Wilson Inlet 1

Report to the Community

GOVERNMENT OF WESTERN AUSTRALIA

WATER AND RIVERS COMMISSION
WILSON INLET MANAGEMENT AUTHORITY

JULY 1998

Summary of Wilson Inlet Studies from 1994 to 1997

Hay River entering Wilson Inlet, photo by Simon Neville.

In response to public concern about the state of the Inlet the Wilson Inlet Management Authority was established in 1994 with modest funding for scientific studies and management of the Inlet.

This report summarises the findings of the scientific studies commissioned with the establishment of WIMA.

Eutrophication

Eutrophication occurs when a waterway is enriched by an oversupply of nutrients and organic matter. The extra nutrients in the water (mostly phosphorus and nitrogen) encourage greater plant growth, often resulting in algal blooms. Land use in the catchment influences the amount and type of material that enters an estuary or a river. Fertiliser runoff, sewage and urban stormwater discharge into waterways are common causes of nutrient enrichment.

In eastern Australia blue-green algal blooms are a major problem in large river systems such as the Murray Darling and in reservoirs. In the west, blue-green algal blooms have occurred most notably in the Peel Harvey Estuary, Canning River, Kalgan River and Lake Powell. Along the south coast of Western Australia, especially in Princess Royal and Oyster Harbours, we have also seen increases in the growth of large algae (macroalgae) in response to excess nutrients from the catchment.

In Wilson Inlet the rapid expansion of the seagrass *Ruppia megacarpa* is currently considered to be an indicator of the eutrophication of the Inlet. To many residents the black ooze and foul smell of decomposing seagrass on the foreshore are a pungent reminder of the deterioration of the Inlet.

Defining the problem

An estuary is a partly closed coastal water body in which sea water and fresh water mix. Estuaries are complex environments. For example, plant and animal species in Wilson Inlet are influenced by the amount of river water that flows into the estuary, the way it mixes with sea water, and by seasonal variations in salinity, water temperature and nutrient levels.

Successful management requires an understanding of the physical, chemical and biological processes in the Inlet, the effects of human activity, and how they all interact.

Environmental studies were started in 1994 to identify the main processes which have led to eutrophication of the Inlet and to pinpoint the areas where management actions should be directed. These studies were completed in 1997 and a full report will be made available for community comment in late 1998.

Environmental studies of Wilson Inlet

- Monitoring nutrient losses from the catchment
- Water quality sampling in Wilson Inlet
- Surveying the quantity and distribution of algae and seagrass
- Studying seagrass *(Ruppia)* biology
- Surveying the quantity and distribution of sediment and the amount of nutrients it contains
- Studying the rate nutrients are released from sediment
- Surveying water circulation and flushing
- Studying coastal sand movements related to the closing of the sandbar at the mouth of the Inlet.

Current status of understanding

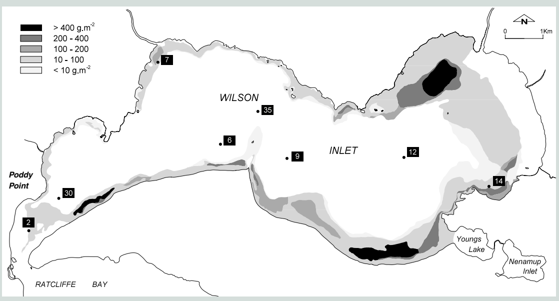
Although the information from these studies is yet to be fully analysed, some early observations can be made:

- The Inlet is eutrophic and under stress.
- The rapid appearance and growth of *Ruppia* seagrass, which may have replaced other seagrass species is a symptom of nutrient enrichment.
- Since its appearance *Ruppia* has become a valuable part of the ecosystem and is an important refuge and nursery for fish.
- There is now concern that as eutrophication continues *Ruppia* may be lost through the growth and shading caused by small algae (epiphytes) on the seagrass leaves.
- *Ruppia* may also be lost if the long term salinity of the Inlet is increased. This is because the germination of Ruppia seed is reduced in salt water.
- If the *Ruppia* is lost, less ecologically useful algal species may replace it.
- Concentrations of phosphorus in the Inlet sediment are relatively low considering the amount of nutrient leaving the catchment. This leads us to think that much of the phosphorus entering the Inlet is taken up by the *Ruppia*.
- Despite the low phosphorus concentration in the sediments, under certain conditions the sediment is an important source of nutrients which can trigger algal blooms.
- The location where the mouth of the Inlet is breached has little impact on the overall health of the Inlet. This is because the system of channels between the bar and Poddy Shot Point appear to be one of the major factors controlling water flow between the Inlet and the ocean. The amount of river flow is also important in moving estuarine water out to the sea.

