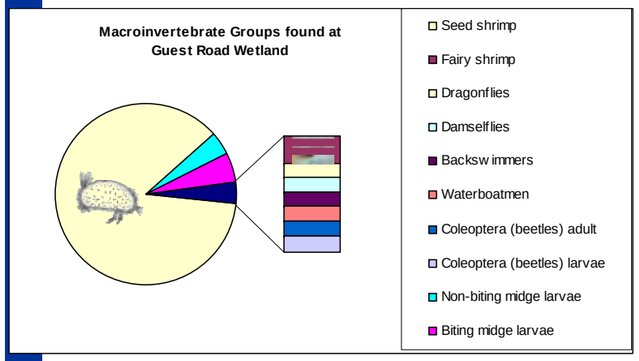
Guest Road Wetland

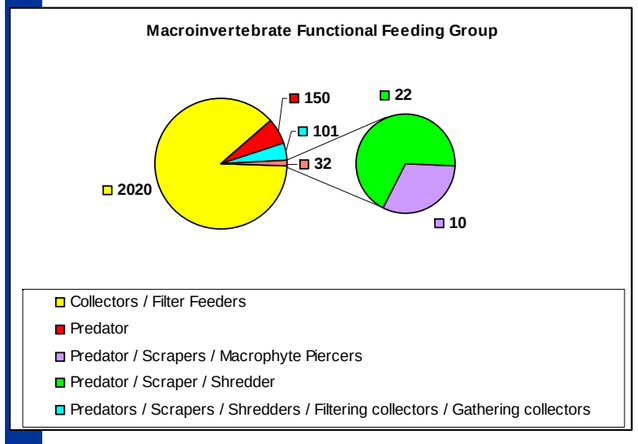
South Coast Wetland Monitoring Project **June 2008**

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 Guest Road Wetland are displayed in the below graph.



Conclusion

Guest Road Swamp is highly saline and acidic which is a reflection of the groundwater conditions. Total nitrogen and ammonia concentrations are high however phosphorus concentrations are low. Further investigation is required to develop greater understanding of the acidification processes and effects on the wetland.

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.

- Yvonne and John Hallam for their support of the project and allowing access to the lake on their property.
- John Simons (Department of Agriculture and Food, Esperance) for providing knowledge of the hydrogeology associated with Guest Road Wetland and editing assistance.
- Dr Brad Degans Department of Water (Perth), Kieryn Kilminster Department of Water (Perth) and Dr Brian Timms (University of Newcastle) for providing information of the acidity in the wetland and surrounding area.
- 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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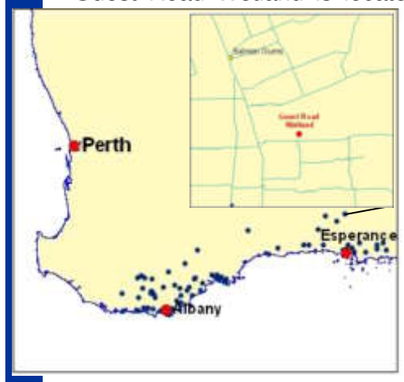
This report card summarises the current state of knowledge of physical, chemical and biological characteristics of Guest Road Wetland based on the knowledge gained from investigation and monitoring conducted by the Department of Water through the South Coast Wetland Monitoring Program.

Accompanying this document is an appendices that provides 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 Guest Road Wetland

Guest Road Wetland is located approximately 60km northwest of Esperance and 23km south of Salmon Gums, Western Australia, within the Bandy Creek catchment. The wetland lies at 220m Australian Height Datum (AHD). The area receives an annual average rainfall of 350mm.



Guest Road Wetland is located on privately owned land, within a catchment of approximately 56.1km^2. The lake is located on agricultural land with some remnant vegetation to the north. The wetland lies within a partially fenced wetland vegetation buffer zone that ranges between 15-80m from the wetland edge. Vegetation predominantly consists of *Eucalyptus occidentalis* (Yates), and *Melaleuca sp.* There is little understorey vegetation however there are some Samphire bushes.

	GPS Location Coordinates		
Wetland Suite	**Easting**	**Northing**	**MGA Zone**
Grass Patch	388351	6333420	51

Guest Road Wetland

Eucalyptus occidentalis (Yates) at Guest

Approximately 95% of the catchment area has been cleared for farming practices including cropping and sheep.

