SWAN RIVER TRUST

River SCIENCE 14

The science behind the Swan-Canning Cleanup Program

Issue 14, October 2000

1998/1999 Canning River Oxygenation Trial

CONTENTS

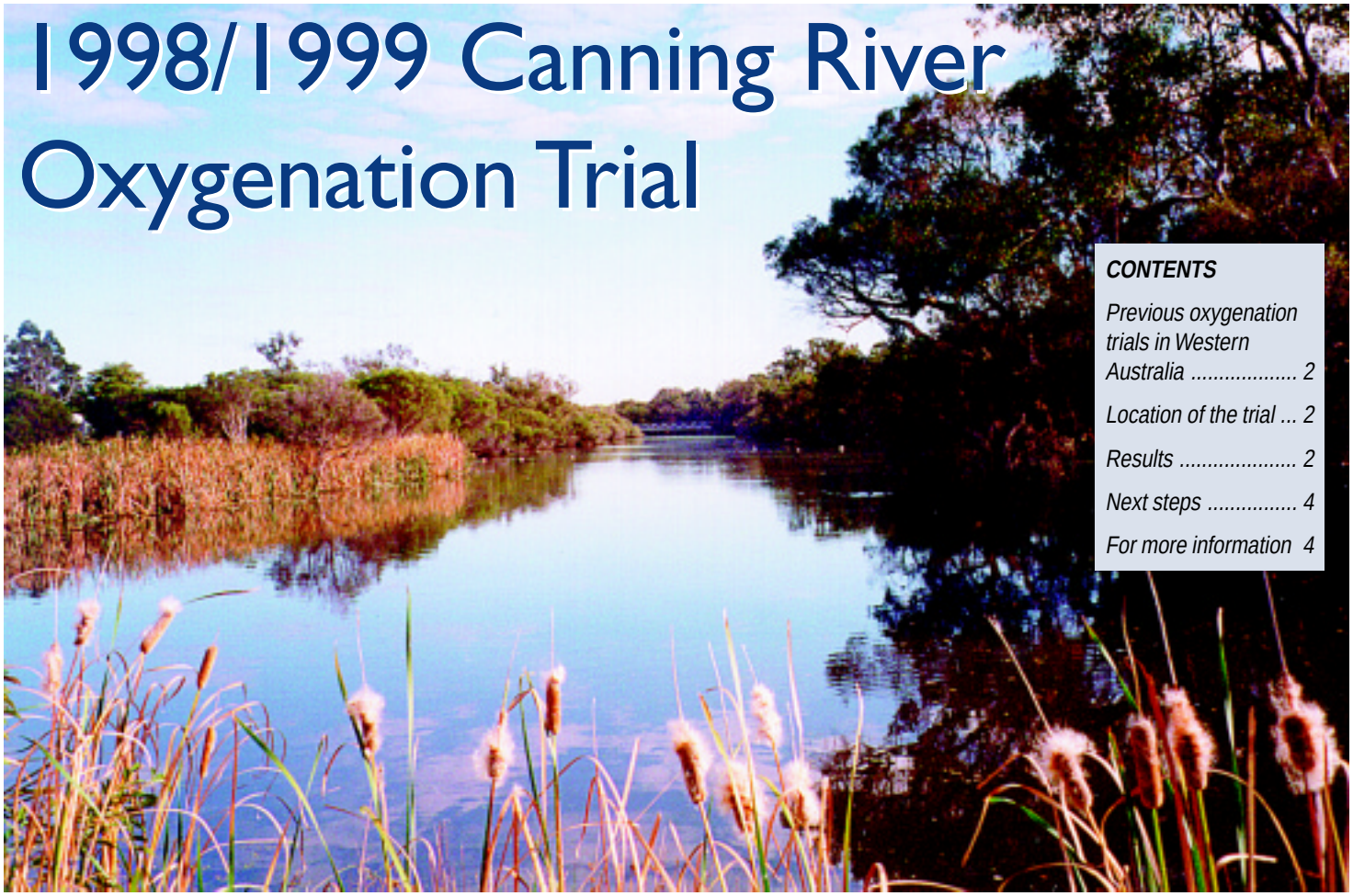

Figure 1: *The Canning River upstream of the Kent Street Weir*

A Brief Outline

This project is part of the Swan Canning Cleanup Program, an integrated five-year plan to clean up the Swan and Canning rivers. Oxygenation is one of several river remediation techniques being evaluated in this program.

