Department of Environment

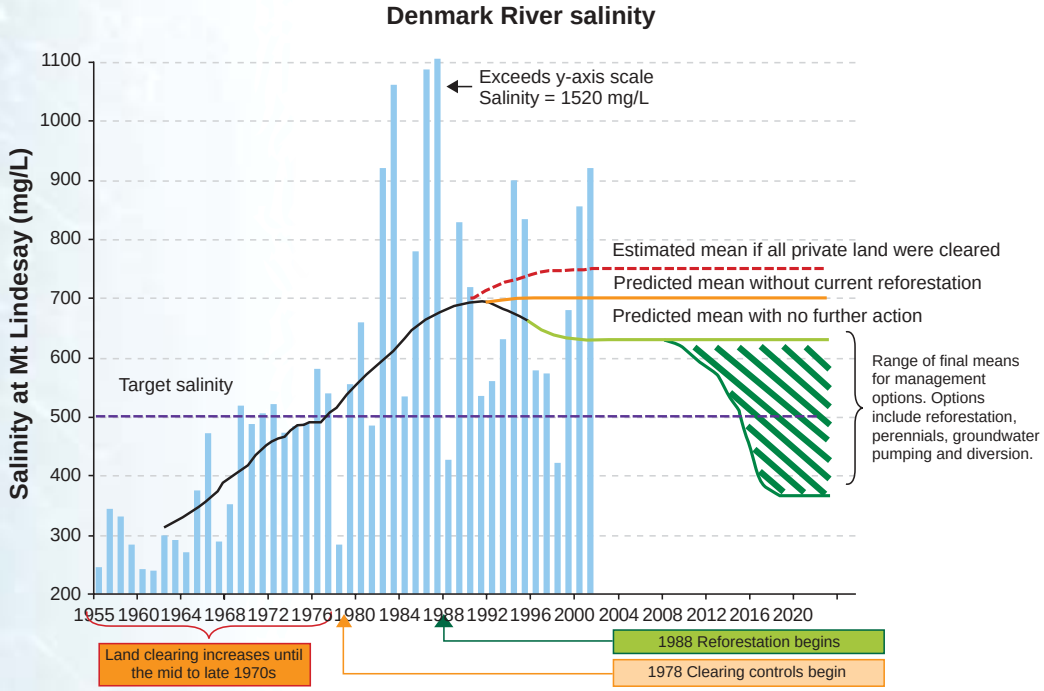
A fresh future for water

Denmark River — Salinity Situation Statement

Salinity recovery of the Denmark River – promising signs and a way forward

The key findings of the salinity situation statement are that:

- Annual salinity at the Mt Lindesay gauging station peaked at 1520 mg/L TDS in 1987 and has, on average, been declining since.
- Salinity in an average year is now about 700 mg/L at Mt Lindesay.
- Plantations established since 1988 are expected to further reduce the salinity of the river water but not enough to reach the drinking water target.
- There are feasible options to meet the 500 mg/L TDS target including tree planting, pasture establishment, revegetation and engineering works.
- Meeting the 500 mg/L target still means variability from about 400–800 mg/L.
- Most management options focus actions in the Upper Denmark catchment.



Salinity trends in the Denmark River

The Denmark River is currently used as a water source for the town of Denmark on the South Coast, and has the potential to become a major new water supply to support the ongoing development of the Denmark–Albany area. The annual demand for Denmark is 400 000 kL (0.4 GL), but the river has the potential to yield up to 20 GL from a new damsite in the future.

Increasing salinity in the Denmark River led to the construction of the Quickup Dam as an alternative water supply for the town of Denmark in 1990. The Denmark River catchment is a Water Resource Recovery Catchment under the Salinity Action Plan, with the objective of reducing salinity to achieve potable drinking water quality by 2020.

