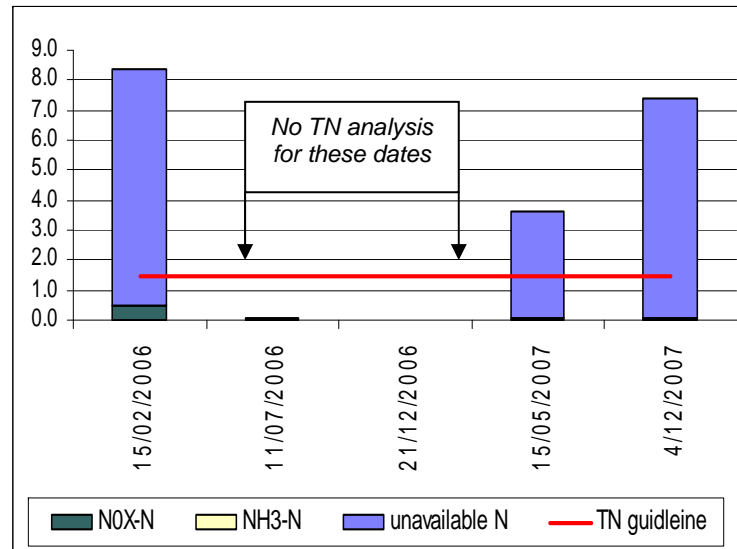


Salinities (mS/cm) over the sample period

Nutrients

Total Nitrogen (TN) concentrations were high ranging from 2.6-14mg/L. TN concentrations on all of the 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) ranged from 0.025-0.51mg/L and total oxidised nitrogen (NO_x-N) ranged between at 0.01-0.03mg/L. NH₃-N fractions exceeded the recommended guideline value of 0.04mg/L on one sample occasion. The NO_x-N fraction did not exceed the recommended value of 0.1mg/L on any sample occasion.

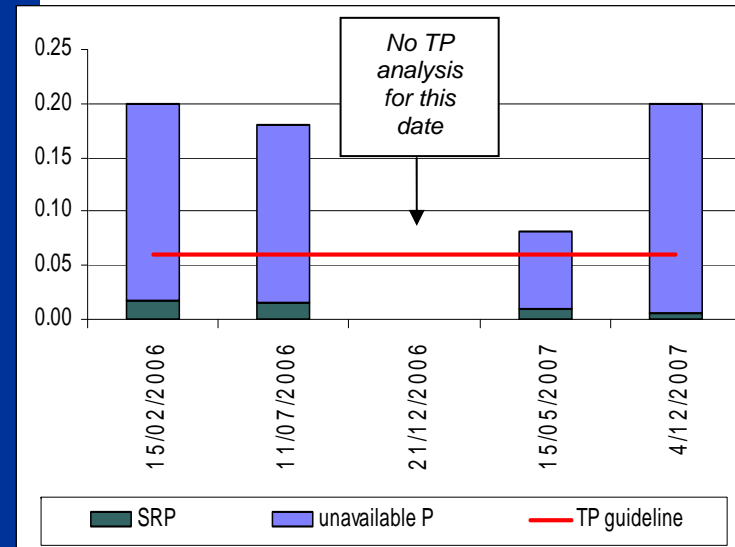


Nitrogen fractions in mg/L over the sample period with TN guideline illustrated

Total Phosphorus (TP) concentrations ranged from 0.082-0.2mg/L. TP concentrations exceeded water quality guidelines of 0.06mg/L on all sample occasions.

Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged from 0.005-0.018mg/L. In relation to water quality guidelines SRP did not exceed the recommended value of 0.03mg/L on any sample occasion.

Howick Swamp



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. During algae blooms total nitrogen (TN) can also be high as it can be bound up in phytoplankton.

Nutrients stores in the sediments may also enter Howick Swamp through surface and sub surface flow from the surrounding land and via the creek line that drains surface salts from land to the north.

Low proportions of available nutrients 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 or bound to clay soils in the case of phosphorous. Total nitrogen may also be high during algae bloom events as phytoplankton stores nitrogen.

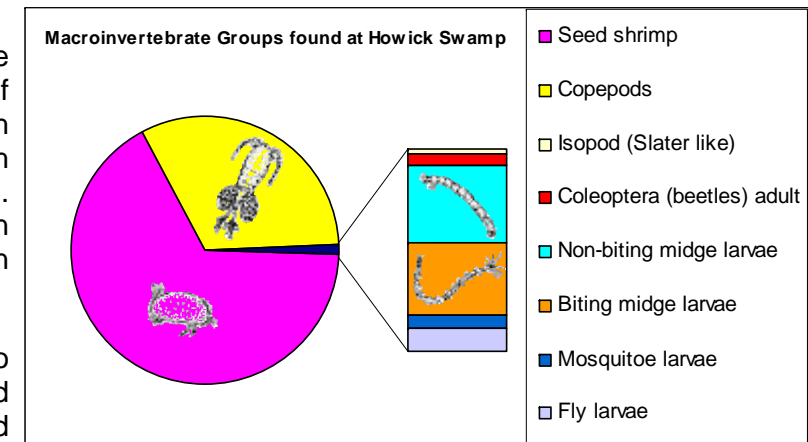


Howick Swamp December 2007. Note the many bird prints in the sediments of the wetland.

Macroinvertebrates

Eight groups of macroinvertebrates were found at Howick Swamp during the monitoring period of which the most abundant included Ostracoda (seed shrimp) and Copepoda (copepods). Other groups of less abundance were found including Chironomidae (non-biting midge larvae), Ceratopogonidae (biting midge larvae), Coleoptera (beetles) adult, Other Diptera (fly larvae), Culicidae (mosquito larvae), and Isopoda (slater like).

The diversity of macroinvertebrates found over the sample period ranged between one to seven groups, with a median of five which rates from average to high 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 Howick Swamp are displayed in the below graph. There appears to be a high number of collectors / filter feeders which could relate to a high amount of suspended decomposing fine particulate organic matter in the wetland.