The 1998/99 oxygenation trials continue on from the 1997/98 oxygenation trial on the Canning River, which was the first time oxygenation has been used in a river system in Western Australia. The 1998/99 oxygenation trials treated 1 km of river. A major objective of these trials was to develop a prototype plant that could be scaled up to treat greater lengths of river for the Swan Canning Cleanup Program.

Figure 2: *Location of oxygenation trial area showing location of plant and layout of diffuser pipes*

River Science issue 13 explains how nutrients are cycled in aquatic ecosystems and how oxygenation affects this cycling.

Previous oxygenation trials in Western Australia

Oxygenation was trialed last summer on the Canning River at the same location as this trial. A single diffuser was used to oxygenate water 100 m upstream and 200 m downstream from the diffuser. More information in the project is contained in the report 'Oxygenation trial on the Canning River Western Australia: A report on the 1997/98 Bacon Street trial'.

Location of the trial

The treatment area was 1 km long, and stretched 500 m either side of the oxygenation plant, which was situated at Bacon Street in Wilson. This area commonly experiences water quality problems related to anoxia (lack of oxygen) and often experiences severe phytoplankton blooms in summer.

Results

The oxygenation trial lasted from November 1998 to April 1999

The oxygenation plant was trialed over six months from 10 November 1998 to 30 April 1999.

The oxygenation plant was reliable and efficient

The plant worked safely and reliably. There were no adverse impacts on the environment and no complaints from the public.

About 85% of the oxygen injected into the river remained in dissolved form. This was a major improvement from the previous trial, when the efficiency of the dissolver used was between 50% and 75%.

Dissolved oxygen levels in the treatment area were higher than the rest of the river

Dissolved oxygen levels in a fairly stagnant water body such as the Canning River in summer tend to be higher at the surface where there is contact with the atmosphere but generally reduce significantly with depth, especially if there is stratification or plentiful decaying organic matter on the bottom. Thus while surface dissolved oxygen concentrations were slightly higher in the treatment area, the real effect of the oxygenation plant was seen in bottom waters. The mean dissolved oxygen level for bottom water in the treatment area was 4.3 mg/L, almost three times the mean dissolved oxygen levels in non-oxygenated areas (1.5 mg/L).

Dissolved oxygen levels were highest in the 450 m downstream from the oxygenation plant. In this area the mean bottom dissolved oxygen concentration was over 5 mg/L.

Figure 3: *The oxygenation plant used in the 1998/99 trials*

The oxygenation plant reduced nutrient release caused by anoxia

The factors that govern nutrient cycling in aquatic ecosystems are complex and often hard to measure, but evidence suggesting that the oxygenation plant did reduce nutrient levels was gathered. Firstly, nutrient levels in the treatment area did not rise after rain events the way nutrient levels in the untreated areas did. Nutrient levels often rise after rainfall due to nutrients from drainage flows, or from nutrient release caused by anoxia due to the decomposing organic matter the drains import. The monitoring results indicate that the nutrient cycling systems were able to process the nutrients more efficiently in the oxygenation treatment area. Secondly, nutrient levels rose rapidly in bottom water when the oxygenation plant was shut down for eleven days at the end of January. Dissolved oxygen levels were also very low while the plant was not operating, but within two days of the plant being operational oxygen levels had risen markedly and nutrient levels had drastically reduced (total phosphorus by 67%, ammonia by 97%).

SWAN RIVER TRUST

WATER AND RIVERS COMMISSION

Contributing to health of the Swan and Canning Rivers

A project of the Swan-Canning Cleanup Program

Coasts & Clean Seas

Eco Action

Our environment, our future.

No blue-green algal blooms were recorded

No blooms of blue green algae were recorded in the Canning River upstream of Kent Street weir in the summer of 1998/99. Several blooms of harmless green algae were recorded. The highest levels of green algae were found just upstream of the Kent Street Weir, which was not in the oxygenated area.

However, the absence of severe phytoplankton blooms could not be attributed solely to the oxygenation plant, as there are many other factors that contribute to the conditions that cause phytoplankton blooms.

Next steps

The success of this oxygenation trial allows the development of a larger scale oxygenation project. This project will oxygenate a longer stretch of river and will run for three summers. Research into the effect of oxygenation on nutrient levels and phyto-plankton populations will continue.

For more information

Swan River Trust
Level 3 Hyatt Centre 87 Adelaide Terrace
East Perth Western Australia 6004

Telephone (08) 9278 0400
Facsimile (08) 9278 0401
Website www.wrc.wa.gov.au/srt

ISSN 1443-4539
Printed on environmentally friendly paper
October 2000