Management of Salinity

Executive Summary

Report 8: May 2018

Introduction

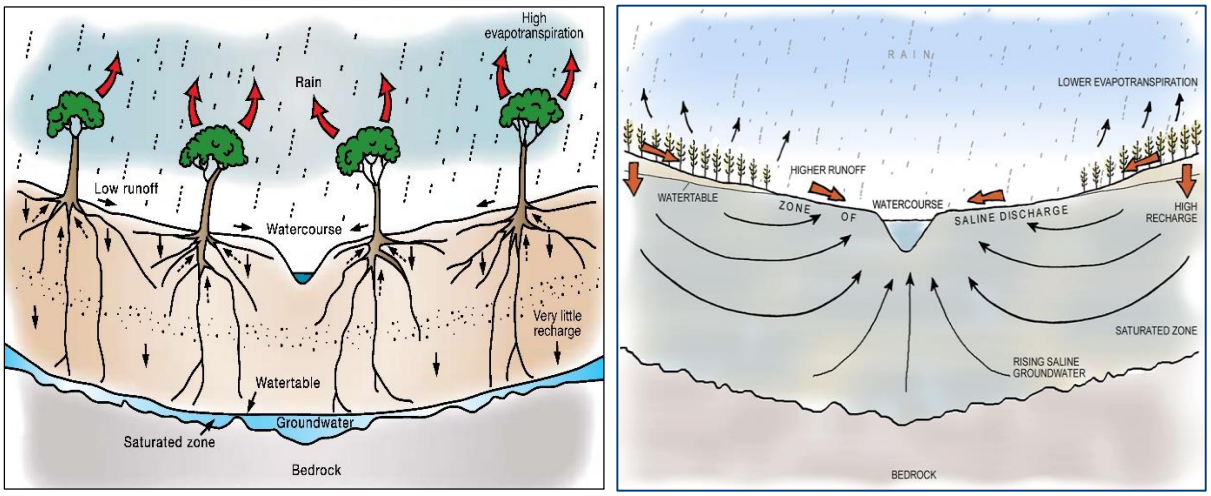
This audit assessed the management of salinity in the agricultural regions of the South West of Western Australia (WA). This is defined by the area roughly west of a line from Kalbarri to Esperance. We focused on the following lines of inquiry:

1. Do agencies know the extent and impact of dryland salinity in the South West agricultural regions?
2. Are efforts to reduce the impacts of dryland salinity in the South West agricultural regions working?

Background

Dryland salinity is a major issue in the agricultural regions of the South West of WA. It adds significant costs to agriculture, causes damage to road, rail and building infrastructure and affects water resources and biodiversity.

It is caused by the clearing of deep rooted native vegetation for shallow rooted annual crops and pasture, which changes the water balance. As water tables rise, salt stored deep in the sub-soil is carried up to the surface and eventually discharged into waterways (Figure 1).



Source: Smith R., 2007, *Salinity- a story of water and salt* (poster), Department of Water, Government of Western Australia

Figure 1: Depiction of how dryland salinity occurs – a healthy balanced system on the left, removing trees on the right shows a high water table, bringing salt to the surface

By the 1990s dryland salinity was considered the greatest economic and environmental threat to the State[1]. The Department of Primary Industries and Regional Development (DPIRD) estimates that since 2009-10 the opportunity cost of lost agricultural production from dryland salinity has been over $500 million a year and that 25% of cleared agricultural land will be at risk of salinity in the long term. It was also predicted by DPIRD that the cost of protecting water supplies and maintaining infrastructure could be even higher.

Clearing over 18 million of the 21 million hectares of native vegetation in the agricultural regions has occurred in an area that is internationally recognised as a biodiversity hotspot.

[1] Western Australian Salinity Action Plan, November 1996
Appreciating and Creating Our History, By Frost and Burnside, page 9

Salinity has had a significant and long lasting impact on the region's natural biodiversity and land systems. The threat to the biodiversity is not limited to individual species. The Department of Biodiversity Conservation and Attractions (DBCA) advises that all the remaining remnants of many valley-floor communities (wetlands, shrublands and woodlands) along with their soils could disappear because of salinisation.

In response to community concern the Government released the Salinity Action Plan in 1996 and the State Salinity Strategy in 2000. A Cabinet Standing Committee, chaired by the Deputy Premier, was established with overall accountability for the Salinity Action Plan. A Salinity Council was also appointed by Government to report to the Committee on matters of policy and performance of the Salinity Action Plan. A timeline of government initiatives is detailed in Appendix 1.

