Protection of agricultural land against erosion in the South Australian Murray-Darling Basin Region

Seasonal Report April 2011

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DENR conducts observational field surveys to monitor trends in the protection of soil from the risk of erosion in the state's agricultural cropping regions. The surveys are undertaken in October, March, May and June each year. Seasonal erosion protection reports are produced twice yearly, following the October and March surveys.
The reports provide a summary of ground cover and soil protection levels in relation to seasonal conditions and land management activities undertaken in recent months, including comparison with the same period in previous years that monitoring was undertaken. They also indicate likely trends in ground cover levels over coming months based on previous years' data.

Summary

- Rainfall recordings across the region for the 6 months from October 2010 to March 2011 were the highest ever on record or in the highest 10% of all recordings (Decile 10) for that period.

- Good winter and spring growing conditions grew a large amount of biomass which provided ample soil surface protection from erosion.

- Several intense rainfall events over the period caused water erosion, particularly on the eastern slopes of the Mount Lofty ranges, around Palmer and Cambrai.

- The rains over summer and early autumn generated growth of summer weeds and volunteer crop plants which helped to maintain surface cover.

Seasonal Conditions

Warmer days and moist soils during October provided good growing conditions for crops and pastures. Rainfall over the region was around average for the month with a few places receiving falls well above average. Decile 10 observations were recorded in the Callington-Mannum-Murray Bridge area and isolated falls at Renmark and Paruna resulted in October monthly totals in the Decile 10 range.

Rain from north-westerly airstreams, which tends to favour the northern and eastern mallee region, fell in November resulting in above average rainfall over the Murraylands and average falls on the eastern side of the Mount Lofty Ranges.

December was very wet and all Bureau of Meteorology rainfall recording sites in the region observed highest-ever or Decile 10 falls for the month. Intense rain of up to 100 mm fell during storms across the Murraylands and the eastern side of the Mount Lofty Ranges. Some of the locations with highest-ever December monthly totals on record were Waikerie (194 mm), Mannum (173), Nildottie (149), Point Pass (175), Alawoona (112), Caliph (130), Claypans (142), Karoonda (142) and Lameroo (108). Sheet and gully erosion on sloping land occurred in the Mannum-Palmer-Cambrai-Sedan area despite good soil surface cover and undisturbed soil. Damage to roads and other infrastructure was severe, with a bridge being washed away.

Heavy rainfalls in the middle of January in the Riverland and northern and eastern Murraylands resulted in Loxton (98 mm) and Alawoona (163) observing their highest-ever January monthly totals on record. In the western part of the region, falls were average to below average for the month.

