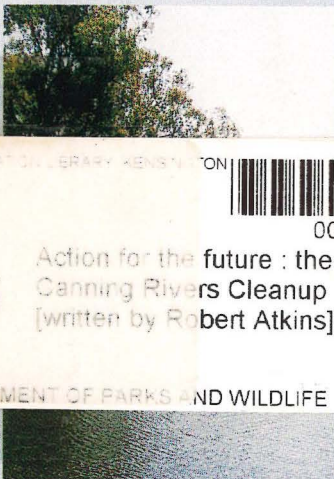
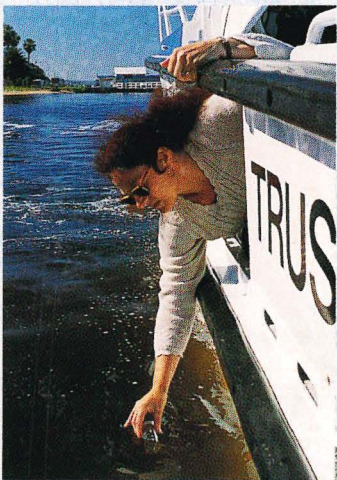


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THE SWAN AND CANNING RIVERS CLEANUP PROGRAM

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Action for the future : the Swan and
Canning Rivers Cleanup Program /
[written by Robert Atkins]

DEPARTMENT OF PARKS AND WILDLIFE



SWAN RIVER TRUST

JULY 1995



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THE SWAN AND CANNING RIVERS CLEANUP PROGRAM

ACTION FOR THE FUTURE



SWAN RIVER TRUST

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The Swan River Trust protects and manages the Swan-Canning river system and associated lands in cooperation with relevant authorities and the public on behalf of present and future generations of Western Australians.

The Swan River Trust wishes to acknowledge its partnership with CSIRO, the Chemistry Centre of WA, Water Authority, Department of Agriculture, Office of Catchment Management and the Ministry of Planning in developing and implementing the Swan and Canning Rivers Cleanup Program. It also acknowledges Bankwest's financial contribution to the CSIRO Algal Bloom Project.

Foreword

The increasing incidence of algal blooms in the upper reaches of the Swan and Canning rivers has prompted widespread community concern for the health of Perth's precious river system. Water quality in the rivers is declining and scientists have warned that urgent action is needed to halt the degradation.

In response, the Western Australian Government has announced a major new strategy to tackle the environmental problems in the Swan and Canning rivers.

The new strategy has a number of components and includes:

- Increased funding for the Swan River Trust to enable it to put in place a **Swan and Canning Rivers Cleanup Program**. The program aims to control the algal blooms in the rivers, improve catchment management to reduce the flow of nutrients which feed the algae, and encourage widespread community participation in all stages of the cleanup.
- The establishment of the **Western Australian Estuarine Research Foundation** to bring together the expertise of the universities, CSIRO, and the private sector with the Swan River Trust. The foundation will coordinate and raise funds for research into ways of solving the rivers' algal problems. This will add to water quality monitoring and other research being carried out by the Swan River Trust and provide the understanding needed to take the most effective action.
- Supporting **Swan River volunteers** to join in river conservation and restoration.

This document presents a summary of the Swan and Canning Rivers Cleanup Program. It explains the main components of the program and how they build on the existing research and management being undertaken by the Trust. It is a framework for those who will become involved in the program, and it indicates how the various research projects, trials, policies and catchment action plans fit into the bigger picture of restoring the water quality of the rivers.

Through the Swan and Canning Rivers Cleanup Program, the Government's new strategy and funding will enable the Swan River Trust to pull together the resources of the scientific community and the wider population to undertake much-needed work to revitalize our waterways. This is a significant step and heralds a brighter future for Perth's river system.



PETER FOSS
MINISTER FOR THE ENVIRONMENT



PETER FOSS
MINISTER FOR THE
ENVIRONMENT



Sailing on Melville Waters, 1922.



Windsurfing on the Swan, 1980s.



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Waterskiing at
Crawley Bay, 1960.



Upper
Swan River, 1995

A river system under pressure

The Swan and Canning rivers are the scenic and recreational heart of Perth, but their sparkling waters conceal a problem we can no longer afford to ignore. The river system is under severe environmental pressure.

Our river waters are among the cleanest found in any capital city in the world but land clearing and the use of superphosphate in the Swan and Canning catchment areas have helped to create an ecological problem – the appearance, in recent years, of increasingly large blooms of microscopic algae in the upper reaches of the rivers.

Algal blooms can cause skin irritations for swimmers, can be toxic to people and animals and can damage the ecological balance of a river. The blooms result from the presence of too many nutrients in the water column. As the microscopic plants that make up a bloom die off their decay robs the river of oxygen. This process can suffocate fish and other aquatic creatures.

Pollution sources that caused problems in the Swan and Canning rivers earlier this century have been largely controlled. However the effect of broader catchment clearing and land use are now taking their toll on the river system. For over 150 years excess nutrients have been accumulating on the river floor. The organic ooze deposited over the years is helping to feed the algal blooms that now haunt the river system. Industrial and animal waste, sewage disposal, septic tanks and fertilisers

from golf courses, parks and gardens are adding to the equation.