In May 2001, a Salinity Taskforce was established by Government to review salinity management in WA. In June 2002, the Government provided a response to the Taskforce report and committed to taking the lead, building on the action plan and the strategy. Between 2003 and 2008, $560 million of Federal and State funds was invested in a range of land management initiatives which included salinity management and water quality programs.

The *Soil and Land Conservation Act 1945* is the principal legislation relating to the conservation of soil and land resources, and to the mitigation of the effects of erosion, salinity and flooding. Government agencies and individual landholders have a responsibility to manage dryland salinity as per below:

Managing salinity – general responsibilities:

Government responsibilities to manage dryland salinity:	
Department of Primary Industries and Regional Development (DPIRD)	• Administers legislation that is related to food production, environmental conservation and sound agricultural management in WA
Department of Water and Environmental Regulation (DWER)	• Manages water resources; its availability, quality and sustainability
Department of Biodiversity, Conservation and Attractions (DBCA)	• Has responsibilities for the State's biodiverse environment, which includes areas outside its reserve system

Other responsibilities:	
Landholders (includes government agencies local government, and private landowners)	• Have a responsibility to manage their land • Require approval to clear native vegetation except where legislative • Require approval to construct drainage systems

***Soil and Land Conservation Act 1945* (Administered by DPIRD):**

Under the Act:	
Commissioner of Soil and Land Conservation (within DPIRD)	General functions include the prevention and mitigation of land degradation, promotion of soil conservation, and education of landholders and the public

Under the Act:	
Soil and Land Conservation Council (a statutory body)	Functions for the Minister for Agriculture: • advise on the condition of soils and land resources • make recommendations on land use, soil and land conservation policy • coordinate, monitor, and review soil and land conservation programs and activities

Under the Act:	
Land Conservation District Committees	The Committees promote sustainable land management, manage projects, follow direction from and provide asistance to the Soil and Land Commissioner

Figure 2: Dryland salinity management framework

The Commissioner of Soil and Land Conservation can issue a notice to a landholder to take specific action if degradation is occurring or likely to occur. If the land is within a gazetted water catchment or has important biodiversity values, there may be restrictions as to its use under legislation managed by the Department of Water and Environmental Regulation (DWER) and DBCA.

Audit conclusion

Dryland salinity has been developing since large scale clearing began. It is estimated to affect between 1 and 2 million hectares (up to 10% of total land) in the agricultural regions of the South West, and cost $519 million per annum in lost agricultural production. Salinity also damages infrastructure, adding further costs, impacts on water resources and reduces biodiversity.

Predictions are that, without some level of intervention, the area of land affected by salinity could more than double over the next 50 to 100 years. Intervention on such a scale is a huge task and needs to be balanced against the possible cost, which could also be large.

Government has to decide how much intervention is both feasible and economically sound, but is currently in no position to make an informed decision. Since 2008, there has been a lack of strategic direction and agencies have reduced monitoring the extent and impact of salinity.

Managing dryland salinity is a shared responsibility, with shared benefits, and experience to date indicates that effectiveness relies on coordinated local action. It also relies on all landholders taking appropriate action to protect their land. But, in the absence of strategic direction, agencies have focused on protecting individual assets, and there has been little coordination of efforts between agencies, landholders and stakeholders.

Key findings

Dryland salinity is a significant cost to agriculture and infrastructure, and a major risk to water resources and biodiversity

- It is estimated that between 1 and 2 million hectares (up to 10% of total land) in the agricultural regions of the South West are salt affected. DPIRD calculates that the opportunity cost of lost agricultural production as a result of dryland salinity since 2009-10 is $519 million per annum. Without some level of intervention, dryland salinity will continue to be a significant cost and major risk to the State. The extent of salinity affected land in the South West is expected to more than double over the next 50 to 100 years to around 5.4 million hectares. Of this, 4.5 million hectares is agricultural land.

- Salinity also has a significant impact on water resources, biodiversity and infrastructure. DWER estimates that almost every stream and river in the South West is affected to some extent by salinity. In 2010, the then Department of Environment and Conservation estimated that 850 endemic flora and fauna species were at threat of extinction as a result of dryland salinity. Cost and impacts on infrastructure assets such as roads, railways and buildings are not accurately known, but local governments estimate salinity can halve the life of roads.