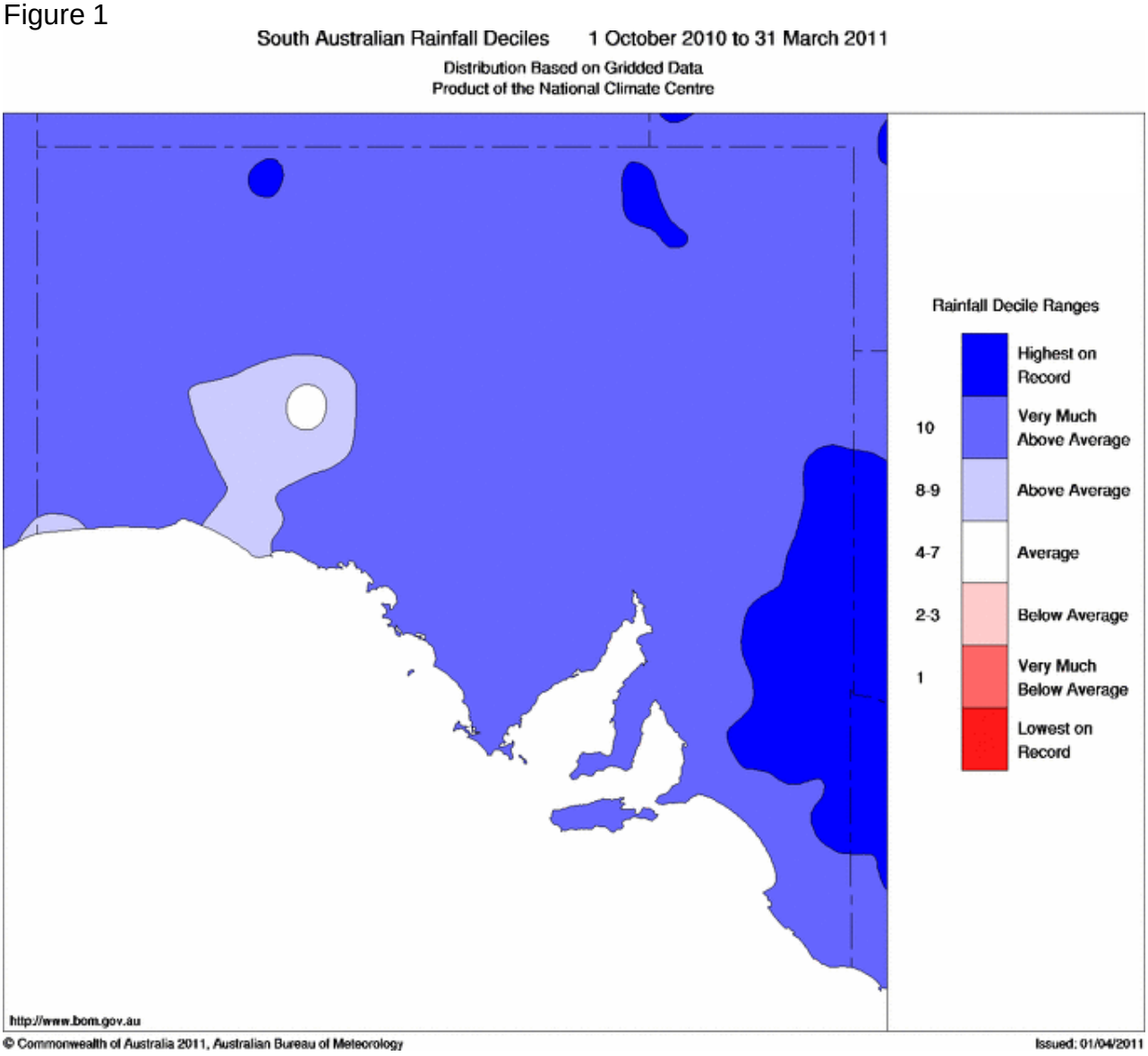
Wet conditions returned in February with several rainfall events occurring during the month. Nearly all recording sites in the region observed monthly rainfall totals of more than 45 mm. Very heavy rain fell early in the month in the Riverland and around the 19th of February, heavy falls on the eastern side of the Mount Lofty Ranges resulted in some minor water erosion. Burra recorded its highest-ever on record February total rainfall of 102 mm while numerous sites observed Decile 10 monthly rainfalls. Some of these were Renmark (102 mm), Meningie (68), Karoonda (73), Paruna (83), Sedan (63), Point Pass (78) and Eudunda (104). The Eudunda township was flooded with significant infrastructure damage occurring. The daily maxima temperature for the month was lower than average but the daily minima average was higher than average. This is attributed to increased cloud cover and humidity levels during this period.

Rain in March was again very much above average with numerous sites recording monthly totals in the Decile 10 range and Blanchetown Lock 1 (98 mm), Nildottie (103), Palmer (188) and Peebinga (57) observing highest-ever March falls. Severe rill and gully erosion occurred in the Palmer area on cultivated paddocks on sloping land.

The Palmer–Mannum- Sedan-Cambrai area was subject to several intense rainfall events and suffered significant erosion and flooding damage as a result, during the October to March period.

The extraordinary rainfall over the October to March period is depicted in the figure from the Australian Bureau of Meteorology showing rainfall deciles (Figure 1).

Figure 1



Soil surface cover levels

Good growing conditions produced a large amount of biomass resulting in high levels of surface cover. Many paddocks were spray-topped or chemically fallowed in spring to reduce weed seed set and to conserve soil moisture. Some paddocks in the northern Mallee were cultivated. Rains generated regrowth in paddocks after they had been cut for hay and baled.

