

WATERSHED Torbay

Special Insert - Research and Monitoring Underway for Watershed Torbay 2002/2003

THE RESEARCH PROGRAM *State of sediment in waterbodies*

Where are Nutrients coming from?

What drives Algal Blooms?

How much water do waterways and wetlands need?

Marbelup water to supply Albany?

Typha invades Lake Powell

Managing the drainage system

Keeping pathogens out of Marbelup
Visit Watershed

Torbay
WEBSITE

www.torbay.scrib.org

Ring: 9842 5760 Water & Rivers Commission, or 9845 1081 Torbay Catchment Group for project information

Are There Really Problems in the Torbay Catchment?

The community has identified key concerns:

The wetlands in the catchment are severely degraded, and experience some of the worst and most regular algal blooms in the State. There are algal blooms for many months of the year.

Local sources of public drinking water are very limited and Marbelup Brook in Torbay catchment needs to be protected for possible future use in the Lower Great Southern Water Supply Scheme.

Water and flood management in the lower drainage district is a critical issue for the community.

Torbay has become a haven for weeds especially in degraded areas along waterways and wetlands.

The catchment has significant local farming, fishing, tourism and conservation resources and the community are concerned that these industries and values are maintained into the future.

How Mucky is Our Sludge? Torbay takes the prize

There is no doubt that algal blooms in Lake Powell and Torbay Inlet are caused by excess nutrients entering the system.

What we don't know is whether the most important sources of nutrients are from (a) creeks and watercourses draining the catchment, (b) groundwater or (c) sediments lying at the bottom of the lake and inlet. Knowing which sources contribute how much nutrient will help plan our management actions.

To answer one part of this three piece jigsaw, scientists from Geoscience Australia examined sediment sources of nutrients for *Watershed Torbay*.

Taking several samples from each waterbody, the cores revealed that the bottom of Lake Powell consists of sand, whereas Torbay Inlet sediments are muddy silts.

The depth of mud in Torbay Inlet was especially surprising to the researchers. The team had to bring in a larger corer because the one they had was not up to the job of getting to the bottom of the ooze, which in places was over 1 metre deep! The build up of muck is the result of years of high amounts of sediment and organic matter washing down to the inlet after land clearing in the region and from the catchment's predominantly agricultural land use. The sediment and organic matter has nutrients bound to it.

Chemical analysis of the water within the pores of the sediments showed very high nutrient levels for Torbay Inlet. Relative to Wilson Inlet, Perth's Swan River, and Melbourne's Port Phillip Bay, the concentrations of nitrogen and phosphorus capable of being released to the Inlet's surface waters were the highest the research team had encountered. Although still high enough to trigger an algal bloom, nutrient concentrations were lower in Lake Powell.

These results suggest an important component of algal bloom dynamics in Torbay Inlet is sediment stored nutrients. The very high nutrient levels in the Torbay Inlet mud warn that attempts to flush the system by keeping the bar open may be very risky. This is because salt water sits on the bottom of the inlet causing de-oxygenation of the sediments, which then results in nutrient release.

Ongoing research is looking at the contribution of creeks, drains and groundwater to nutrient loads that lead to algal blooms. These studies will be vital to community discussion regarding where on-ground actions will be most effective in addressing the problem of algal blooms.

Terry Walshe Centre of Excellence in Natural Resource Management Albany



Lake Powell, Lake Manarup and Torbay Inlet: Sediment cores from Lake Powell and Torbay Inlet show disturbingly high levels of nitrogen and phosphorous (photo Simon Neville)

Why is Research Needed?

The Community Steering Committee for the Watershed Torbay project has the responsibility for coming up with ways to address catchment issues..

The research work will provide information to help make good decisions on what actions to take in the Catchment and where!

The research projects will provide:

- A model of water movement and storage in the lower drainage district so that different scenarios of drainage management can be tested to determine flooding and other impacts.
- Understanding of how groundwater is interacting with Lake Powell and the amount of nutrients being discharged to the Lake via groundwater.
- Accurate mapping of current land uses in the catchment so that we have an understanding of nutrient sources.
- Case studies for three industries, piggeries, dairies and horticulture to describe their nutrient inputs and exports.
- Understanding of what environmental conditions trigger and support algal blooms in Lake Powell and Torbay Inlet.
- Further understanding of the relative contributions of nutrients from sub-catchments.