The scale and cost of intervention could be very large, and government needs to decide what is feasible and economically viable

- For large scale improvements, DPIRD estimates that over 80% of the Wheatbelt would need to be replanted with deep rooted trees and shrubs to stabilise and lower water tables. Water tables would take decades to fall and the current extent of broad scale agriculture would no longer be possible.

- Agencies advise that recovery from dryland salinity is only feasible in discrete catchments and they have focused efforts on individual assets that warrant protection. On a landscape scale, more achievable and feasible management goals are to contain the area impacted or adapt to the saline conditions. Options include revegetation, drainage

systems, planting salt tolerant plant species or adopting alternative land uses. The choice for government is to decide how much intervention is feasible and economically sound.

The State does not have all the information it needs to effectively manage salinity

- Agencies do not have good information about the current extent, impact and cost of dryland salinity and are therefore not well positioned to manage the risks and provide direction and advice. In large part, this is because since 2008 agencies have reduced monitoring and evaluation, and the Soil and Land Conservation Council, the key independent advisor to Government, has not met since 2003. This impacts on the State's ability to manage salinity effectively and efficiently, and increases the risk that poor decisions will be made.

- DPIRD conducts limited monitoring and reporting, and its estimates of the extent of dryland salinity are out of date. The last satellite imagery analysis that mapped salinity was in 2000. At that time, DPIRD calculated that severely salt affected land was increasing by 14,000 hectares per year. The Department does not know if this rate of increase has continued, decreased or accelerated.

- DPIRD monitors water tables throughout the South West. Because there is a link between water table height and salinity this does provide an indication of areas at risk. DPIRD reported water table data in 2013, however, there are gaps in the data and DPIRD has advised that its monitoring effort has reduced since 2010.

- Recently, Government has recognised the need to develop a greater understanding of how to manage WA soils and has taken some steps to address this. In December 2017 it announced the formation of a Ministerial Advisory Committee to guide the re-establishment of the Soil and Land Conservation Council.

There has been little coordination of efforts between agencies, landholders and stakeholders

- There is currently little coordinated management across government agencies, landholders and stakeholders. As a result, efforts to manage dryland salinity are unlikely to achieve any landscape wide improvement.

- The management of dryland salinity lacks strategic direction. Neither the State Salinity Action Plan nor the State Salinity Strategy were completed. Since 2008, both have been dormant and are now outdated. The absence of clearly defined outcomes, and good information on what works, increases the risk that limited funding is not spent efficiently. For example, it is not clear how effective the $560 million investment of state and federal funds between 2003 and 2008 was because agencies have not continued to monitor and evaluate outcomes.

- Salinity is spread unevenly across the landscape, resulting in varying impacts. Addressing it is a shared responsibility and experience to date indicates that effectiveness relies on coordinated local action. It also relies on all landholders taking appropriate action to protect their land, even those who are not affected and stand to gain relatively little.

- There are currently no goals and targets for reducing water tables or planting deep-rooted species and decisions to protect land are left to individual landholders. Relying purely on private benefit can result in landholders either acting alone, or not at all.

- Mechanisms exist to help more collaborative approaches, such as the functions of the Commissioner of Soil and Land Conservation, the Soil and Land Conservation Council, and Land Conservation District Committees. But these are not used, which increases the risk that some landowners will take appropriate actions while others will not. Inaction by a landowner can have a significant impact on their neighbours.

- DPIRD measures to prevent land degradation are mostly reactive and reliant on applications for drainage or complaints from the public. It is not effectively using its legislative powers to prevent land degradation. With up 2 million hectares affected by salinity, and the problem predicted to get worse, we would expect a more proactive approach to the prevention and mitigation of land degradation.

- DPIRD advised that since 2008, it had investigated 303 land degradation complaints and only 2 were directly related to dryland salinity. A further 39 complaints were related to unapproved drainage which the Commissioner for Soil and Land Conservation stated may have been about salinity.

Agencies have protected individual assets but overall are not meeting legislated responsibilities

- Agencies have focused on protecting individual, high value assets in local areas. This has resulted in some success for those assets. However, agencies are not meeting wider legislated responsibilities to prevent and mitigate land degradation, and protect water resources and biodiversity throughout the South West.