The annual algal bloom cycle begins when rains flush nutrients from the sandy soils of the Swan coastal plain into the drains and streams that flow into our rivers. Nutrients that are not washed out to sea through the Swan River's opening at Fremantle can add directly to the store of organic matter on the river bottom or can cause winter blooms of algae. These blooms turn the river murky but are not harmful to the river environment except for the role they play in trapping and recycling nutrients. As the blooms die they settle on the river floor, adding further to the nutrient rich sediment.

In summer, salt water from the ocean moves up the Swan causing changing conditions that result in the release of nutrients from the river floor. These nutrients, combined with warm summer temperatures and sunlight, provide ideal conditions for more algal blooms. Summer blooms are bigger and more toxic than those in winter and can cause health and other problems for river users. The environmental effects on river life can be dramatic with major blooms causing massive fish kills.



‘National and international experience shows that without action in the rivers and the catchment, increases in algal blooms will continue.’





Managing the rivers

Government authorities have recognised the need to manage and protect the Swan River for more than half a century. The first coordinated effort began in 1943 with the establishment of the Swan River Reference Committee.

Since then a succession of agencies have worked to keep the river clean and healthy. Today, responsibility for planning, protecting and managing the Swan-Canning river system and its associated environment rests with the Swan River Trust.

The Trust – in cooperation with a wide range of community groups, academic institutions, industry and local, state and federal government agencies – works to manage an environment faced with the pressures of increasing population and development.

Many of the industries that once pumped their waste directly into the rivers have found alternative means of disposal but concern still exists for the health of the Swan and Canning.

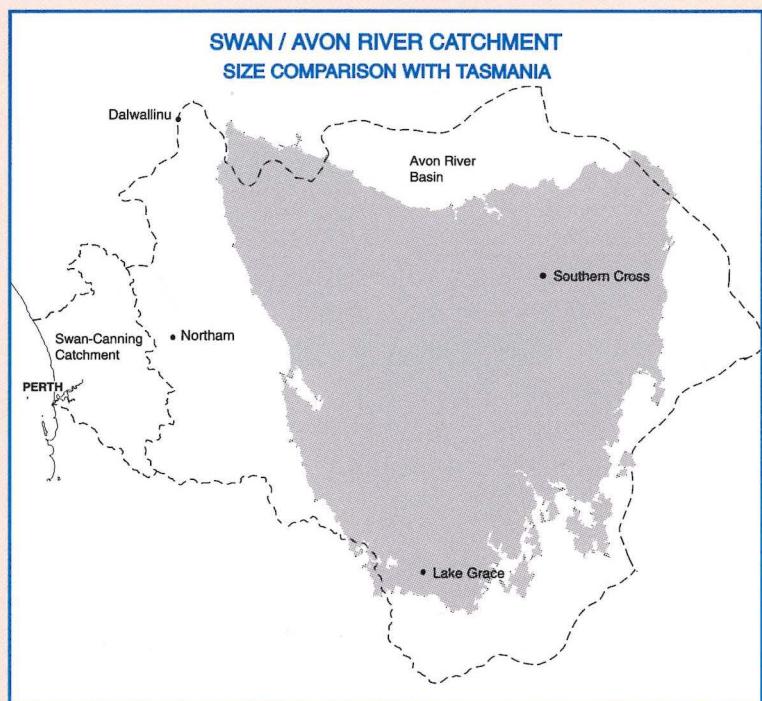
The Trust is working to monitor and control the nutrients entering the rivers. But the problem is complex. The rivers' catchment covers an area bigger than Tasmania and the nutrients are coming into the system from many sources.



How big is the catchment?

At 140,000sq kms, the water catchment that feeds the Swan-Canning river system stretches from Dalwallinu in the north, past Southern Cross in the east and Lake Grace to the southeast.

It supports a population of 1.4 million and includes some of Western Australia's main agricultural districts. Strong community networks exist in rural areas through 40 Land Conservation Districts and 100 associated sub-catchment groups. In the city, many community groups exist but their environmental activities are less coordinated.





What needs to be done?

The problems confronting our river system are complex but we cannot wait until we understand all of the rivers' processes before acting to clean up the mess.

Scientists acknowledge that a great deal of research is required before we can know what specific factors are promoting or inhibiting algal blooms in the Swan and Canning rivers. In the meantime however, urgent action is required to bring the existing problems of the rivers under control. We know enough to begin trials on techniques such as treating sediments and stripping nutrients from stormwater and to know that we must improve catchment management in the city and country.

The Swan River Trust has developed an integrated program to clean up the Swan and Canning rivers. It will focus on both action and investigation and will look at river and catchment management. Community involvement will be an integral part of the program.

Community involvement

The first phase of the Cleanup Program will develop a clear plan that identifies who needs to do what and when. It will act as a starting point for developing details of how the program can be implemented. This process will involve many sections of the community and all agencies who have an interest in the river.

Phase one of the program will also set in motion a community-based catchment management plan for the rivers.



Members of the Bayswater Integrated Catchment Management Committee at the Bayswater drain in Slade Street.



Nyungah elder Robert Bropho with children during a tree planting day at Success Hill, Bassendean.

'A program involving all sections of the community is needed to tackle the nutrient problem and clean up the rivers.'