Harvesting commenced in November. Surface cover levels in pasture paddocks were generally good due to low livestock numbers on properties.

The late rains generated growth of summer weeds and some summer fodder crops such as sudax were sown in the Callington area. This summer growth provided surface cover, particularly on grain legume stubbles where cover had declined to critical levels.

While most farmers used herbicides to control summer weed growth, some tillage was also used after rainfall events, for example, in the Truro to Eudunda area in March.

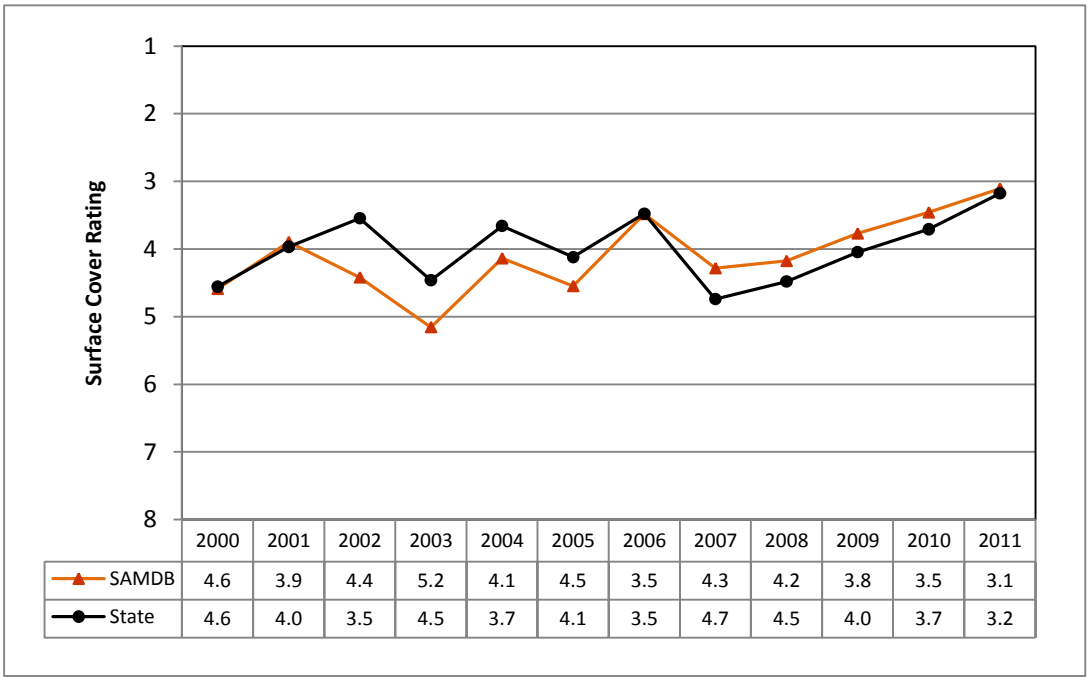
In the DENR erosion protection field surveys, surface cover levels and soil disturbance are visually rated. The surface cover rating system used is based on a scale of 1-8 where 1 = full cover and 8 = bare ground.

Assessments in October 2010 showed that surface cover levels then were the best for October observed over the monitoring period of 12 years.

Crop and pasture residues break down naturally over summer, particularly if there is rain that stimulates micro-organisms. Natural breakdown, combined with management practices, reduce surface cover levels. Based on the average change in cover ratings between October and March in previous seasons, it was anticipated that surface cover ratings in March 2011 would not be in the range considered to be at risk of erosion.

Data from the land condition field survey show that the mean surface cover rating in March 2011 was 3.1 (Figure 2). This is outside of the critical rating range for erosion risk (greater than 5) and better than the rating of 3.5 in March 2010 and the March average from 2000 to 2010 of 4.1. The change in the surface cover rating of 1.0 unit from October 2010 to March 2011 was less than the average change in cover ratings from October to March for the period 2000 to 2011.

