Burkes Flat - A Salinity Treatment Success Story

Burkes Flat occupies an area of gentle, rolling sedimentary hills, or rises, not far from St. Arnaud. Its average annual rainfall is about 450mm. Salinity was first recognised as a problem at Burkes Flat in the 1930s. Aerial photographs confirm the development of severe salinity at breaks of slope and within drainage lines between 1947 and 1963. By the mid 1980s, the salt affected areas occupied 12% of the catchment, causing substantial losses to farm production.

In early 1983, a pilot project in this area was funded by the National Soil Conservation Program for investigation, treatment and monitoring of dryland salinity. With the support and assistance of the four landholders in the selected project area (J.Gallacher, B.Scollary, B.Rinaldi and W.Rodger) and other members of the local community, a treatment plan was developed for a 900 ha pilot catchment. Investigations carried out by Chris Day of CLPR provided the framework upon which the treatment plan was based. The plan covered the whole catchment, its aim being to establish a farming system which would increase the uptake of annual rainfall, thereby lowering, or at least stabilizing, groundwater levels.

Between 1983 and 1986, native trees were planted on the mapped high recharge areas (about 4% of catchment) and lucerne and phalaris-based perennial pastures were established on the low to moderate recharge country between the tree plantations and the discharge area. The discharge area was fenced off and planted to salt tolerant grasses, primarily tall wheat grass and puccinellia. By August, 1986, 90% of the catchment had been treated. Financial assistance was provided for tree and pasture seed with labour provided by each of the four participating landholders.

Groundwater Trends

Twenty-six (26) observation bores were established within and adjacent to the pilot catchment to monitor groundwater levels. Monthly measurement of the levels commenced in 1983, the year that treatment commenced.

Virtually all observation bores in the pilot catchment, including most of the discharge site bores, have shown declining groundwater level trends. In contrast, two control bores located in untreated areas outside the pilot catchment have shown gently rising trends.

Many of the bores, particularly in the upper part of the catchment, now have substantially lower levels **(mostly between 1 and 6m lower**) than when first measured.

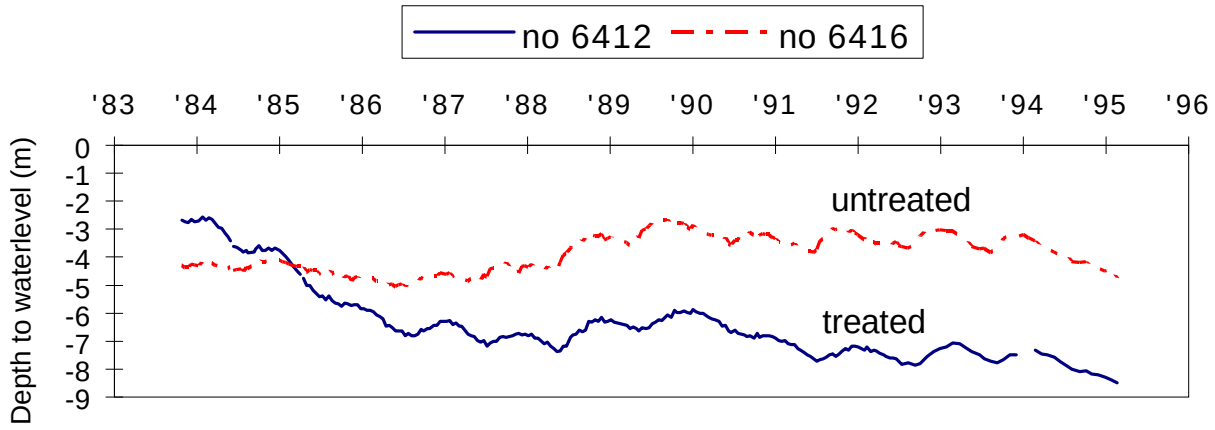
Substantial drops in levels of up to 4m were recorded in the middle to upper parts of the catchment as early as 1987, with the most significant declines occurring during 1985 and 1986. Despite wet years in 1988, 1989 and 1992, a general downward trend has continued in these areas (e.g, Bore 6412, Figure 1).