Aims of the Cleanup Program

- Understand the mechanisms that trigger algal blooms and control their growth; identify how nutrients are getting to the rivers; and determine the best way to manage these inputs.
- Help maintain water quality both now and in the future by managing river sediments to reduce the store of organic material and nutrients.
- Help change land uses, planning processes and development decision making to reduce the amount of nutrients leaving rural and urban catchments.
- Inform and involve the community in the cleanup of the Swan and Canning rivers.

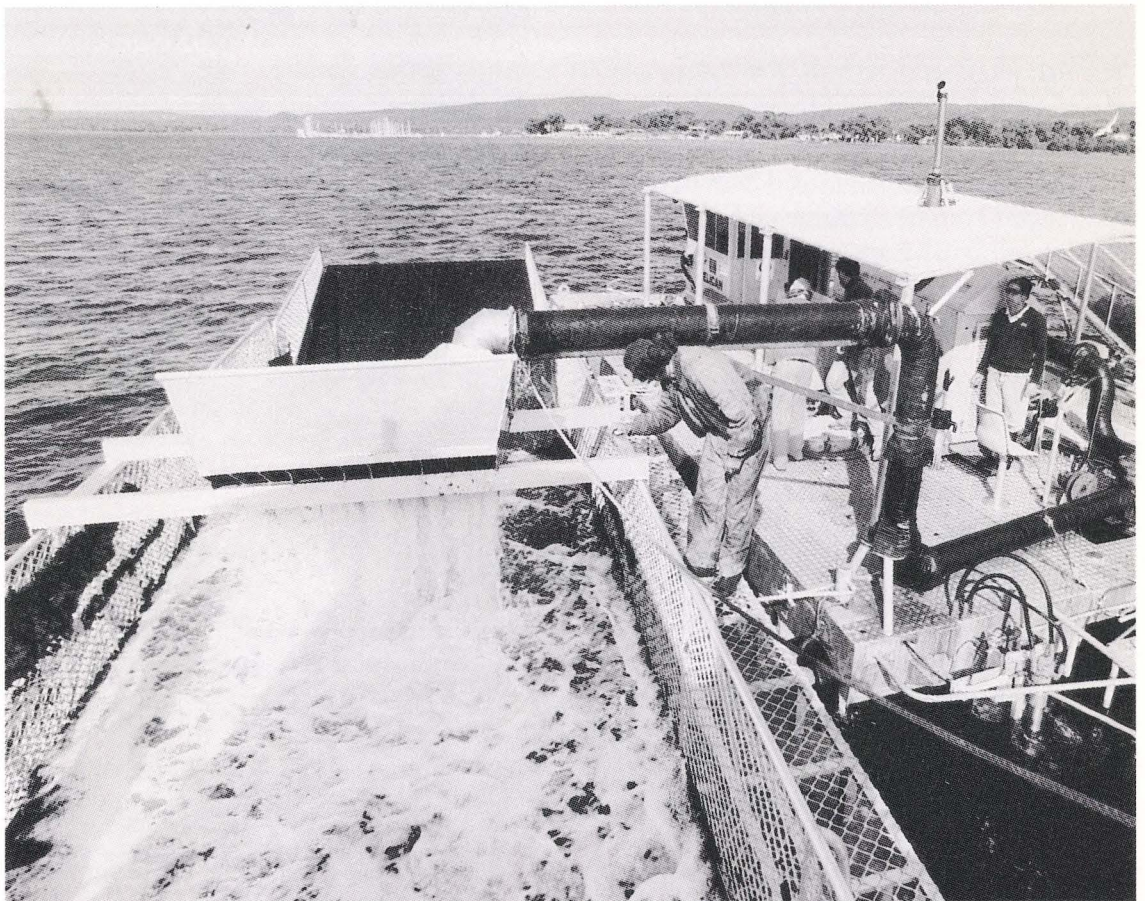
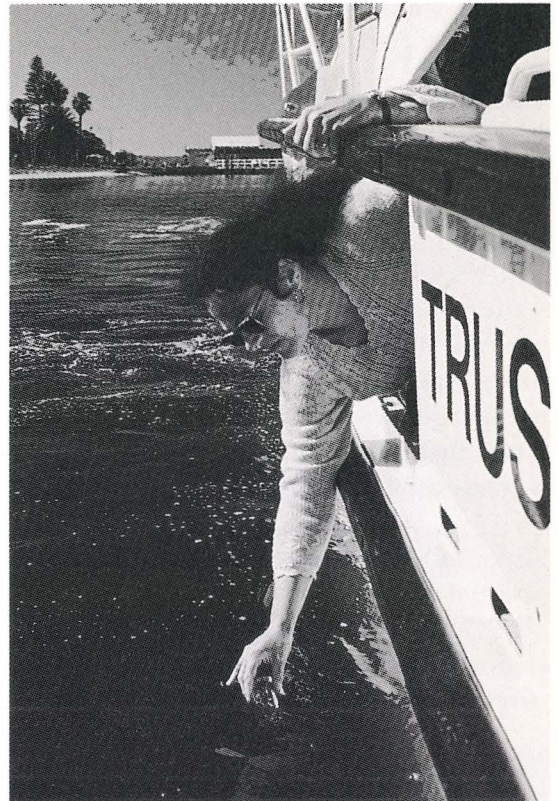


What needs to be done?

How will we know when the strategy is working?