Long term management strategy

The Water and Rivers Commission (WRC) in partnership with WIMA is working to develop a long- term strategy for managing the Inlet paying attention to the following key issues:

- Controlling nutrients entering the Inlet through catchment and river management.
- Identifying the factors essential to maintaining or improving the Inlet as a healthy estuary, including determining the ideal salinity levels in the Inlet.
- Maintaining Prawn Rock Channel as a community recreation site.



Map of Wilson Inlet indicating the water quality sampling locations and the distribution of Ruppia *in the Inlet.*

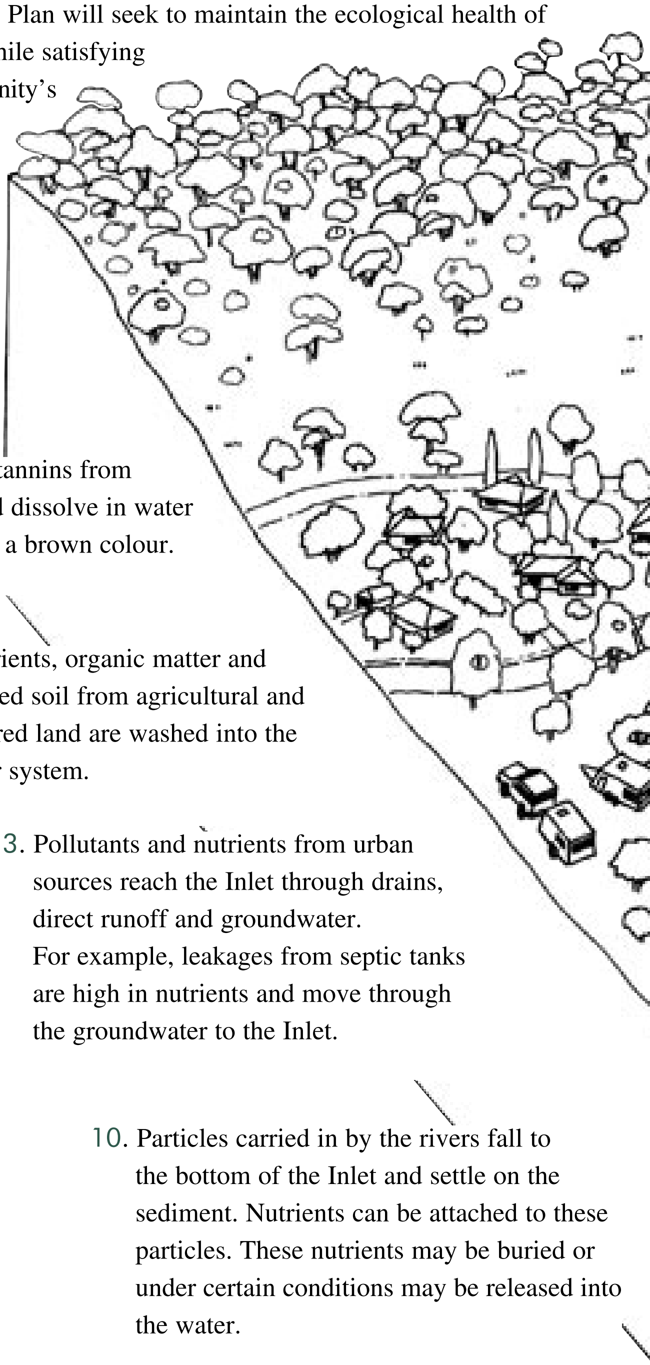
An integrated approach

As part of this long-term management strategy, the Wilson Inlet Management Authority together with local government authorities, landcare and catchment groups, other community groups and community members is producing a management action plan for the Inlet and its catchment.

This process involves WIMA and the community developing a shared vision for the future management of the Inlet and identifying key management issues. The scientific studies conducted to date will improve our knowledge of the Inlet and provide a sound basis for future management.

Studies to better understand water and sand movement through the mouth of the Inlet will be conducted to help with the community's concern about sandbar management. Related scientific studies in the Inlet will be focussed on seagrasses, sediments and microscopic algae.