How Research Projects Were Selected

Funding for research was part of the contract with the major project partner, the National Rivers Consortium. Watershed Torbay is a national case study - there are only two throughout Australia. There are obligations to undertake research applicable Australia wide.

A set of criteria was developed to select research proposals:

1. **What is the capacity of the research to answer key community questions?**
2. **Will the research give information that will help influence selection and management of actions?**
3. **Is the research transportable to other catchments?**
4. **How urgent is the research to influence actions (this is the priority) – or is it addressing a long term issue?**
5. **Can the research be funded through other sources?**
6. **What is the direct cost of the proposal, how cost effective is it and what is the level of matching funds?**
7. **How likely is it that the research will give results leading to low cost land use management options and behaviour change?**

The Research Program : catchment nutrients

Intensive Agriculture Nutrient Balance Case Studies

Three case studies are being prepared in cooperation with landholders for: **annual horticulture, a dairy, and a piggery.**

The case studies will improve knowledge on the levels of nutrient accumulation and potential loss within specific land uses in the Torbay catchment with the costing for full implementation of best management options. The case studies will identify:

- * What are the most significant nutrient inputs?
- * How can nutrients be reduced or made less problematic?
- * Where are the stores of nutrients?
- * How are nutrients being exported from each case study?
- * How do these levels compare to other data for intensive nutrient loss?
- * What opportunities for internal replacement exist– eg can we source the nutrients required for productivity from elsewhere on the farm / area?
- * Are there opportunities for farmers to save money through better nutrient management?

Researchers: David Weaver
Department of Agriculture, Simon
Neville Ecotones

Timing: February 2003 - March 2004
Funding: \$10,000

Investigating Groundwater Inputs to Lake Powell and Torbay Inlet

Ground water flow rates and water quality will be measured through 20 bores installed around Lake Powell and Torbay Inlet to estimate ground-water nutrient loading to the system and potential sources for these nutrients. The research will help understand:

- * Where the lakes and inlet receive nutrients from, and how they are lost.
- * The relative importance of ground-water versus surface water inputs.
- * The amount of groundwater which flows into the lakes and inlet which will help develop the water balance model for the drainage system.

The results of the project will help draw a picture of nutrient transport pathways to the lake and inlet, and help determine where actions need to be focussed.

Researcher: Andrew Maughan WRC
Timing: November 02 - January 03
Funding: \$10,000

Land Use & Management Audit

Land use data sets and maps are fundamental tools to assist in nutrient management. This project will identify, collect and map current catchment land use and land management to produce an up-dated landuse and land management dataset for Watershed Torbay.

Through the mapping of management issues and works undertaken like waterways fencing and rehabilitation, installation of stock crossings, and perennials, the project will provide essential baseline data to assess change over time and help target future work. This data can also assist in locating other community-identified environmental problems such as sediment deposition, contaminants and weeds.

It will allow land use and degradation hot spot information to be compared with water quality monitoring information.

This project will create locally managed datasets that underpin the whole of catchment waterways restoration plan.

Researchers: David Weaver Department of Agriculture, Simon Neville Ecotones
Timing: December 02 - February 03
Funding: \$10,000

What drives algal blooms?

Sediment Nutrient Supply & Release

The findings from the initial small project are described in the article 'How Mucky is Our Sludge' on page 1. A limited number of samples of sediments were taken in Torbay Inlet and Lake Powell to help understand the contribution sediments are likely to contribute to nutrients in the water bodies.

Researchers: Australian Geological Survey Organisation

Timing: Undertaken in 2002
Funding: \$3290

There has been a proposal to undertake a much more significant project to examine the key sediment processes in Torbay Inlet and Lake Powell. The Steering Committee did not feel that this was a priority in the short term when examined against other research priorities and with the limits to funding.

Algal Bloom Drivers

This project aims to determine what drives the algal blooms, through algal bioassays taken of various species of algae over the summer months. Samples have been taken in Lake Powell and

Torbay Inlet during February, March and April 2002 with a second set of samples to be taken in Spring 2002. This will help determine what nutrient is most critical in causing algal blooms (phosphorus or nitrogen), and which environmental parameters are most strongly correlated to algal blooms. We will then know which nutrient sources from the catchment are the priority to target. It will also help to understand whether we can change the system from having toxic algal blooms to less dangerous ones.

Researchers: Malcolm Robb, Centre for Water Research, Andrew Maughan and Geoff Bastian, WRC Albany, Professor Peter Thompson, University of Tasmania.