We will know the Cleanup Program has achieved its aims when:

- Algal blooms are kept at a level where there is no threat to public health, the rivers' ecology or any nuisance to the community.
- Water quality in the Swan River is suitable for maintaining a healthy ecosystem and for human use. People can swim and catch fish at any time.
- Rural catchments are productive and profitable, while nutrients leaving the catchments are within set targets.
- New urban areas are designed to reduce water and nutrients entering the rivers, while still being attractive and affordable places to live.



Algae being sucked from the bottom of Princess Royal Harbour, Albany. Similar operations may be used in Perth's waterways to clear away built-up nutrient-rich sediment.



What does the Cleanup Program involve?

The Cleanup Program will uncover key information about the river systems so that algal blooms can be controlled and managed. There are already a number of projects underway (see page 10), while others will be established.

Activities in the river

Investigations

Estuarine water quality and phytoplankton ecology

The water quality in the estuary and the occurrence of phytoplankton from Fremantle to Guildford will be monitored and assessed on a regular basis throughout the year. Prior to the Cleanup Program blooms were studied only when they were noticed and reported by members of the public.

Algal triggers and sediment chemistry

The CSIRO is investigating what triggers algal blooms and studying sediment chemistry in the upper Swan estuary. This project will be extended from two to five sites. It will provide vital data on the causes of algal blooms, why they grow and the role of sediments in these processes.

Sediment mapping

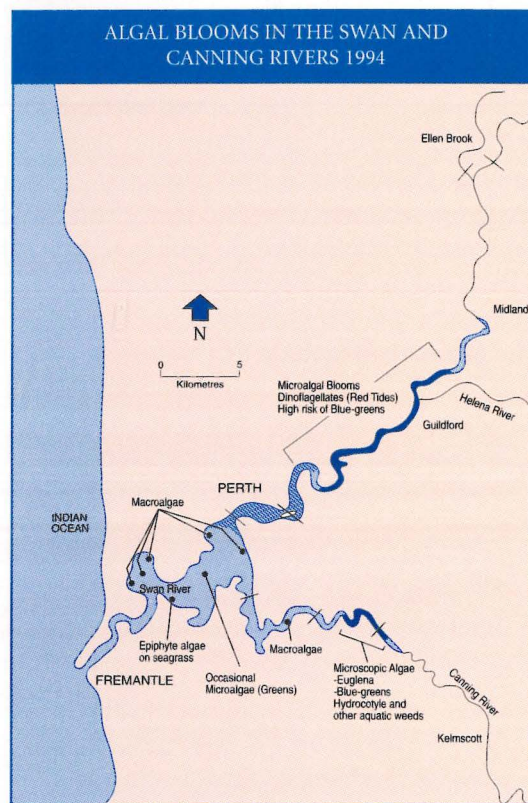
Nutrient-rich sediment in the estuary will be located, enabling an assessment of the magnitude of accumulated nutrients in the system. These "hot spots" will provide the basis for determining the best way to treat the sediments and target the areas where treatment will be most effective.

Ecology of benthic animals

Dying algal blooms and low oxygen levels often kill benthic (bottom living) animals. A Murdoch University Honours project into the effects of reduced oxygen levels and algal blooms on the benthic fauna will be extended to include much of the upper estuary. This will provide vital data on the health of the benthic fauna - the basis of the food chain that supports life in the rivers.

Macroalgal and seagrass ecology

Seagrasses are an important part of the habitat for fish, prawns and crabs. Attached (epiphytic) algae can be a burden to the health of seagrasses. Surveys will be conducted to get a better understanding of the main seagrasses and macroalgae in the estuary, their seasonal dynamics and their role in nutrient uptake, release and recycling.



Estuarine hydrodynamics

Water movement is an important process in the release of nutrients in the estuary, and tidal movement is believed to be an important influence in triggering algal blooms. The major physical and chemical processes that influence estuarine water quality will be investigated. The study will provide information on the impact of tidal exchange.

‘Prior to the Cleanup Program blooms were studied only when they were noticed and reported by members of the public.’



Trials of new techniques

Altering the river water body

Artificially mixing the waters of the upper estuary may help to control algal blooms. The feasibility of such a management measure will be investigated. A computer model will be used to determine where and when artificial mixing would be most beneficial, and a compressor on a barge may be used to pump air into lower waters. Depending on results, a full-scale program of aeration and monitoring could be implemented.

Sediment manipulation

This project will look at a number of techniques used in Australia and overseas for managing nutrient enrichment and algal blooms. These include mud pumping, dredging, sediment chemical treatments, bathymetric modifications (mixing deep water) and oxygenation of sediments.

The project will include:

- A search of the international scientific literature for techniques which could reduce the incidence and severity of algal blooms. Methods cited in the literature will then be evaluated and pilot trials developed for the most promising techniques.
- An investigation of the feasibility of selective dredging or modification of nutrient-rich sediments. Using information from the sediment map, areas where organic ooze could be removed or covered will be determined. A dredging plan will then be prepared. It will include an assessment of the environmental and social impacts of the operation.

When more is known about the feasibility of these options, an action plan will be put in place.

‘When more is known about the feasibility of these cleanup options, an action plan will be put in place.’