The Action Plan will seek to maintain the ecological health of the Inlet while satisfying the community's needs.

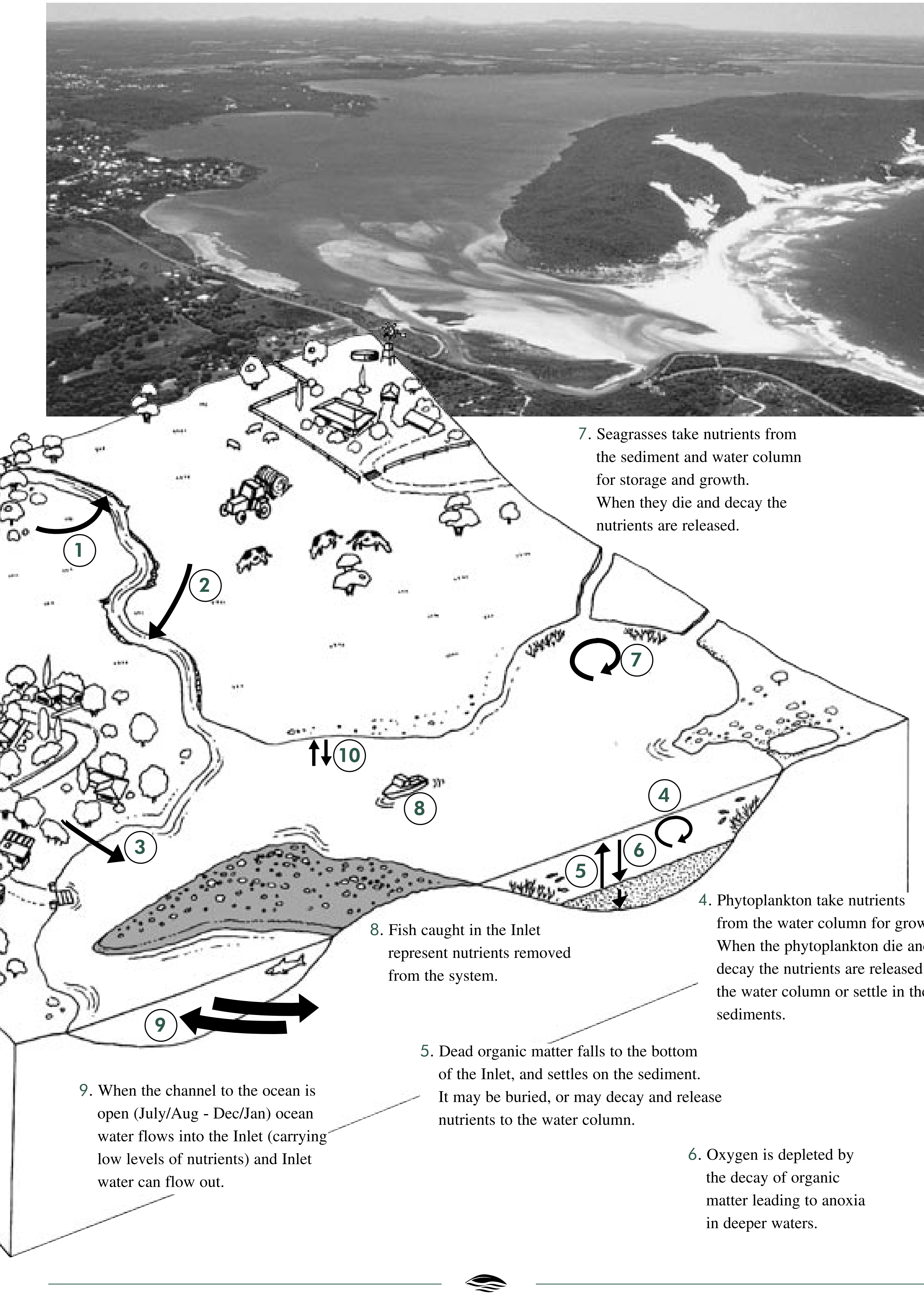


1. Natural tannins from bushland dissolve in water giving it a brown colour.

2. Nutrients, organic matter and eroded soil from agricultural and cleared land are washed into the river system.

3. Pollutants and nutrients from urban sources reach the Inlet through drains, direct runoff and groundwater. For example, leakages from septic tanks are high in nutrients and move through the groundwater to the Inlet.