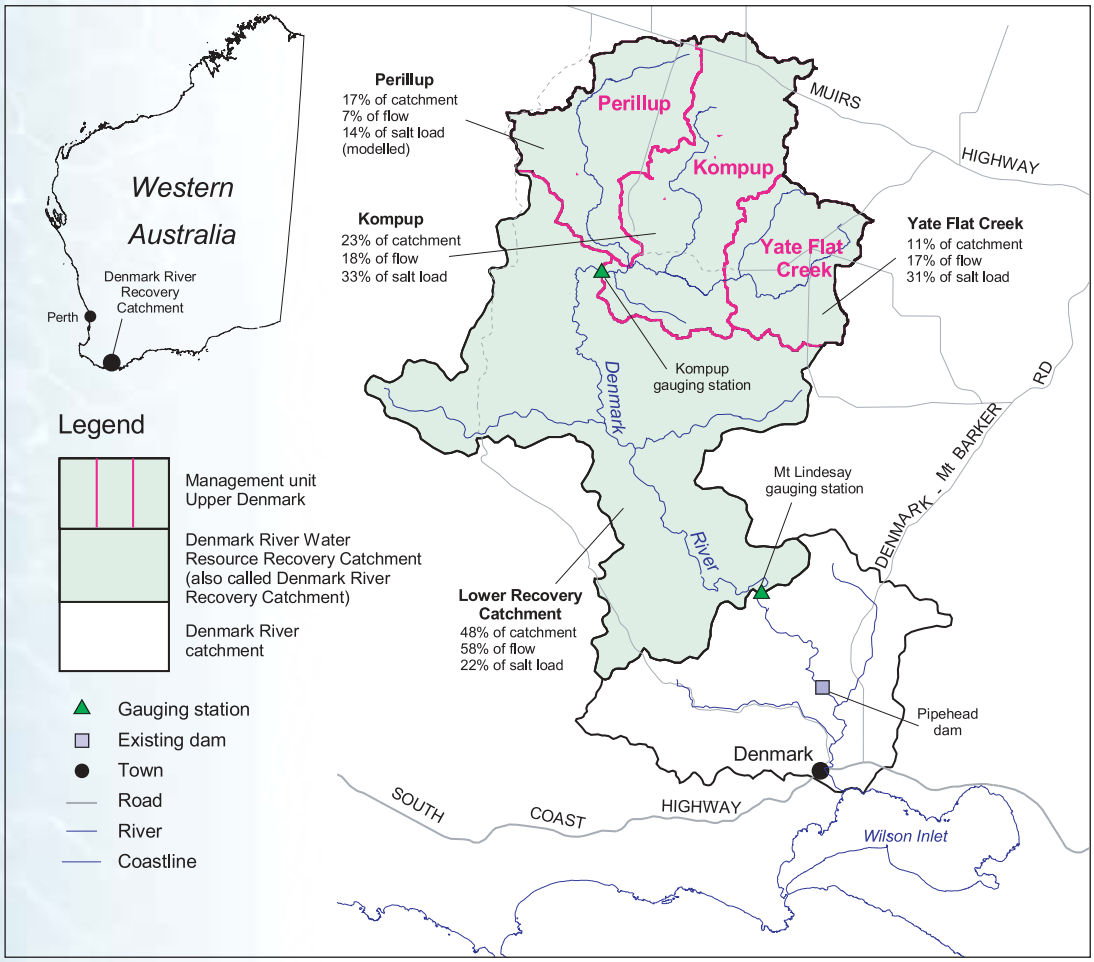
Between Mt Lindesay and the Kompup gauging stations (see map) the catchment is almost fully forested. Salinity reduction activities have been occurring throughout the Perillup, Kompup and Yate Flat Creek catchments above the Kompup gauging station — the area referred to as the Upper Denmark catchment.

More than 40% (225 of 525 km^2) of the upper catchment had been cleared by the 1970s. Intermittently since the mid 1970s, and especially in dry years, water in the Denmark River has been too saline for public water supply. Calculations indicated that without intervention the average annual salinity could have peaked at around 1400 mg/L TDS at the Kompup gauging station and 700 mg/L at the Mt Lindesay gauging station (see graph).

The State and Commonwealth Governments initiated recovery measures including reafforestation and land acquisition in the late 1970s. The Department of Environment is the lead agency to coordinate achieving the target — 'fresh' river water (500 mg/L TDS) at the Mt Lindesay gauging station by 2020.

These initiatives, together with commercial and community actions to establish plantations, fence vulnerable areas, revegetate stream-lines and other areas, establish perennial pastures and construct drainage and manage surface water, have resulted in a measurable reduction in stream salinity — a rarity in a major river system. In fact, this is the first major catchment in Western Australia where a downward trend in salinity is being observed in response to direct intervention through on-ground works — primarily revegetation.

If the trend continues with further intervention in the catchment and final recovery is successful, the Denmark River could be a major potential water source for the Denmark–Albany region.



Salt and flow contributions to the Denmark River.

What is the Denmark Salinity Situation Statement?