Activities in the urban and rural catchment

Investigations

Identifying nutrient sources

The Swan River Trust’s monitoring has identified key catchments that lose large amounts of nutrients – Ellen Brook, Avon River and Southern-Wungong River (see map next page). More information is needed in each catchment to identify the “hot spots” – such as sandy soils which do not retain nutrients effectively, and landuses like effluent disposal and intensive horticulture which may be large contri-butors. A network of shallow groundwater bores will be located around the estuary to determine the amount of nutrients coming directly from groundwater.

Stormwater design and drainage management

New criteria are required for urban stormwater systems. With better design, drainage systems could control flow to allow for nutrient removal and to help retain water in the catchment, while still controlling flooding.



The best ways to reduce silt and nutrients in urban stormwater drains need to be identified. The WA Water Authority and local government authorities are investigating ways to design and build appropriate nutrient removal ponds and drainage systems for new urban areas and refit existing systems. Methods will include the rehabilitation of degraded wetlands, the development of artificial wetlands, compensating basins and gross pollution traps.

Nutrients from domestic gardens and streets

Investigations will be carried out to determine nutrient loss from domestic gardens and other urban sources such as golf courses and parks. An ongoing education program to change people's watering and fertiliser habits will be established.

Detergents

Phosphorus in detergents is a significant proportion of the phosphorus in septic tank discharge. Further work will evaluate detergents that are either phosphorus free or low in phosphorus.

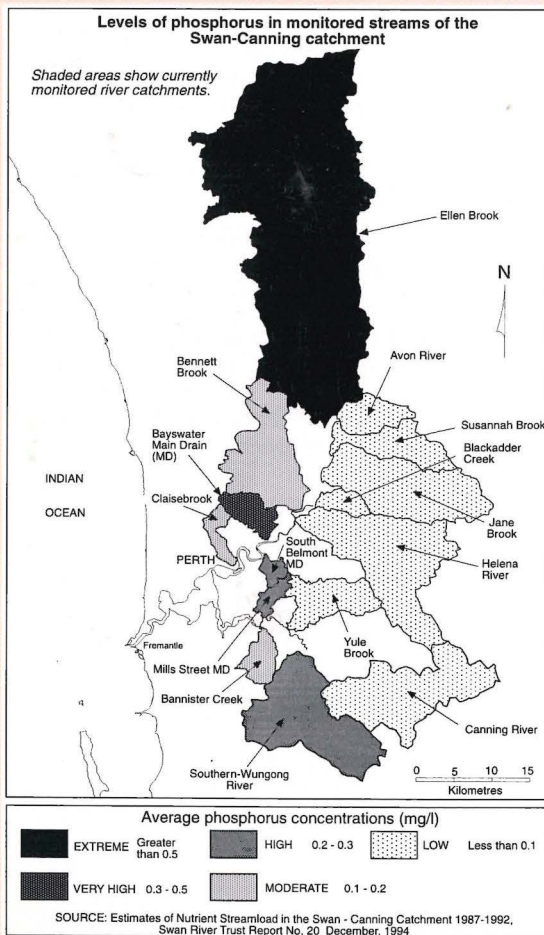
Action plans

Catchment management plans

Catchment plans will be developed and implemented to improve land management and control other "polluting" activities to reduce nutrient loss. The preparation and implementation of these plans will require the close involvement of the people living and working in the catchment, especially local government.

Catchment plans have many parts. They include guidelines for rural activities such as:

- amending sandy soils to improve nutrient holding
- managing fertiliser use and irrigation to reduce loss of excess water and nutrients
- controlling grazing rates
- making sure rural activities such as horticulture are appropriately located and managed
- incorporating nutrient retention and stripping into drainage systems
- ensuring appropriate effluent treatment and reuse
- rehabilitating streams
- fencing remnant vegetation
- and revegetating damaged stream and river banks.



All catchments of the Swan and Canning rivers will eventually have a catchment management plan. These plans will recommend work throughout the catchment from tree planting to drainage management, water quality sampling and community education.

Community groups, local government and State agencies are involved in developing management plans for these catchments. For the Ellen Brook, Southern-Wungong River



and Canning River catchments, project officers have been appointed to work with local communities to help prepare and put the catchment management plans into action. The project officers will work on education programs and activities designed to raise awareness about conservation and land management. This support will be vital to the success of the catchment management program.

An urban landcare officer/facilitator has also been appointed to augment the Swan River Trust's pollution control program with local government authorities and community groups.

Catchment management plans for the Ellen Brook and Southern-Wungong River catchments remain the highest priority.

'All catchments of the Swan and Canning rivers will eventually have a management plan.'

Horticulture policy for the coastal plain

A policy will be implemented to ensure that new horticultural developments are located in appropriate places and that operators prepare and use Nutrient Irrigation Management Plans.

Water sensitive urban design

The Ministry of Planning's Water Sensitive Urban Design Policy should be implemented in all new developments on the coastal plain sands. The policy provides developers with guidelines on how to design housing areas to reduce the rate and volume of surface stormwater runoff. It includes such things as porous paving, spoon drains along roads, paths and carparks to increase the infiltration of rain into the ground. Housing designs can be modified to reduce lawn area and gardens that rely on large amounts of water and fertiliser, thereby reducing runoff and fertiliser flow into the rivers.