Water quality monitoring commenced in November 2005 and included physical, chemical and biological parameters as outlined in the appendices. Guest Road Wetland is a seasonally inundated wetland however was dry in November 2005 and December 2006.

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Wetland Classification

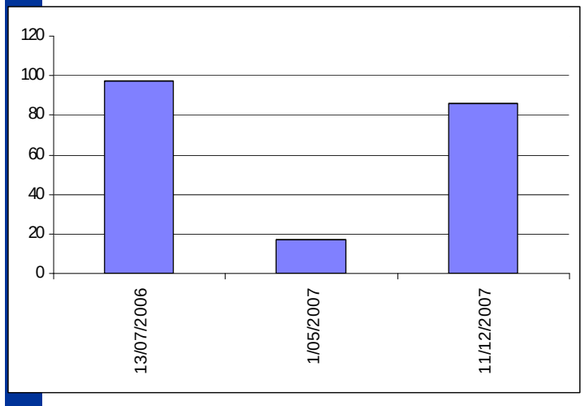
Wetland type	*Water Salinity*	*Consistency of Salinity*	*Size (Metres)*	*Shape*
Sumpland	Hypersaline	Stasohaline	Microscale 225 x 170	Irregular - Ovoid

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

Salinity

Salinity over the sample period ranged between saline (16.8mS/cm) and brine (97.3mS/cm). High salinities of the wetland correspond to the fact that Guest Road Wetland is connected to groundwater. This is supported through measurement of a nearby groundwater monitoring bore GP16 which had a salinity of 99.58mS/cm and a water surface level 3.2m below the surface at 221.8m AHD (compared to the wetland at 220m AHD) on 22/05/2008. This bore has a similar salinity of 90.40mS/cm on the 30/08/01 (Agbores database).

During periods of high rainfall fresh water may enter the wetland through surface runoff and a small drainage line flowing from the north east and contribute to reducing wetland salinities. High flows as a result of the storm event in February 2007 contributed to lower salinities in May 2007.

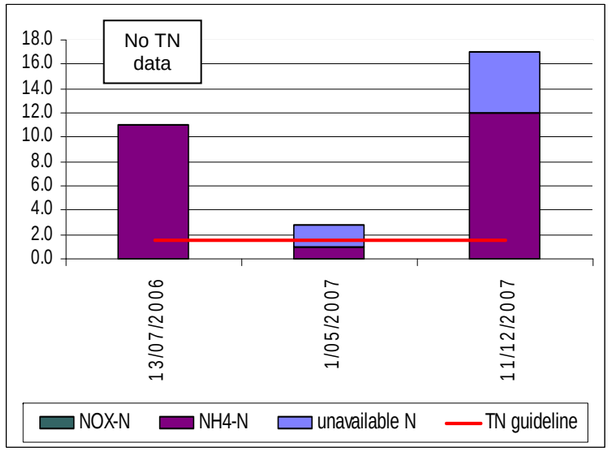


Salinity (mS/cm) over sample period

Nutrients

Total Nitrogen (TN) was sampled on the two occasions and concentrations were 2.8mg/L and 17mg/L respectively which 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 (NH_3-N) ranged from 0.9-11.0mg/L and total oxidised nitrogen (NOx-N) ranged from 0.024-0.047mg/L. NH_3-N fractions exceeded the recommended guideline value of 0.04mg/L on both sample occasions. The NO_X-N fraction did not exceed the recommended value of 0.1mg/L.



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

Total Phosphorus (TP) concentrations ranged from 0.016-0.025mg/L. TP concentrations did not exceed water quality guidelines of 0.06mg/L on either sample occasions.

Soluble Reactive Phosphorus (SRP) (form of phosphorus available for uptake by plants) ranged from 0.005-0.015mg/L. In relation to water quality guidelines SRP did not exceed the recommended value of 0.03mg/L on any sampling occasion. Of the total phosphorus (TP) there was 26-60% of available phosphorus (SRP).

Nutrients are recycled naturally through the lake 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 nutrient stores may also enter Guest Road Wetland through surface runoff and sub surface flow from the surrounding land, via the small drainage line and through groundwater.