Timing: Summer 2002, Spring 2002

Funding: \$5,000

How much water do waterways and wetlands need?

Water Requirements for Marbelup Brook, Lake Powell & Lake Manurup

How much water is needed to protect the values of Marbelup Brook, Lake Powell and Lake Manurup?

This project aims to work out the quantities of water and the flow patterns that are needed to protect the environment of the Brook and wetlands, including the vegetation, fish, crustacea and the protect the river banks from subsiding. This is important information in determining how much water can be taken by the Water Corporation and other users along the Brook.

Researchers: To be determined

Funding: \$20,000

Timing: 2002/2003/2004

Water Demands from Marbelup Brook

This project aims to better understand likely demands for water from Marbelup Brook and other tributaries in the short to medium term. Water and Rivers Commission are preparing demand scenarios based on discussions with GSDC, Department of Agriculture, the Water Corporation and other groups. This will help with its decision-making about how water should be allocated between the Water Corporation, the local community, industry and the environment.

Researchers: The Commission is currently preparing an Albany Groundwater Area allocation plan which will include Marbelup Brook, and a Sub-Regional allocation plan, and this will be included as part of the work.

Timing: 2001/02 for the Sub-Regional

Allocation Plan.

Funding: This is a project that has separate funding through the Water and Rivers Commission.

Typha in Lake Powell

Typha orientalis (bullrush) is successfully invading Lake Powell at the expense of the native vegetation, most likely due to increased nutrients. However, *Typha* may also be preventing other symptoms of eutrophication through its excellent capacity to remove nutrients from water. This project aims to:

- * Find out the rate of invasion of *Typha orientalis* in Lake Powell
- * Establish the ecological impact of *Typha orientalis* on the lake
- * Compare and contrast the relative rates of growth and nutrient use of *Typha orientalis* and the native sedge *Baumea articulata* in the system
- * Suggest management guidelines for Lake Powell concerning *Typha*

Researcher: Mieke Bourne, Murdoch University Honours Student

Timing: 2002

Funding: \$3,500

Water Requirements for Estuaries

This PhD project entitled: "Ecological Water Requirements for Estuaries" will be undertaken through the Centre of Excellence in Natural Resource Management, Albany.

Although methods for establishing the ecological water requirements of streams are reasonably well established in WA, there has been little work done on estuaries. The project will examine approaches being undertaken in eastern Australia and overseas and apply these methodologies to the estuaries of the south coast region of WA. The project will particularly focus on Torbay Inlet. This information is important to assist in understanding issues such as how often the bar should be opened, how drainage water should be managed, and the impact of various management options on the environment.

Researcher: Paul Close, supervised by Dr Peter Davies, Centre of Excellence in Natural Resource Management.

Timing: 2002

Funding: \$3,500

Managing the drainage system

The lower Torbay catchment has been extensively drained by a very complex system which is an integral part of local agriculture. How does the drainage

system work and how could it better meet the requirements of the people who use the area?

Survey of Torbay Drainage System

Survey work is being carried out over the Torbay Drainage System and adjacent flood prone farmland. The survey is collecting data to help determine the effect on land flooding of various drainage management options. The objective is to obtain accurate terrain information to produce high resolution contour information within the drainage district. This is absolutely essential to determine the potential for flooding given that the land is so flat.

Surveyors: Denmark Survey and Mapping

Timing: November 2002 - January 2003

Funding: \$40,000

Model of the Drainage System

Lake Powell, Manarup Lagoon and Torbay Inlet are the three main water bodies in the system. They are connected by drainage links operating on three separate levels.

The core components of the model are:

- * Calculation and representation of the water storage of Lake Powell, Manarup Lagoon and Torbay Inlet.
- * Calculation of the flow of water to Torbay Inlet using high, medium and low level drains.

The key to the success of this water balance modeling will be the precise measurement of river or drain flows and good prediction of ground water flow and evaporation from the lakes.

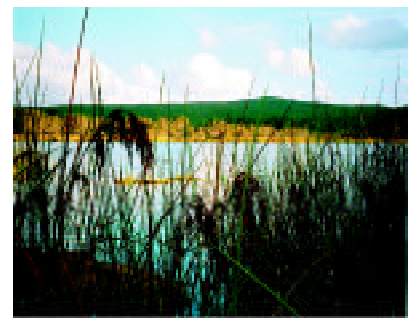
In order to be able to cater for a range of management alternatives the model will be made flexible enough to cater for different drainage routes.