Figure 2: Mean Surface Cover Rating on cleared land in March in the South Australian Murray-Darling Basin Region and South Australia for the period 2000 – 2011

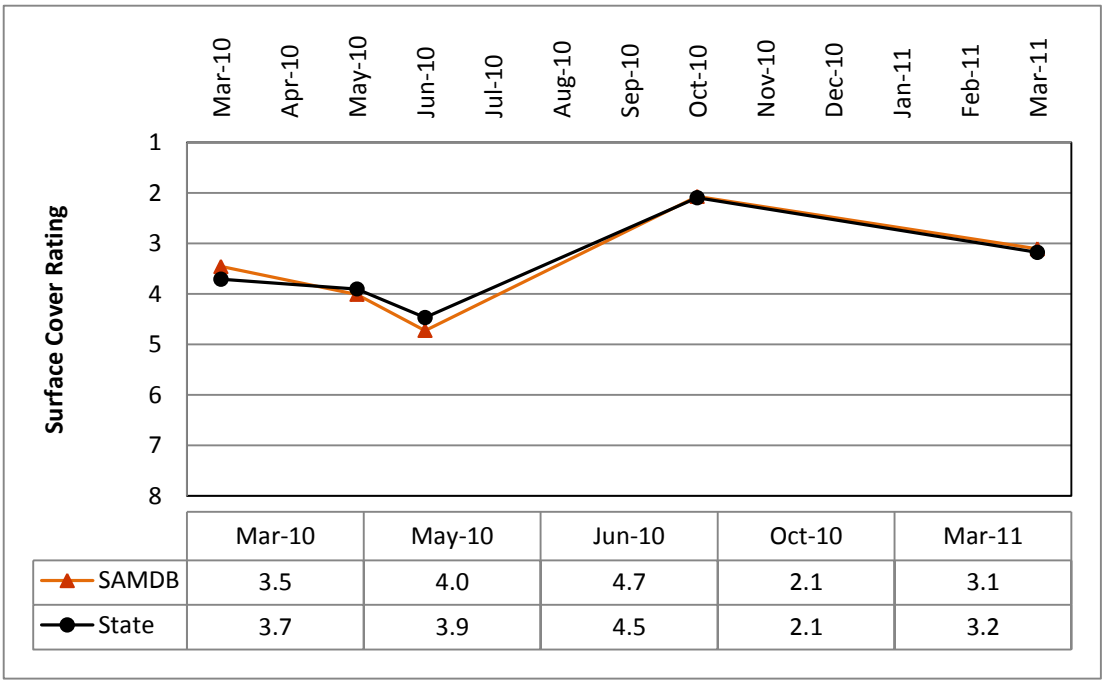


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SAMDB	4.6	3.9	4.4	5.2	4.1	4.5	3.5	4.3	4.2	3.8	3.5	3.1
State	4.6	4.0	3.5	4.5	3.7	4.1	3.5	4.7	4.5	4.0	3.7	3.2

Note: Cover rating of 1 = full cover; 8 = bare

Figure 3 shows the change in surface cover in the 13 month period from March 2010 to March 2011.

Figure 3: Mean Surface Cover Rating on cleared land in the South Australian Murray-Darling Basin Region and South Australia from March 2010 to March 2011



	Mar-10	May-10	Jun-10	Oct-10	Mar-11
SAMDB	3.5	4.0	4.7	2.1	3.1
State	3.7	3.9	4.5	2.1	3.2

Note: Cover rating of 1 = full cover; 8 = bare

It is estimated from the land condition field survey that about 2.0% of the region's land was cultivated at the time of the March observations. This is less than the mean for March of 8.6% for the period 2000 to 2011 and equal to the proportion observed on in March 2010.