Detergents

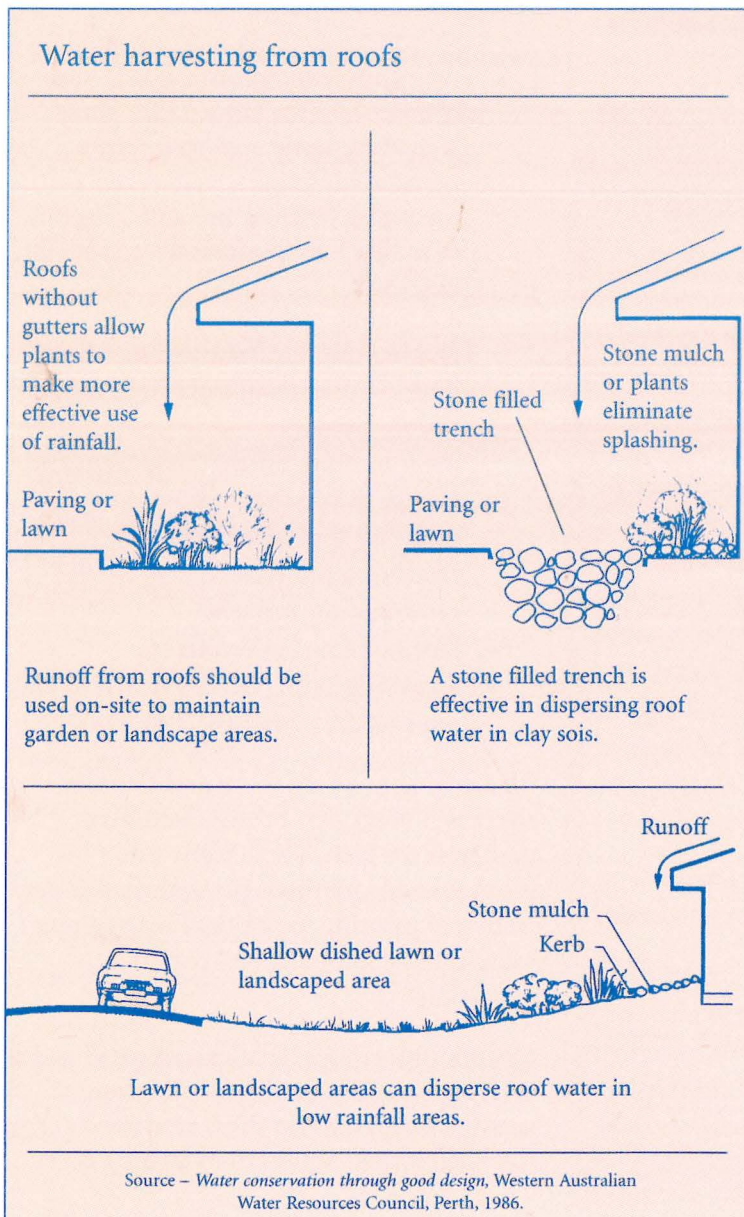
An investigation of suitable low environmental-impact detergents will be undertaken and recommendations made.

Point sources of pollution

The Swan River Trust, Water Authority of Western Australia, Department of Environmental Protection and local government will implement programs to reduce point sources (specific spots) of pollution throughout the urban and rural catchments.

Fertiliser management

The Department of Agriculture will lead the development of sustainable agriculture and farm planning to reduce soil erosion and fertiliser loss in rural areas as part of the integrated catchment management process.





Catchment and streamline revegetation

Government agencies and local government authorities will work with landowners and community groups to replant stream banks, wetlands and strategic parts of the catchments to reduce water runoff and nutrient and soil loss.

Putting the pieces together

A database system and models will be developed based on the multitude of findings and observations collected during the research and monitoring phases of the Cleanup Program. This information will provide a foundation for developing effective catchment management plans.

Ecosystem modelling

All of the information gathered in various projects will be integrated into computer models describing dominant physical,

chemical and biological processes in the Swan estuary. These will help in assessing different management options.

Geographical Information System (GIS) mapping

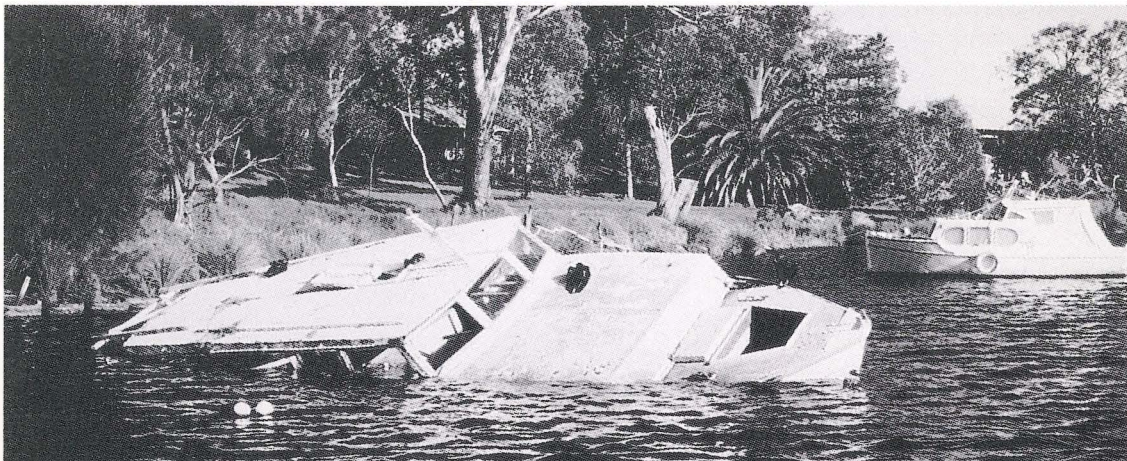
A GIS system will provide maps of river features including sediments and benthic habitats. The system will also provide maps for catchment management plans.

