# THE TOOLIBIN LAKE CONSERVATION PROJECT

## - PROGRESS DURING THE FIRST THREE YEARS



### 1. THE RESEARCH INTO TOOLIBIN LAKE (1977-87)

The deterioration of the vegetation and water quality of Toolibin Lake was first drawn to the attention of the then Minister for Fisheries & Wildlife and Member for Narrogin, Mr P.V. Jones, in 1977 by the Field and Game Society.

Peter Jones set in motion an inter-departmental study to investigate the degree and rate of habitat deterioration and also the main causal factors. The Departments involved were Fisheries & Wildlife, Public Works, Mines Dept. and Agriculture. Their forum for discussions was the Northern Arthur River Wetlands Rehabilitation Committee. Studies of vegetation trends, the volumes and salinity levels of inflow to the Lake and monitoring of the regional groundwater system were all involved. This committee has recently published it's final report after a ten year period of study.

As far as the Committee can determine this study is the most comprehensive assessment carried out in Australia of the effects of man-induced salinisation on a terrestrial aquatic environment.

Surveys of waterbird populations show that Lake Toolibin is the most important inland wetland of the region. More species have been recorded as breeding there than any other wetland in the region. Also, apart from Lake Wannamal, a greater diversity of species use Toolibin than any other inland lake. It is one of the few remaining breeding habitats for the rare Freckled Duck and a vital breeding area for maintaining the populations of other less rare waterbirds.

The emergent vegetation of Lake Toolibin is the prime reason for its value as a waterbird habitat. However surveys reveal an unequivocal trend of vegetation decline. Natural regeneration of degraded areas is not occurring and the reason for the poor vegetation condition is high soil salinity, possibly in combination with increased waterlogging.

Lake water salinity fluctuates over an annual filling and drying cycle from 500mg/L to 6000 mg/L Total Soluble Salts, but during the spring breeding period it is usually less than 3000 mg/L. On the basis of water depth and salinity, Lake Toolibin is currently suitable for breeding for about 70 per cent of the time. Without improved catchment management the salinity of inflow to Lake Toolibin is expected to further increase as the full effects of past clearing for agriculture are reflected in stream water quality. If this salinity increase exceeds 30% the lake would no longer be suitable for breeding of the more critical waterbird species.

A key to the future of Lake Toolibin is the level of the saline groundwater beneath and adjacent to the lake. Currently Toolibin is an effluent lake with slow leakage through its bed to groundwater occurring whenever the lake contains water. This prevents a build-up of lake water salinity.

The watertable levels beneath and around the lake are shallow, saline and generally rising by about 20 centimetres per annum. During periods when the lake contains water the general groundwater flow is south away from the lake. However during prolonged dry periods the lake environment acts as a groundwater discharge area. Where vegetation is healthy groundwater discharge is by transpiration but on the western shore, where vegetation has died, evaporation from the soil is salinising the bed. It is expected that without improved management increasing salinity of the lake bed will expand the area of degraded vegetation outwards from the boundary between healthy and degraded vegetation. The death of vegetation along the western shore is likely to have been initiated by local saline seepage from an adjacent area of saline soils on cleared land.

It will be necessary to implement a number of management actions to stabilise and improve the lake ecosystem and to limit further increases in regional groundwater levels and inflow salinities. Also, it will be important to continue with a minimal but significant programme of hydrologic and vegetation monitoring to provide warning of any need for greater management intervention that may become necessary to save this valuable State asset.

RECOMMENDATIONS

Active management actions will be essential for Lake Toolibin to retain its current high environmental value.

Recommendations for ongoing management are as follows:-

* That a 100 to 200 metre wide strip of farmland adjacent to the full length of the western edge of the lake be acquired and revegetated promptly. Revegetation of this buffer strip should be carried out using techniques and species appropriate to the various site conditions.

* The system of interceptor banks currently discharging saline water into the western side of Lake Toolibin have been modified to divert this flow to the south of the lake, keeping this diversion well to the west of the proposed western buffer strip.

* That active management of vegetation in the Lake Toolibin Reserve be carried out to maximise health and increase evapotranspiration. Sequential small scale burning and planting of native seedlings should be considered to encourage regeneration and increase species diversity.

That there be active encouragement of all practical actions for control of groundwater levels and salt discharges across the catchment. These actions to include: encouraging the development of farming systems and farm plans to reduce recharge while at the same time increasing farm productivity; rehabilitation of salt seeps and salt flats; and fencing off and revegetating areas adjacent to streamlines to control groundwater discharge.

The Wickepin Soil Conservation District in collaboration with Greening Australia have embarked on a saltland revegetation programme which deserves every encouragement.

* That a bore field be designed, and costed, to assist the vegetation to lower the watertable beneath the degraded western shoreline to at least 1,5 metres beneath the soil surface. An essential first action is to arrange a sustained pump test to obtain the hydraulic parameters required for the design of this bore field.

  Implementation would then depend on an assessment of the cost and current condition of that section of the lake.

* That the condition of all 26 vegetation plots be monitored and re-assessed every four years with annual inspection of a sub-set of these plots. The next comprehensive survey to be in 1990.