10. Particles carried in by the rivers fall to the bottom of the Inlet and settle on the sediment. Nutrients can be attached to these particles. These nutrients may be buried or under certain conditions may be released into the water.



7. Seagrasses take nutrients from the sediment and water column for storage and growth. When they die and decay the nutrients are released.

4. Phytoplankton take nutrients from the water column for growth. When the phytoplankton die and decay the nutrients are released to the water column or settle in the sediments.

8. Fish caught in the Inlet represent nutrients removed from the system.

5. Dead organic matter falls to the bottom of the Inlet, and settles on the sediment. It may be buried, or may decay and release nutrients to the water column.

9. When the channel to the ocean is open (July/Aug - Dec/Jan) ocean water flows into the Inlet (carrying low levels of nutrients) and Inlet water can flow out.

6. Oxygen is depleted by the decay of organic matter leading to anoxia in deeper waters.

Learning together

Over the past three years, we have continued to build our understanding of Wilson Inlet. Rainfall, river flow, nutrient losses from the catchment, changes in water quality, water circulation within the Inlet, movement of Inlet water to the sea, and coastal sand movements are all important factors.

We know that the estuary is a constantly changing environment, whose plants and animals are well adapted to a wide range of natural conditions. We also know that to manage the Inlet well, we need to understand these natural processes and the changes caused by human activities.

It is important that the community is involved in the management of Wilson Inlet. A feature of future studies of the Inlet will be an increased level of community involvement in research activities. This will help to make sure that valuable local knowledge can help the research while the community learns more about the Inlet.

How to participate

For more detailed results from the studies that have been completed, or to find out more about current programs and how you can participate please contact WIMA or the Denmark office of Water and River Commission.

Eutrophication glossary

You will hear many technical terms in discussions about the Inlet as we move towards finding a solution. This brief glossary is included to explain some of the more common terms.

Algae - A diverse group of aquatic plants containing chlorophyll and other photosynthetic pigments. Microscopic algae are referred to as phytoplankton, while algae visible to the unaided human eye are referred to as macroalgae.

Anoxic - Absence of oxygen in the water.

Cyanobacteria - (blue greens) - An ancient group of photosynthetic bacteria without a nucleus. Some use nitrogen fixation to provide sufficient nitrogen for growth. A number of species produce toxins. Cells can also cause irritation of the skin and eyes on contact.

Denitrification - The transformation of nitrate to nitrogen gas, which is carried out by anoxic bacteria under suitable conditions.

Diatoms - Single celled algae, characterised by two overlapping silica cases surrounding each cell. Diatoms are often the most abundant type of phytoplankton found in Wilson Inlet.

Dinoflagellates - Single celled algae characterised by two flagella (hair-like extensions of the cell used for locomotion). Dinoflagellates are found in Wilson Inlet.

Enteromorpha - An attached or free floating macroalgae with filament-like strands which grow in a thick mat (often off Poddy Point).

Epiphytes - Small animals and plants that grow on the leaves of seagrasses and macroalgae.

Flushing - The process of removing Inlet waters to the ocean, and is the result of the interplay between freshwater coming from the catchment and seawater coming from the ocean.

Groundwater - Water which occupies the pores or crevices of rock or soil.

Macroalgae - Algae visible to the unaided human eye. Includes large green, red and browns algaes often referred to as seaweeds or kelp. eg *Enteromorpha*

Macrophyte - Rooted aquatic plants such as seagrasses and macroalgae.

Nitrification - The transformation of ammonia to nitrate, which is carried out by bacteria under oxygen rich conditions.

Nitrogen Fixation - The transformation of nitrogen gas to the nutrient ammonia. In aquatic systems this is often carried out by cyanobacteria.

Nutrients - Minerals dissolved in the water, particularly compounds of nitrogen (ammonia and nitrate), phosphorus (phosphate) and silicon (silica) which are essential for plant growth.

Phytoplankton - Small algae (often single celled), identifiable under a microscope, eg diatoms, dinoflagellates and cyanobacteria.

Porewater - Water which occupies the voids within the sediment at the bottom of the Inlet. Due to its close contact with the sediment, porewater is often enriched in nutrients.

Seagrasses - Marine flowering plants (angiosperms) found in coastal rivers, estuaries, protected coastal embayments and nearshore coastal areas. They are ecologically important as they provide habitat and food for many organisms, and stability for the seabed. eg *Ruppia*

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