High proportions of ammonium (NH3-N) relate to anaerobic (low or no oxygen) decomposition of

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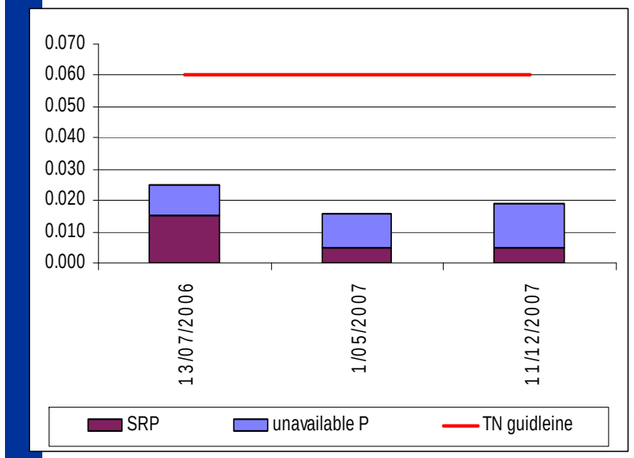
organic matter which releases high amounts of ammonia from the sediments into the water column. Low proportions of available nutrients can indicate the majority is being readily taken up by plants and animals, or bound to clay soils in the case of phosphorus.



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

pH

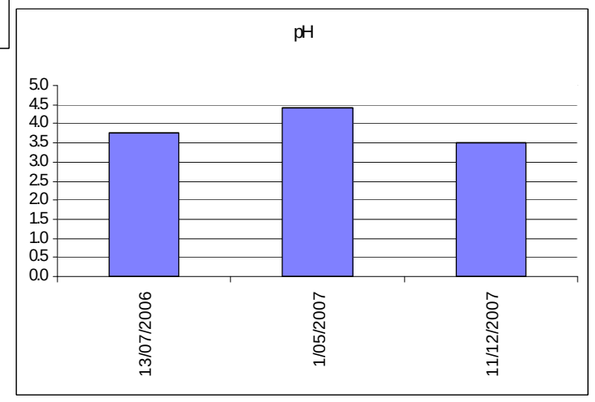
Shallow Iron stained waters of Guest Road Swamp

The pH of Guest road wetland was low on all sampling occasions even when full (<4.4) which is indicative of acidic conditions. The acidity is derived from the groundwater which was confirmed by initial water quality measurements at bore GP16 at the time of drilling in 2001 and May 2008 where groundwater pH was 3 on both occasions.

There are a number of acidic and alkaline lakes in the Grass Patch/Salmon Gums that are connected to the groundwater. Differences are attributed to variations in underlying soils and rock and depend on the quantity of carbonates in the subsoils that buffer the acidity. The possible origins of acidic groundwater are being investigated. Currently there are two trains of thoughts which are as follows:

1. The reason for the acidity may be due to the historical oxidation of iron pyrite minerals over thousands of years. These were derived from sulfate in rainfall and stored in surface soils and underlying geological layers. The acidity from the oxidising pyrite has concentrated in groundwater, particularly where this water has not flowed through carbonate (limestone) materials (Timms 2008).

2. Acidity has been slowly generated in surface soils over thousands of years during periods of waterlogging and has been leached to groundwater. Iron rich waters form during waterlogged conditions by a combination of microbial and plant activities in topsoils, which also results in formation of carbonate (limestone) layers in soils (in intervening dry periods). Leaching of the waters below the topsoils and reaction of the iron in the waters with oxygen in air lowers the pH of the waters. This reaction is thought to occur deeper in the soil below where carbonates have accumulated and therefore results in formation of acidic groundwaters, even though shallow soil layers are alkaline.



Low pH on all sample occasions (neutral pH =7)

Macroinvertebrates

Ten groups of macroinvertebrates were found at Guest Road Wetland during the monitoring period of which the most abundant included; Ostracoda (seed shrimp), Chironomidae (non-biting midge larvae) and Ceratopogonidae (biting midge larvae). Other groups of less abundance were found including; Anostraca (fairy shrimp), Epiproctophora (dragonflies), Zygoptera (damselflies), Notonectidae (backswimmers), Corixidae (waterboatmen), Coleoptera (beetles) adult and Coleoptera (beetles) larvae. The diversity and abundance of these groups are shown in the graph below.

The diversity of macroinvertebrates found over the sample period ranged between five to seven groups, with a median of six which rates low when based on the Ribbons of Blue