* That monitoring of the bore holes in and around Lake Toolibin be carried out annually at the end of summer with the data analysed and stored in the State Water Resources Information System. Consideration be given to instrumenting key sites for continuous monitoring.

* That operation of the established gauging stations monitoring lake level and the quantity and quality of inflow from the Northern Arthur River be continued; and that the lake water quality be sampled at appropriate intervals following each major inflow event.

## 2. LAND DEGRADATION PROBLEMS ON FARMS NEAR THE LAKE

During the course of the Lake Study, the problems of soil salinity, waterlogging and flooding on flat farmland surrounding the Lake became apparent. There was pressure on the Department of Agriculture to advise on drainage systems and saltland management. One property to the west of the Lake invested a very large amount of money on seepage interceptor banks in an attempt to solve these problems.

This desire by local farmers to tackle the problems of the flats came to a head in November 1984, about the time when the first Soil Conservation Districts were forming. A public meeting at Noman's Lake Hall decided to recommend to the Minister for

Agriculture that the catchment area above the Toolibin Lake be gazetted as a S.C.D. A steering committee was formed of people involved with the lake problem. This committee decided to recommend that the whole of Wickepin Shire be declared an S.C.D. and this eventually occurred in 1986.

The first project of the Wickepin S.C.D. was the Toolibin Lake Project, which involved work on all salt affected flat surrounding the Lake Reserve. Eight farmers were involved in this co operative venture with two main aims in mind:-

(a) To minimize the impact of agriculture on the Lake Reserve and

(b) To improve the productivity of the saline and waterlogged farmland itself.

## 3. THE TOOLIBIN FLATS PROJECT (1985/87)

Eight farmers have been involved in the treatment of 569 hectares of salt affected land in the catchment area upstream of Toolibin Lake.

### TREES

Following promising results from a Department of Agriculture trial at Boundain, 22 kilometres east of Narrogin, where trees placed in rows 12.5 to 25 metres apart at densities of 80 to 160 per hectare have lowered saline watertables by 150 to 200 cm, it was decided to use the same approach on the Toolibin Flats.

So far 200 kilometres of tree lines have been ripped and mounded to improve tree establishment and prevent waterlogging losses. In the past three years nearly 60 000 trees have been planted but as these were well below average rainfall years a very high tree mortality rate of 50 - 60% has been suffered. Losses have also been due to kangaroos, high salinity at some sites and unfortunately in some cases sheep breaking through old fences.

The main tree species used have been Flat-topped Yate (E. occidentalis) and Salt Sheoak (Casuarina obesa) which are both highly tolerant of salinity and waterlogging.

Smaller numbers of River Red Gum (E. camaldulensis), Swamp Mallet (E. spathulata) and Tamarisk (T. parviflora) have also been used.

In 1985, 24 000 trees were planted by 400 students from four local primary schools, the Narrogin Senior High School and the Narrogin Agricultural College. Subsequently the remainder have been planted using mechanical tree planters owned by the Wickepin Soil Conservation District and Greening Australia. Terri Lloyd from Greening Australia has been heavily involved in the tree planting work at all stages.

The tree seedlings were either purchased from Mitchell's Nursery in Wickepin (15 000), the C.A.L.M. Department nursery at Narrogin (4 000) or donated free of cost by Alcoa (33 000).

## SALTBUSHES

To obtain better grazing production and to provide a soil surface mulch to reduce capillary rise of salt, the area between the tree rows has been sown to saltbushes (Atriplex undulata and amnicola) and bluebush (Maireana brevifolia). Samphire (Halosarcia spp) and bluebush are also spreading by natural seed dispersal in the areas treated.

To date 170+ hectares of land have been sown to saltbush and bluebush using a Kimberley Seeds Contour Seeder owned by the Wickepin Soil Conservation District. Some of the seed was purchased from Mr K. Diamond of Maya but in 1987, 80 kg of seed were hand harvested by Department of Agriculture staff from a 1985 sown site on the Toolibin Flats.

Germination of saltbush seed has been very variable with good results on some sandy and loamy surfaced soils but very pour on heavy clays or highly saline bare areas. The large area sown in July 1986 had a delayed germination twelve months later in June 1987. Some weed competition problems on the ridges have also occurred.

## FENCING

To exclude sheep from the areas planted to trees and saltbush 34 km of fencing has been erected by the eight farmers on a 50/50 cost sharing basis. Unfortunately this fencing has not prevented kangaroos from the Lake Reserve from entering the planted areas and grazing and killing young tree seedlings.

The fencing programme is now substantially completed, though in future one farmer still has 2.2 km to erect.

## FINANCE

This project was made possible by financial assistance from sources additional to those provided by the farmers themselves.

In summary these sources were:-

Year One (1984/85)

| | | |
|---|---|---|
| W.A. State Assistance to Soil Conservation | | $9 900 |
| Greening Australia | | $1 000 |
| Alcoa - free trees | | $3 375 |
| | Sub Total | $14 275 |

Year Two (1985/86)

| | | |
|---|---|---|
| W.A. State Assistance to Soil Conservation | | $10 296 |
| Alcoa - free trees | | $8 000 |
| | Sub Total | $18 296 |

Year Three (1986/87)

| | | |
|---|---|---|
| Bi-centennial Authority | | $5 000 |
| Alcoa - free trees | | $2 100 |
| | Sub Total | $7 100 |

In total, therefore, $39 671 have been made available to match the farmers' contributions in implementing the project works.

