



BOOROWA KEY SITE

WHAT ARE WE ASKING?

Where does the salt and water come from, and where is it going?

How do we account for water at a paddock scale and how does this relate to the catchment water balance?

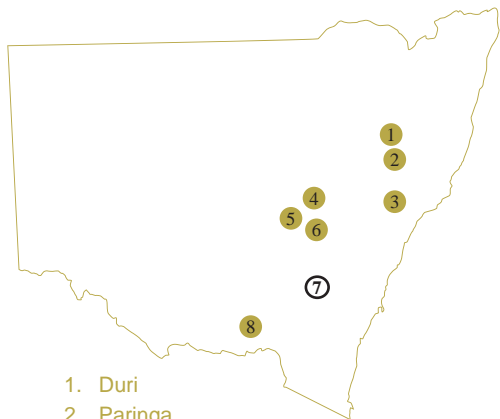
Do perennial pastures and tree belts affect a localised salt scald?

Can a well managed rotationally grazed system affect natural resource outcomes?

How does land use affect salt input output ratios?

Which land use is the most appropriate in terms of using the available water?

Are water and salinity models predicting results that are consistent with catchment observations?



1. Duri
2. Paringa
3. Hunter
4. Sloanes Creek
5. Baldray
6. Gumble
7. Boorowa
8. Livingstone Creek

WHY THE BOOROWA KEY SITE?

It is commonly accepted that clearing native perennial vegetation to grow annual crops and pastures has a negative impact on salinity and water quality. Introduced annual plants cannot use all the rain that falls and this excess water dissolves salts stored in the soil, transports them underground and eventually discharges them at the soil surface lower in the catchment.

The Boorowa Key Site provides a comprehensive and scientifically credible analysis to support the theory that changing from annual to perennial systems will result in reduced salinity. It provides an analysis of data collected over 13 years that includes a change from an annual based cropping system to a perennial pasture system that includes tree planting.

This is the only research site in NSW that has confirmed the impact of land use change over such a significant time period. It provides what is likely to be the most comprehensive data set tracking these changes in Australia.

Data analysis has confirmed that the change from an annual to a perennial system has reduced recharge to below measurable levels and halved the amount of salt and water leaving the catchment.

THE BOOROWA SITE

The Boorowa Key Site is a 130 ha first order sub-catchment within the Lachlan catchment located near the Boorowa township. In the early 1990s a significant saline scald developed near the bottom of the catchment. During this time the dominant land use was annual winter cropping. As a result of the appearance of the scald the local landcare group implemented what they considered to be best practice solutions for ameliorating and preventing dryland salinity. From that time on several State agencies including NSW DPI and universities collected data from the site to monitor the effects of implementing the best salinity management practices.

The farmer undertook land use change that included perennial pasture and rotational grazing. Alleys of trees covering approximately 20% of the area were planted in an attempt to minimise recharge.

WHAT HAS THE RESEARCH FOUND?

Results from the Boorowa Key Site prove that the move from an annual system to a well managed perennial based system will reduce the size and severity of a saline scald. The results agree with current ideas on dryland salinity abatement such as the Australian Groundwater Flow System framework. The data collected at the site and subsequent modelling shows

WHAT IS KEY SITES?

KEY SITES is generating new knowledge in priority dryland salinity areas of NSW.

It is a research project with eight sites across upland fractured rock aquifers in local and intermediate groundwater flow systems.

These areas have been identified as being major salinity sources for NSW.

Each site addresses a different and locally relevant gap in salinity knowledge. The sites are not simply eight replicates of a single methodology.

The impact of all major land uses is being investigated, including: *annual cropping, improved annual and perennial pasture, native pasture, native forestry, planted forestry and rehabilitated open cut coal mine.*



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that the increase in the number of perennial plants (grasses and trees) has significantly decreased the amount of salt and water exported from this 130 ha catchment.

The value of this site is reflected in the outcomes developed from the long term data set. This is one of the few data sets available that has continued to measure the effects of landuse on the water balance at this scale. The analysis has confirmed a positive natural resource outcome from increased perenniality – a significant reduction in the amount of salt entering the watercourse. The analysis has confirmed that the reduction in salt export has taken place regardless of the series of dry seasons that has been experienced.

Five years after the move away from annual cropping and into perennial pastures there is almost no recharge, runoff has been reduced and the salt output has halved. The salt input-output ratio has fallen from 1:22 down to 1:10 and salt discharge has fallen from an annual 56 tonnes to 26 tonnes per square kilometre. However, an important point to note is that this is nearly entirely due to the reduced volume of water being discharged off the site rather than a reduction in EC of the water.

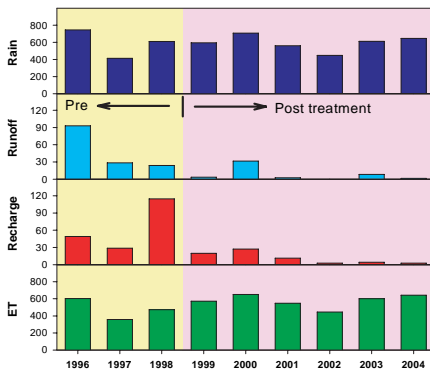


Figure 1 Water balance from Boorowa Key Site from 1996 to 2004 (units in mm)

For this Key Site and other sites with similar hydrological characteristics, landuse change to incorporate increased perenniality is recommended. However, if these management actions are encouraged on areas that do not export salt this will have a negative effect on the stream flows in the Boorowa catchment.

WHERE TO FROM HERE?

This is the only research site in NSW that has confirmed the impact of land use change over such a significant time period. It is likely that it is the most comprehensive data set tracking these changes in Australia.

Economic analysis is now required to assess the impact of the land use change, both on a farm basis and on the basis of the local community.

The landuse change coincided with a number of dryer than normal years. Although modelling has confirmed that the landuse change has affected salt and water movement, questions still remain over what the effect of a prolonged wetter period would have on the catchment. Ongoing monitoring will enable a better understanding of the processes controlling salt and water exports. Currently the research shows that to control salt export there needs to be a reduction in the volume of water draining from the catchment. However, research needs to continue to determine if this process can be decoupled to maintain water yields while decreasing salt exports.

The effects of these land use changes on the downstream catchment are now being explored.

Research at other Key Sites suggests that not all salinity issues can be solved as elegantly. For instance, research from the Gumble and Livingstone Creek

Key Sites show that the mobilisation and transport of salt and water from the landscape to streams is much more complicated. There is a danger in directly transferring the findings from the Boorowa site to other catchments that may have different hydrological characteristics.

OUTCOMES AND OUTPUTS

- Increased understanding of the salt mobilisation processes, from the landscape to the stream leading to better targeted salinity management options for land use
- Improved reliability of catchment planning
- The project has identified data requirements to validate and improve existing salinity models
- MODFLOW model has been developed for the Boorowa Key Site
- Proof that increased perenniality (both pastures and trees) coupled with good grazing management can significantly reduce salinity
- Results are now published in *Agricultural Water Management*, volume 88 Issue 1–3, March 2007.
- Boorowa Key Site featured in *Focus on Salt* Edition 39, 2006.
- Presentations to the Boorowa farmers and the Boorowa Community Landcare Group and to the NSW SGSL Producer Network Committee
- Boorowa Key Site featured in a workshop conducted by CRC Salinity at Boorowa exploring the latest research findings on the hydrological impact of land use change.

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