The Denmark Salinity Situation Statement, a major modelling study, reviewed the salinity situation and modelled the effects of the various work that has been undertaken in the catchment, including revegetation scenarios, commercial forest management and engineering options.

Management options

If the downward salinity trend is to continue and the final targets achieved, further intervention will be required. There are several management options which could contribute to the continued improvement in water quality.

Plant more trees

Trees reduce the salinity by reducing the recharge and so reducing groundwater discharge from the upper catchment. The benefit of reduced discharge is partially offset by an associated reduction in the volume of available river water.

Plant substantial areas to perennial pastures

Deep-rooted perennial pasture species like lucerne might be expected to lower salinity sufficiently to reach the target although keeping the pasture's transpiration rate high when soil moisture is available is important or stream salinity could actually rise.

Establish a groundwater pumping scheme

If groundwater pumping is selected, streamflow is assumed to be reduced by the volume pumped. Salt load reduction is calculated as volume pumped multiplied by the groundwater salinity. Groundwater pumping resulting in a 40% reduction of the salt load together with ongoing rotations of plantations would be enough to reach the target.

Build dams to divert saline water

Diversion of higher salinity flows around the water supply abstraction point near the Mt Lindesay gauging station could improve the long-term average of the remaining streamflow but the annual average values in most years would still be above the target.

Diversion of about 30% of the streamflow from the Kompup gauging station could substantially achieve the target and would be technically feasible, subject to safe disposal of the diverted water.

How effective are management options expected to be?

Management option	Modelled Mt Lindesay salinity (mg/L)	Modelled Mt Lindesay volume (GL/yr)	Likely salt-affected land (km^2)
Base case	697	29.0	35
Case 2 Actual plantations established by 2001	631	23.5	24
Case 3.1 Actual plantations plus trees on all remaining cleared land	368	18.2	7
Case 3.2 Actual plantations plus deep-rooted perennials (e.g. lucerne) on all cleared land *	380	18.1	8
Case 3.3 Actual plantations plus shallow-rooted perennials (e.g. kikuyu) on all cleared land *	714	18.5	21
Case 4 Groundwater pumping in the absence of ongoing rotations of plantations **	528	27.9	No estimate, but a substantial reduction is expected
Case 5 Groundwater pumping with ongoing rotations of actual plantations **	476	22.8	No estimate, but a substantial reduction expected
Case 6 Diversion of high saline flows at the Mt Lindesay gauging station	500	26	35
Case 7 Diversion of high saline flow at the Kompup gauging station	500	25	35

* The figures for lucerne and kikuyu assume that their leaf area is the same year around as the maximum leaf area of annual pastures.

** Groundwater pumping discharge requires safe disposal.

A partnership approach

The improvements in water quality in the Denmark River achieved to date could not have occurred without the very strong input from local landholders and other community members. The Recovery Catchment Program is an excellent example of community, industry and government working in partnership to improve water quality and to establish viable and ongoing alternative agricultural enterprises in the catchment.

The program is led by the Kent – Denmark Recovery Team, an active partnership between the community of the Kent and Denmark catchments and key government agencies led by the Department of Environment.

The Recovery Team was formed in 1998 to oversee the delivery of the state's salinity program in the two catchments with the aim of 'recovering' water quality to potable levels in both rivers.

The Recovery Team is chaired by a landholder and has strong community representation with four community members to each government representative. The shires of Plantagenet and Cranbrook are represented.

Some Recovery Team members came with great knowledge and experience having been members of the Steering Team that oversaw the Focus Catchments program in the Kent catchment. This was a program of the National Dryland Salinity Program of the Land and Water Resources Research and Development Corporation which undertook salinity studies in the nearby Kent River catchment.

Where to from here?

This report focuses on conceptual salinity reduction options. This work was important to understand the extent of the land use changes needed to achieve the salinity target. The next steps are to talk to the stakeholders about the options and evaluate the social, economic and environmental implications of each prior to finalising a salinity recovery plan.

The final step would be to implement this plan and to recover a major river from salinity — a national first!

Kompup gauging station.

Where can you go for more information?

For more information contact Brett Ward, Department of Environment, Albany on 9841 0113 or **brett.ward@environment.wa.gov.au**

For copies of the Salinity Situation Statement (Report No. WRT 30) contact the Information Centre at the Department of Environment **(08) 9278 0464.**

Copies of this brochure and the complete report Salinity Situation Statement — Denmark River are also available on **www.wrc.wa.gov.au**

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