## EXTENSION

The Toolibin Lake Project has had a big extension impact both locally and with a State and even Nation-wide audience.

The Wickepin Soil Conservation District has held several field days and seminars related to the projected. These were well attended by local farmers. In addition many groups of farmers, scientists and students have been shown around the Project.

The Project has received excellent mass media coverage in the Narrogin Observer and the agricultural press. Without doubt the best publicity was the A.B.C. National Tree Care Award 1986, which exposed the project to a nationwide audience on the Countrywide T.V. programme in September 1986 to other wheatbelt valleys.

The Project is now being extended to a full scale catchment conservation scheme involving all fifty farms in the 500 km2 catchment area above the Lake. It is anticipated that in future years, a lot more extension of catchment conservation, farm planning, saltland management and drainage techniques will be possible.

The Committee for Understanding the Environment has commenced a documentary film of the Project and subject to availability of funds this should be completed for use in schools and other group situated.

## THE WORKERS

The Toolibin Lake Project has required a vast amount of hard work during the past ten years for those research workers involved in the Lake Study itself. In all cases, this was additional work to their main duties in their departments.

During the past three years the Toolibin Flats Project has demanded a big effort from the eight farmers themselves and in particular Mrs Lyn Chadwick, who has carried out a great deal of organisational and liaison work.

Planning the tree planting programme and actually planting trees has been a major input by Mrs Terri Lloyd of Greening Australia. Staff from the Department of Agriculture, Narrogin, have also been heavily involved in the tree planting and more recently in organising the saltbush seeding work.

The Department of Agriculture have shouldered the major work load in relation to planning the project, providing advice and extension services and the monitoring of progress. The Shire of Wickepin have been most helpful in carrying out the financial accounting service for the Project.

## THE FUTURE

Although much has been achieved in the past three years, a lot more work remains to be done both on future management and maintenance of the saltland areas and in planning and implementing conservation work in the upper and middle catchment.

As the employment of a project officer using NSCP or State Assistance to Soil Conservation funds seems unlikely to occur, all future work will progress at a much slower rate as our permanent staff are able to allocate time to the Project.

This is most unfortunate, as it is vital to maintain the momentum of catchment conservation projects once the enthusiasm of landholders has been aroused.

(T.R. Negus)
OFFICER IN CHARGE
NARROGIN DISTRICT OFFICE
W.A. DEPARTMENT OF AGRICULTURE

August 25th, 1987

## THE TOOLIBIN LAKE PROJECT – 1988

In the Reserve to the west of this site lies Toolibin Lake, the well-known wildfowl santuary. Toolibin is probably the most important wetland in the wheatbelt of Western Australia as it is still relatively fresh and is suitable as a breeding ground for waterfowl, including the rare Freckled Duck and the Great Egret.

A research study by the Department of Conservation and Land Management, the Water Authority of W.A., the W.A. Department of Agriculture and the Mines Department commenced in 1977 and set out to find out whether the environment of Toolibin Lake is deteriorating or in a stable condition. The findings of this study are that Toolibin Lake is threatened by increasing salinity, which will alter the food supply for the water birds and may eventually kill the Casuarina and Melaleuca vegetation which grows in the bed of the lake. The vegetation provides protective cover for the nesting birds.

The study concluded that much of the salt originated from salt affected land on farming properties adjacent to the Lake Reserve and particularly at the north end of the Reserve. Watertable measurements since 1977 have shown that the saline watertable under the Flats surrounding the Reserve is rising at about 10 centimetres per year. As the watertable now lies at 150 - 200 cm below ground level, the chances of more land becoming salty is very real indeed. This would result in even more salt inflow into Toolibin Lake.

In 1985 it was decided to attempt to stop this watertable rise and hopefully in the long run to cause it to drop to safer levels below 200 cm below ground level.

To achieve this the eight farmers with salt affected land adjoining Toolibin Lake have co-operated with the W.A.D.A. in planting rows of trees 25 metres apart across all their saltland. The trees are 5 metres apart along the rows. The main trees used have been Flat-topped Yate (E. occidentalis) and Salt Sheoak (Casuarina ~~glance~~ obesa); both highly salt-tolerant W.A. species.

In the three years since the project started 47 000 trees have been planted over 400 hectares of land. In addition saltbush has been seeded on 400 hectares between the tree rows to provide a surface mulch which will reduce salt accumulation on the soil surface and also provide useful grazing for the farmers' sheep. To enable the salt-affected area to be control grazed, 30 cm of fencing has been erected by the farmers.

Some financial assistance to share the cost of the tree planting and fencing was provided by the W.A. State Government. Alcoa kindly donated a large number of trees free of charge.

In 1986, the Toolibin Lake Project was awarded the A.B.C. Countrywide National Tree Care Award.