

# Salinity data in Tasmania—a review

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## Introduction

In Tasmania land salinity has been recognised as an issue for many years. This paper provides an overview of the relevant land surface and groundwater data being collected in the NAP region of Tasmania.

The main findings are:

- (i) An update of land salinity extent in 2003 showed that the estimated area of agricultural land affected by salinity was 73,900 ha;
- (ii) While some good new monitoring networks have been established, there is generally inadequate groundwater data to determine regional trends;
- (iii) Significant changes in groundwater levels have been identified in specific locations across the NAP region; however, limitations of the monitoring network constrains understanding of what trends are really showing;
- (iv) Analysis of surface water data showed that some surface waters are also increasing in salinity;
- (v) There is a need to improve monitoring networks and the collection of contextual data.

## Background

### *Previous work*

In 2000 Tasmania made an assessment of salinity as part of the National Land and Water Resources Audit. It was reported that there was approximately 53,500 hectares of saline agricultural land in Tasmania increasing by 1.5% per annum (Bastick & Walker 2000). Using the method of Grice (1995), the extent was estimated by using the visual extent of salinity (the presence of salt tolerant species and/or visible scalds) in land systems on agricultural land. The main drivers were assumed to be historic land clearance, rainfall and irrigation.

### *Recent work*

Bastick and Lynch (2003) using the same methodology as in the 2000 Audit report updated the extent of land effected by salinity figures. They estimated that there were 73,900 hectares of agricultural land affected by salinity in Tasmania. The increase from 53,500 reported in 2000 was mainly due to improvements in reporting salinity, rather than any significant increase in the size of existing sites.

Since 2004 a groundwater flow systems framework has been developed as an analytical framework for salinity monitoring.

Hocking (2007) undertook a review of available data relevant to salinity monitoring in the National Action Plan for Salinity and Water Quality (NAP) region of Tasmania (an area of approximately 700,000 hectares containing the majority of salinity present in Tasmania). This review included both surface and groundwater data collected for a range of purposes.

Hocking's review concluded that:

- (i) there were 87 groundwater monitoring bores suitable for analysis, based on the following criteria:
  - At least four years of monitoring data;
  - At least one measurement in the past two years;
  - Depth to water table greater than 1.5 meters.

- (ii) there were five surface water monitoring sites with sufficient data to assess cumulative residual water salinity and cumulative residual salt load trends.

By analysing the data from these monitoring sites, Hocking was able to provide indications as to possible trends at each specific site.

Because of the site specific nature of the monitoring sites and the fact that apart from Back Creek catchment, areas near Waterhouse and in the Coal River Valley, there are very few well established monitoring networks, he was unable to determine regional and/or catchment trends with confidence.

Currently there is little known about salt storage so interpreting groundwater rise as a salinity threat is difficult. Because of a lack of data Hocking could not look at salt storage.

### **Current situation**

#### ***Land data***

The data on extent of land effected by salinity has not been updated since the 2003 estimate of 73,900 hectares by Bastick and Lynch.

#### ***Groundwater data***

Whilst Hocking (2007) was unable to determine regional and/or catchment trends in groundwater levels with confidence, he reported on some specific locations where analysis of available data pointed to groundwater changes. For example, site specific values showed groundwater rises in the order of 8cm per year and groundwater lowering in the order of 16cm per year. However, these outlier values are not indicative of significant upward or downward trends across the NAP region. Whilst he was unable to provide any regional and/or catchment trends in groundwater levels within the NAP Region, Hocking (2007) reported that analysis of the limited data available indicated that:

- (i) Bores with groundwater levels rising at greater than 5 cm per year were commonly located in the following groundwater flow systems (GFSs):
- Local scale GFS in high relief layered fractured rock;
  - Local/ intermediate scale GFS in low relief layered rock;
  - Local scale GFS in high relief dolerite.
- (ii) Bores with groundwater levels falling at greater than 5 cm per year were mostly located in the following GFSs:
- Local/intermediate scale GFS in marine plain;
  - Local and intermediate scale GFS in folded- fractured rock.

Other than climate data, no contextual information is available to be able to determine the reasons for these apparent trends.

#### ***Surface water data***

Currently there are 23 surface water gauging stations in the NAP region which collect salinity concentration and flow. However only one of these has been established for salinity purposes. As a consequence, current stations are not ideally located for measuring end of valley salinity outputs. There are only five stations with more than four years of monitoring data so interpretation of trends is currently limited.

Hocking (2007) reported that analysis of data from suitable monitoring stations on the Coal, South Esk, Meander and Pipers Rivers indicated rising stream salinity and/or salt load trends. Again other than climate data, no contextual information is available to explain the reasons for these localized trends.

#### ***Drivers***

Hocking (2007) analysed the climate trend using cumulative residual rainfall for the NAP region. The data showed that average rainfall increased from 1900, peaked in the mid-1970s

and has decreased generally since. The degree to which rainfall influences expression of salinity in this drying period is unclear.

Although land use change is a recognised driver of changes in groundwater levels, Bastick and Waker (2000) reported that it was considered unlikely that land clearance would cause future watertable rises in local systems in the below 800 mm rainfall zone. They also indicated that other land use changes, such as cropping and irrigation could cause further increases in salinity area.

Irrigated cropping and pastures have expanded in Tasmania over the past 10 years. Locally, increasing land and water salinity has potential to be observed where land containing saline GFSs is converted from grazing to cropping and / or irrigation or even urban development. Recent modeling of the impact of increasing centre pivot irrigation in the Brumby's Lake catchment suggested that a doubling in the number of centre pivots would not have a notable impact on the catchment water balance. However a significant impact would be likely under centre pivots depending to a degree on their position in the landscape.

### **Conclusion**

While good groundwater bore networks have been established in some areas, in most of NAP, sufficient bores have not been installed to provide adequate data to monitor trends in salinity and groundwater. The focus has been on monitoring and measurement of groundwater to improve understanding of the processes that underlie salinity expression. However, more work is required to understand the interaction between drivers of salinity (i.e. climate, land-use change) and the processes causing salinity.

While Hocking (2007) demonstrated some trends at specific locations, expansion of the bore network, together with improved modelling and contextual information is required for better understanding of salinity and groundwater trends. More work is required to understand the complexities of groundwater and surface water interactions in the Tasmanian NAP region.

### **References**

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