Brymaroo catchment is located in the north-eastern Darling Downs, 20 kilometres north of Jondaryan. It has an area of approximately 1500 hectares and drains the headwaters of Cain Creek—which flows into Myall Creek and then into the Condamine River.

During the 1950s extensive tree clearing took place in the catchment. The effects of this large-scale removal of native vegetation on groundwater recharge were not immediately apparent.

Lucerne was the main crop grown in the lower catchment. However, yields gradually decreased as waterlogging and salinity increased. Landholders then changed to growing crops such as oats in winter, and forage sorghum in summer. After a very high rainfall period in January 1974 much of the land became unproductive.

In 1987 the Rosalie Landcare Group was formed. This group targeted Brymaroo as a key site for investigating salinity management options. A survey found that around 60 hectares of the catchment was severely salt affected varying from small outbreaks to extensive areas. Since then, the Rosalie Landcare Group has worked with the Queensland Government to investigate various salt management options in Brymaroo catchment.

Investigating the problem

In 1989 the Rosalie Landcare Group sought information from other salt affected areas around Australia. Their initial efforts concentrated on planting trees which were very successful in terms of tree survival rate and increasing community involvement. However, the group realised they would have to broaden their focus by involving soil and water experts to help determine other management options.

In 1991, Queensland Government and University of Queensland researchers (with funding from the National Landcare Program) investigated the geomorphology and hydrology of the catchment in detail.

They found that groundwater flow was restricted by three factors typically contributing to salting across the Darling Downs (as presented in Figure 1) including:

- The top of the catchment is permeable basalt, which overlies less permeable sandstones. Salting and seepage occurs where the two rock types come into contact, as water moving down-slope through the basalt is restricted by the sandstones below.

- When roads are constructed across heavy alluvial clays in historically wet areas, soil compaction restricts ground water movement down the valley. As the watertable rises, salting can occur above the road.

- Fine sediments deposited upstream of the junction of minor and major streams reduces the underground flow of water from the up-valley aquifers. This causes the watertable to rise and salting can occur upstream.

The catchment's watertable was mapped using test holes installed with piezometers. Salting processes were analysed using soil salt profiles and aerial photography, and a groundwater computer model for the catchment was developed.

Management options

The groundwater computer model was used to evaluate the effects of different management strategies for controlling salinity in the catchment.
Strategies tested against the model included:

- draining water-logged areas
- planting trees in recharge areas
- planting salt tolerant vegetation in affected and water-logged areas
- using intercepted groundwater for irrigation.

The model indicated that:

- draining water-logged areas was not feasible as the soil’s hydraulic conductivity (rate of water flow) was too low
- planting 200 hectares of trees at 400 trees per hectare in the upper catchment would reduce the recharge in that area by 90 per cent. This would result in a water level drop of 1–2 metres over most of the salt affected area
- planting salt tolerant vegetation in affected areas would lower groundwater levels by 1–2 metres
- the groundwater up-slope of affected areas could be used for irrigation—40 hectares of irrigation would lower the watertable under the salt affected areas by at least 3 metres.

![Diagram](image)

**Figure 1. Three geomorphic forms commonly associated with introduced salinity in the Brymaroo catchment**

**Management actions**

Around 16 000 trees have been planted since 1989. Trees have been planted across toe slopes in a high density belt approximately 3.4 kilometres long and 40 metres wide, beside scalded areas and along property access roads. Agroforestry species and fodder trees have been planted, resulting in greatly improved productivity.
The trees reduce groundwater recharge and provide shade, shelter and wildlife corridors, while improving the appearance of the catchment. Much has been learnt about tree planting on these sites including knowledge of watering systems and tree guards.

Salt tolerant lucerne has been planted on two of the salted areas. A major waterway that previously discharged onto a salted area has been relocated.

An irrigation network covering 40 hectares was set up in June 1993. Since then the watertable close to the bore has dropped 1.5 metres. Due to increased protein levels of the irrigated silage, the irrigating landholders plan to expand their dairy herd by 30–40 per cent and expect output per cow to increase by approximately 20 per cent.

In 2001, researchers from Commonwealth Scientific and Industrial Research Organisation found that Brymaroo Catchment is relatively responsive to changes in the water balance and the expansion of salinity—as a result of catchment clearing has largely culminated.

Further spread of salinisation is expected to be minimal if current land-use is maintained. However, it must be noted that due to the geological character of this catchment, saline discharge may possibly never be completely removed.

The current integrated approach to salinity management has resulted in containment of the salinity problem and the return of most of the previously salt affected areas into production. The ongoing work at Brymaroo has contributed greatly to knowledge about salinity management in Queensland.

Further information

This and other science notes are available from the Queensland Government website www.qld.gov.au—search ‘science notes’. For further information about this science notes series phone 13 QGOV (13 74 68)—ask for science notes – Land series L58.

For further information on salinity visit <http://www.qld.gov.au/environment/land/soil/salinity/> or email soils@qld.gov.au.