- DPIRD has responsibilities under the *Soil and Land Conservation Act 1945* (the Act) to prevent and mitigate land degradation, promote soil conservation and encourage and educate landholders. DPIRD does not own or manage agricultural land apart from a few research stations. It works to ensure a profitable and sustainable agricultural industry by conducting research and providing advice on a range of agricultural issues. It can also investigate complaints about land degradation but does little to directly manage salinity.

- DBCA and DWER have wide responsibilities to protect the environment and manage water resources. They advised that given the widespread scale of dryland salinity and limited resources they have prioritised which assets they protect. These were originally identified in the Salinity Action Plan. They acknowledge that while they have had success with some of those assets, other water resources have become more saline and native flora and fauna remain at significant risk.

- In the early 1990s, DBCA started recovery works to protect biodiversity in 6 South West wetland catchments. In 2002, the Government committed to increasing the number of recovery catchments to 25, however this was never done. Work in the recovery catchments has since been reduced based on available resources and changed priorities. DBCA currently provides a direct staff resource and funding to implement recovery actions for 2 wetland catchments; Toolibin Lake and Lake Bryde. They also conduct broader wetland projects and research at other sites that includes monitoring water depth and salinity levels.

- The Salinity Action Plan identified 5 key water resource catchments in the South West for DWER to manage. These catchments are declared under the *Country Areas Water Supply Act 1947*. Interventions by DWER in the Kent and Denmark River catchments were successful in reducing salinity levels, especially the Denmark River where the salt levels are now within Australian Drinking Water Guidelines. DWER remains active in the Collie River (Wellington Dam) and Denmark River catchments. For many other rivers in the South West such as the Avon, Blackwood, Warren/Tone, Pallinup, Gairdner and Lort, salinity levels continue to increase.

Recommendations

1. **To improve the effectiveness and efficiency of the management of dryland salinity DPIRD (in consultation with DBCA and DWER) should by December 2018:**

    a. **set the strategic direction for the management of salinity**

    b. **establish regular monitoring and reporting of the spread, impact and cost of dryland salinity**

    c. **make better use of established mechanisms to ensure there is better cooperation and coordination at the government and local level**

    d. **consider whether there should be targets to reduce water tables and re-plant deep rooted tress on a catchment wide or localised level**

    e. **continue to promote soil conservation, and educate landholders and the public**

    f. **where necessary, make greater use of compliance and enforcement mechanisms under the *Soil and Land Conservation Act 1945* to ensure that landholders prevent and/or mitigate land degradation.**

Agency responses

Department of Primary Industries and Regional Development

The Department of Primary Industries and Regional Development (DPIRD) accepts the findings of the audit of the Management of Salinity in the agricultural regions of Western Australia.

The requirement to establish a new strategic direction for the management of salinity is acknowledged and DPIRD generally accepts the recommendations outlined to improve the effectiveness of the management of salinity in Western Australia.

DPIRD will work with DBCA and DWER through existing consultative mechanisms to ensure effective cooperation and coordination of future activities to manage salinity.

With the available estimates of salinity now nearly 20 years old, finalising a strategic direction will require establishing the current extent, impacts and rate of change in salinity. This will take approximately two years to complete, is unfunded and could not be achieved by December 2018 as recommended.

Department of Water and Environmental Regulation

The Department of Water and Environmental Regulation (DWER) accepts the key findings contained in the report and notes that the benefits of the previous investment into salinity management are often intangible.

The Department supports all but one of the recommendations proposed. While the setting of targets to reduce water tables and re-plant deep-rooted trees may appear attractive, the Department is of the view that the scale of intervention required for even small reductions in salinity levels place unreasonable and unobtainable expectations on land managers. It may also impose significant costs without realisation of benefits commensurate with the scale of investment required.

The Department believes that the current targeted approach to salinity mitigation whereby activity is focussed in areas where there is a high chance of success is a much more efficient use of limited resources and provides a far greater return on investment than spreading the effort across large geographical areas.

Overall, DWER recognises the scale, complexity and importance of the management of salinity in the state's agricultural regions. The Department also acknowledges the work of its predecessor agencies and other agencies and their contributions to the significant body of work on salinity management in Western Australia since the early 1900s.

This research has directly informed the Department's policy with respect to waterways management and has resulted in success. Maintaining or improving salinity levels has been achieved in key water resource catchments including the Denmark River, which is now being used for drinking water for the town of Denmark, and the stabilization of salinity in the Wellington Reservoir enabling it to continue to be used for agriculture on the coastal plain and is the subject of renewed efforts to improve water quality.