Integration and reporting

A Program Task Force will coordinate all aspects of the investigation into algal bloom management and will report regularly to the Government and the community on the progress and results of the investigation.



New developments must be sensitive to the long-term impact they might have on the river environment.





Improving water quality: current activities

The Swan River Trust is working in tandem with other agencies and research institutions to control pollution and to identify the sources of nutrients entering the rivers.

This research includes a program of monitoring and measuring nutrient loads from various parts of the rivers' catchment areas. As part of the program the Trust provides the Government with an annual audit of water quality flowing from the catchment.

The aim is to identify land uses and sections of the catchment where better management could reduce the loss of nutrients to the river system. So far, the research has found that most of the phosphorus (the nutrient of greatest concern) is coming from just two catchment areas – Ellen Brook and Southern River.

The following list summarises the key activities of the current program to manage and improve water quality. All of this existing work will support the Cleanup Program objectives.

- The Trust is working with the Water Authority to monitor 16 sub-catchments on the Swan Coastal Plain.
- A joint Federal-State funded project, the Ellen Brook Study, is identifying sources and paths of nutrients from land uses in this catchment. It is tracing the fate of the nutrients in the brook and recording when the nutrients reach the Swan River. The Ellen Brook catchment management plan will outline how to begin cutting down the amount of nutrients lost.
- The CSIRO is conducting an algal bloom research program with Trust support. The program will develop a method of identifying algal types (diatoms, dinoflagellates, and blue-green algae) over large areas using remote sensing from aircraft. The triggers causing algal blooms will be identified and a model developed to predict algal

growth and relate land use changes in catchments to nutrient levels in estuaries.

- The Swan River Trust is carrying out estuarine monitoring to identify the physical, chemical and biological processes which lead to algal blooms.
- The Swan River Trust is negotiating tighter controls on licensed point sources of pollution (industrial discharges) to control the amount of phosphorus flowing into the river. This is part of a wider pollution control program.
- The Swan River Trust is working with the Royal Institute of Parks and Recreation on a Turf Irrigation Nutrient Study to develop better nutrient irrigation methods.
- The Centre for Water Research at the University of Western Australia is undertaking research into river water movements and oxygen fluxes.
- The Environmental Protection Authority and the Swan River Trust are preparing an Environmental Protection Policy to set targets for the health of the Swan and Canning rivers.

‘The research aims to identify where better management could reduce nutrient loss.’



Swan River Trust field hand Ivan Stork removing rubbish from the Applecross foreshore.

Improving water quality: current activities

- The Swan River Trust is involved in the planning process for new subdivisions to help ensure adequate setbacks and nutrient controls are in place.
- The Swan River Trust is assisting a Curtin University project to prepare a management plan for the Southern River catchment, which will provide guidance for reducing nutrient loss.
- A strategy for integrated catchment management of the Bayswater Main Drain has been prepared by a community-based committee, with assistance from the Trust.
- The Trust promotes sound catchment management by providing advice, information and, where possible, support to land managers.

The Western Australian Estuarine Research Foundation

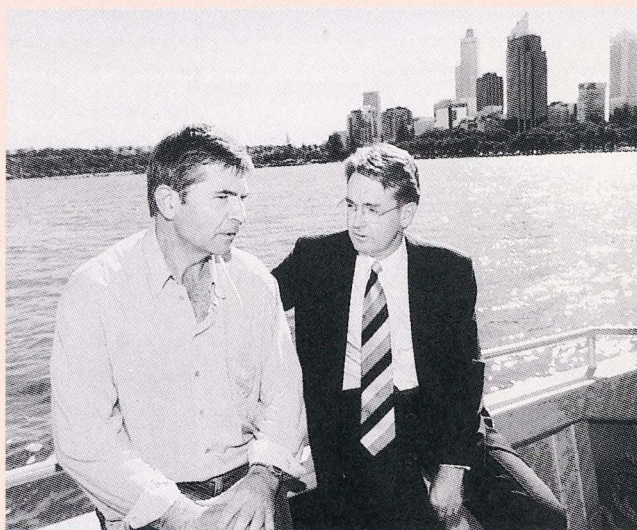
Scientists do not fully understand the many and complex processes that operate in the river system. More research is needed to unravel the secrets of the rivers and their catchment areas.

To ensure that the best quality research is carried out, the Western Australian Estuarine Research Foundation has been established. It has a small membership of prominent researchers and industry and community representatives. The foundation will raise money and coordinate research programs for the State's waterways. Its first priority will be the health of the Swan and Canning rivers. Start-up funding of \$750,000 has been pledged to the Foundation by the State Government. The Foundation chairman, Professor Jorg Imberger, is the head of the University of Western Australia's Centre for Water Research.

