



# MAFRI Research & Education

## Role of sediments in generating algal blooms in the Gippsland Lakes.

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*Andy Longmore, Marine and Freshwater Resources Institute*

*Gippsland Lakes are a series of large, shallow coastal lagoons connected to the ocean by a narrow, permanent man-made channel (Lakes Entrance).*

Since the time of European settlement considerable modifications have occurred to the lakes catchment including clearing of lowland and foothill forests, drainage of wetlands and diversion of water from rivers for urban, agricultural and industrial use. These changes have increased the delivery of nutrients and sediments to the lakes and have altered the regime of freshwater inflow. This has led to major concerns regarding the water quality in the Gippsland Lakes.

The Gippsland Lakes suffers from occasional severe blue-green algal blooms, which affect tourism, human health and fisheries.

The Gippsland Lakes Coastal Board commissioned the CSIRO to draw together the results of research and monitoring conducted over the past 25 years. These results were synthesised into the Gippsland Lakes Biogeochemical model.

This model is being used to test the efficacy of a range of different actions designed to alleviate the environmental problems suffered by the lakes.

The model's ability to accurately predict the functioning of the Lakes ecosystem is reliant on the comprehensiveness of the data on which the model is based. The model will give a better understanding of the lakes' processes when its source data is representative of the lakes diverse habitats.

The Gippsland Lakes Biogeochemical model indicates that the nutrients that feed the algal blooms in the Lakes are drawn both from catchment runoff, and from large stores in the sediments beneath the Lakes.

However the measurements of sediment nutrient flux that were used to validate this model, were not representative of all sediment habitats in the lakes.

Mr Andy Longmore, a specialist nutrient scientist at the Marine and Freshwater Resources Institute (MAFRI) explains "The measurements used in the model were collected from only three deep sites and then only on a few occasions. These deep sites were devoid of vegetation."

"These limitations are important to redress because we know from studies conducted elsewhere the presence of plants can greatly alter the magnitude and direction of nutrient flows in ecosystems. Since up to one-third of the lake bed is vegetated, there was considerable uncertainty about the true importance of sediment nutrient fluxes in fuelling algal blooms."

"It was important that the model was updated with more representative data," Mr Longmore says, "to retest the efficacy of different management actions."

Monash University, Environment Protection Authority and MAFRI have just completed a one year study re-examining the importance of sediment nutrients in fuelling algal blooms in the Gippsland Lakes.

Sediment nutrient fluxes were measured at four deep (>5m) unvegetated sites and four shallow (<2m) vegetated sites four times during 2002-2003.

"Our results indicate that deep sites are net sources of nutrients that can fuel phytoplankton blooms, confirming our original research results" Mr Longmore says. "Interestingly we have found that shallow sites can be either sources or sinks of nutrients."



**Role of sediments in generating algal blooms in the Gippsland Lakes.**

While shallow sites were found to release the nutrients that can fuel algal blooms, the rate of release was significantly lower than the rate of nutrient release measured at the deep sites.

While these results have refined the model, Mr Longmore says we still have questions to answer before we can be sure the model adequately represents the functioning of the lakes as a whole.

“It is not yet clear where the division between the shallow and deep zones occurs.” Mr Longmore says. “We don’t know whether the shallow/deep division depends on factors such as a lack of oxygen in deep waters or whether it is determined by the results of plant photosynthesis and respiration.”

“Further research will be required to sort out these questions but once we have this understanding we will be able to apply these results to the whole of the Lakes and better define the Gippsland Lakes Biogeochemical Model” says Mr Longmore.

This work was funded by the Natural Heritage Trust, and supplemented by funds from the Gippsland Lakes Rescue Package and Fisheries Victoria.

For more information about this project please contact Mr Andy Longmore at MAFRI on 5258 0382.

Fact Sheets (1-10) on the Gippsland Lakes Environmental Study are available in pdf format from the Gippsland Coastal Board’s web site at [www.gcb.vic.gov.au](http://www.gcb.vic.gov.au)

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