The model will be used to examine the impacts of a range of drainage management options on the environment and land users and residents.

Researchers: Aditya Kumar and Andrew Maughan, WRC.

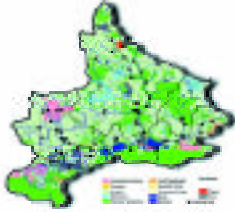
Timing: January - December 2003

Funding: \$50,000



Natural Peace - Lake Powell Photographer Brenda Howe Watershed Torbay Photographic Exhibition 2002

Access Torbay Maps Online!



Torbay map data is now being showcased in the new online WA Atlas. This is an interactive internet map serving application that allows the user to view and create maps... *because not all atlases belong on the shelf!*

You can enter the Atlas through the front page (www.atlas.wa.gov.au) and then load the Great Southern area. Data can be added using the 'Add Layer' function and navigating through the 'Regional Focus' topic to the 'South Coast Regional Study' layers.

To find out more about the data, click a hotlink on the right hand side of the screen. This will popup a window with metadata, which is description about the data, such as currency, scale of capture and who owns the data.

You can also jump directly to the Torbay area with natural resource management data layers preloaded, through a direct link - get details from Kristina!

SCRIPT Regional Information Centre Manager Kristina Fleming, assisted in getting the Torbay data into this great online resource through WALIS. Contact Kristina on 9892 8494 or email kfleming@agric.wa.gov.au or check out the RIC website www.scric.org for further information.

Community Involvement in Research Invited!

Local residents are encouraged to be involved in the research work:

Help with macroinvertebrate sampling call Julie Pech 9841 0108

Come along to workshops and catchment tours

Attend Catchment Group and Watershed Torbay project meetings

Help researchers during field trips - ring Terry Walshe to express interest on 9892 8435

Visit the website for research updates www.torbay.scric.org

More Research: Social and Economic Factors

Economics of protecting water quality in Marbelup Brook catchment

This project investigates the cost effectiveness of methods to prevent pathogen transport into Marbelup Brook and who would contribute to the costs. Marbelup Brook is an important water-course for residents within the catchment and the city of Albany.

However, there are contaminants entering Marbelup Brook from the surrounding farms including low levels of fertilisers, pesticides and pathogens. The type of pathogens are mainly Cryptosporidium and Giardia, which are difficult to kill and can cause diarrhoea, nausea or more severe illness to humans.

Pathogens enter Marbelup Brook through livestock drinking and defecating in the stream. Animals are carriers for these pathogens, and transmit them to water and one another via their saliva and faeces. Management methods include:

- * monitoring landuses which harbour and transport pathogens into the brook,
- * reducing pathogen transport into the brook by fencing waterways etc,
- * preventing the future establishment of landuses considered to be highly damaging to the environment,
- * treating the water after abstraction to remove the pathogens.

Researcher: Lorna McGuire University of Western Australia

Timing: 2002

Funding: \$2000

Managing Community Change

The Watershed Torbay project is being run using best practice communication techniques to bring about positive change. This research project aims to gather successful methods used in other projects to apply to Torbay catchment. Watershed Torbay aims to:

- * develop a shared community vision for the waterways of the Catchment

- * achieve a partnership with the local community in the planning and delivery of the project.
- * facilitate community change which leads to a good understanding of the values of waterways in the catchment, and pro-active attitude toward implementing on-ground works to achieve the shared vision.
- * develop catchment health indicators to provide feedback on progress toward achieving the vision.
- * identify any barriers to implementation
- * communicate the project at a Local, Regional, State and National level.

Researcher: Louise Duxbury Masters Murdoch University

Timing: February 2002 - March 2004

Funding: Part of Watershed Torbay communication budget.

Other Research & Monitoring

There is an ongoing monitoring program for water quality across the Torbay catchment carried out by the Water and Rivers Commission Albany - results are regularly updated on the Website.

There is a research project being developed to identify stream characteristics in Torbay catchment and their varying ability to help control phosphorus and nitrogen from adjacent land uses.

Catchment Facts!

- Current Incidence of Algal Blooms
Marbelup Brook - **5 months a year**
Lake Powell **6 months per year**
Torbay Inlet - **3 months per year**
- Total catchment area 32,055ha
Current **area cleared 65%**
- Length of **Waterways** in Catchment 180kms
- **Threatend fauna** recorded in Torbay catchment
Australasian Bittern
Baudin's Cockatoo
Carnaby's Cockatoo
Western Ringtail Possum



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