The actual impact of the treatment becomes even more obvious when comparing groundwater trends in the pilot catchment with those in untreated areas outside the catchment. As an example, Figure 1 shows the comparitive hydrographs of Bores 6412 (treated) and 6416 (untreated) for the period, 1983 to 1995. **After initially being about 1.5m higher than the 6416 water level, the 6412 water level is now about 4m below that of 6416.**

The most significant **seasonal** response differences between 6412 and 6416 have mainly occurred between mid summer and early winter. This is particularly the case for the years 1984 to 1988, and 1991, during which 6412 recorded substantial drops while 6416 was only stable to slightly dropping. This indicates that the perennial pastures were using much more water than the annual pastures during the dry summer/autumn seasons of these years.

Not only have groundwater levels been dropping in the recharge areas. It is now clear from the updated hydrograph record that groundwater levels under the pilot catchment's discharge area have also been steadily becoming lower. Dropping trends of up to 11cm/year are now evident in this area. In early 1995, the levels were as much as 2.5m lower than in early 1984.

Figure 1. Burkes Flat Bore Hydrographs



From the available information, the reduction in watertables and hydraulic gradients appears to have occurred over the majority of the pilot catchment. If so, then it follows that there is now significantly reduced groundwater flow towards the discharge area and, consequently, significantly reduced groundwater discharge.

Pilot Catchment Condition and Production

Most of the ridgetop tree planting has now been established for ten years and the success of the establishment is reflected by the generally good health, density and growth of the trees. It is expected that the trees will achieve maximum water uptake during the next five years. Lucerne and phalaris pastures have consistently achieved good strikes and flourish on the middle and lower slopes. The pastures have outperformed annual pastures in adjacent catchments and their condition has been generally better during dry spells.

Records kept by James Gallacher for his property, which is 729ha in area and occupies the majority of the pilot catchment, show an almost 100% increase in annual wool production between 1983 and 1990 (from about 12kg/ha/yr to 24kg/ha/yr). Production levels since 1990 have been maintained at around 23 to 26kg/ha/yr.

Recent inspections and discussions with James Gallacher also strongly point to a considerable improvement in the condition and productive value of the pilot catchment discharge area since 1983.

According to local opinion, there has been little, if any, change in the actual area affected by salt (originally estimated to be approx. 100 ha). If true, this is further good news because a significant expansion of salt affected land was highly probable if the treatment was unsuccessful. It is also good considering the several wet years that have occurred since treatment began.

In contrast to the pilot catchment discharge area, some untreated discharge areas in neighbouring catchments to the west and south have noticeably deteriorated and expanded in the last five or so years. An inspection of these catchments has shown that their discharge areas are currently in much worse condition than that of the pilot catchment.

Conclusions

The updated evidence at the Burkes Flat pilot catchment shows that the groundwater declines reported previously have continued to occur, are more widespread, **and are occurring in the discharge area**.

There is also good evidence of successful salinity treatment in other nearby catchments.

The main conclusions drawn from the updated evidence are, (i) that the salinity treatment has been effective in reducing watertables and providing productivity benefits over most of the pilot catchment, including the discharge area, and (ii) that the perennial pastures have had the greatest controlling influence on watertables in the catchment over the past eleven years.

The updated evidence from Burkes Flat provides confirmation of the salinity control and productivity benefits of well managed perennial pastures and trees on ridges in a localised sedimentary bedrock groundwater system in undulating, moderate rainfall country.

The Burkes Flat pilot catchment project has proven to be an excellent example of salinity control through community involvement in catchment planning and productive land management. Its outstanding success should provide strong encouragement for the adoption of similar treatment strategies in this commonly occurring type of salt threatened area.