In March 1995, after a public call for research proposals, the Foundation decided to fund research activity totalling \$1.7 million over three years. To be undertaken by the University of Western Australia, Murdoch University, Curtin University, Edith Cowen University and the CSIRO, the research projects will look at:

- the economic value of the Swan-Canning estuary, including the costs and benefits of estuary management;
- developing an integrated ecological model of catchment hydrology to achieve a greater understanding of the behaviour of the Swan-Canning catchment; and
- the influence of the Dawesville Channel on crustaceans and fish in the Peel-Harvey estuary.

For more information contact the Western Australian Estuarine Research Foundation on (09) 380 2466.



WA Estuarine Research Foundation Chairman, Professor Jorg Imberger, with Premier Richard Court during the launch of the Swan-Canning Cleanup Program in May 1994.





The community's role

Community involvement is the key to a successful cleanup program for the Swan. If we all act responsibly in the way we use fertiliser and water in our homes and gardens we will be part way to saving our rivers.

The Cleanup Program will assist people to re-establish a sense of place in their local environment by helping community action groups restore areas of conservation value and to improve the recreational, wildlife and scenic values of their local streams and drains.

The program will also give members of the community a chance to have a say in decision making that affects their lives. The community involvement component of the Cleanup Program will:

- raise awareness of the values of the river system and the threats to its health;
- raise awareness of what individuals, community groups and schools can do to help;
- provide education resources and programs through schools;
- provide information on how to get involved in the program and foster opportunities for involvement, for example in rehabilitation or litter cleanup projects;
- encourage positive experiences of the river environment and appropriate recreational use; and
- support better catchment management by helping catchment and community groups to find information, receive training, and locate speakers and facilitators.

‘The Cleanup Program will help people to re-establish a sense of place in their local environment.’



Students from Forest Crescent Primary taking water samples of the Canning River as part of the Ribbons of Blue program.

The Swan River Trust will keep members of the public informed about the progress of the program through an annual forum. The forum will discuss the results of investigations and trials, the success and status of action plans and the health of the rivers. A regular newsletter will be published and distributed to local government authorities, community groups and interested individuals.

Leaflets and other printed materials will be available as investigations proceed to provide information to specific audiences such as local government and catchment groups. A community resource centre, to be set up under the Swan Avon Integrated Catchment Management Program, will help people get information and become involved in the cleanup.



Erosion control works at Ron Courtney Island, 1995.



Getting involved

There are numerous ways members of the public can get involved in caring for the rivers and their catchment.

The Swan River Trust will support volunteer groups that provide such opportunities. Examples of ways individuals could take part include:

- Pollution watch – keeping a watch on local streams, drains or river foreshore, and reporting to the Trust unusual events like algal blooms, or signs of pollution.
- Planning – getting involved in catchment landuse or foreshore planning.
- Activities – joining in cleanup days or community projects to restore degraded streams or foreshores.
- Joining a group – taking part with other interested people in a catchment or rivercare group.
- Supporting environmental education and activities in schools.



For more information about ways to get involved, including a list of community rivercare groups in your area, information about training days and cleanup opportunities, and a copy of the Trust's regular newsletter, you can contact our Community Relations Officer on 327 9730.

The future

This five-year Cleanup Program is the beginning of a long-term strategy to halt the decline in water quality and reduce the pollutants entering the Swan-Canning river system.

It will increase our understanding of the rivers and will pin-point where we can have the most success in reducing nutrient flow and controlling algal blooms. It will also highlight ways that individuals can reduce their own impact on the river system through a range of activities such as water conservation and the careful use of fertilisers.

Throughout its operation, development, planning, investigation and implementation,

the program will help provide the information necessary to encourage members of the community to play their part in the cleanup.

The establishment of the Cleanup Program is an important milestone for the Swan and Canning rivers. It heralds a time of concerted community action to halt the decline in water quality we have witnessed in recent years. It is the start of a healthier future for our river system.





Find out more

Contact:

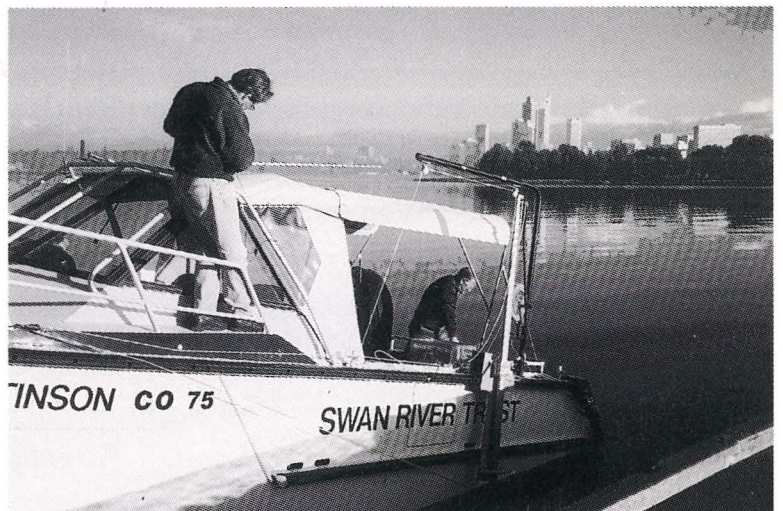
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River cleanup equipment, 1960



Swan River Trust staff at the Ellam Street depot, Victoria Park, 1995.