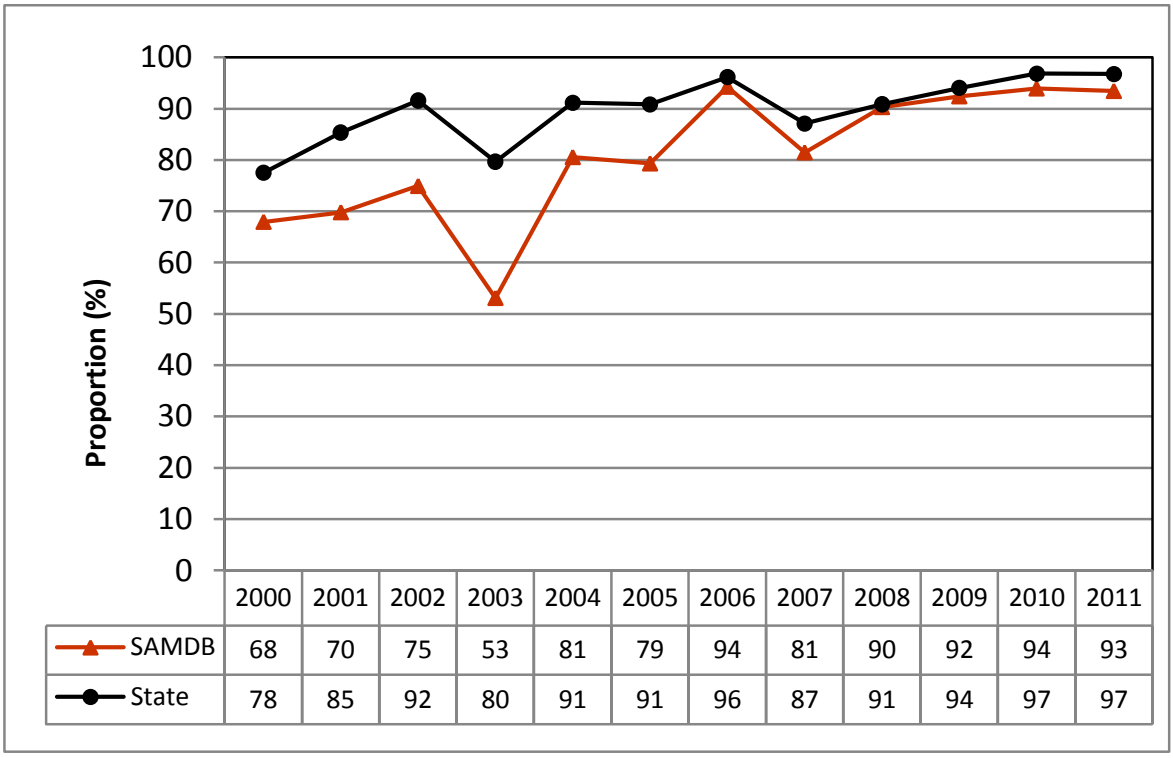
Given the good levels of surface cover in March this year, adequate levels should remain until they are disturbed or removed by burning and/or tillage.

Protection of land from wind erosion

The area of cleared land inherently susceptible to wind erosion due to soil type, rainfall and topographic features (Class III_a, IV_a and V_a) is approximately 710,000 ha or 32% of cleared land in the SA Murray-Darling Basin region. This is mainly found on the sandier soil types of the Murraylands.

In March 2011, 93% of the land was protected from wind erosion, which is the same as March last year and equal to the highest proportion observed over the monitoring period (Figure 4). The average proportion of land protected from wind erosion in March for 2000 to 2011 is 81%.

Figure 4: Proportion of cleared land (%) adequately protected from wind erosion in March in the South Australian Murray-Darling Basin Region and South Australia for the period 2000 - 2011



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
SAMDB	68	70	75	53	81	79	94	81	90	92	94	93
State	78	85	92	80	91	91	96	87	91	94	97	97

Protection of land from water erosion

The area of cleared land inherently susceptible to water erosion due to soil type and topography (Class III_e, IV_e and V_e), is approximately 295,000 ha or 11% of cleared land in the SA Murray-Darling Basin Region. It mainly occurs on the eastern slopes of the Mount Lofty Ranges.

This land is mainly used for grazing and no land condition monitoring is undertaken in these areas.

Conclusions

A good growing season produced a large amount of crop and pasture biomass. This provided good surface cover levels over summer and into autumn. Low livestock numbers resulted in lower grazing pressure on pastures which also helped to maintain surface cover.

Some paddocks in the northern mallee were cultivated in October, leaving them vulnerable to erosion for a relatively long period. More cultivation was used after subsequent rainfall events but most producers used herbicides to control weeds over the reporting period, which resulted in maintenance of surface cover and little soil disturbance.

Intense rainfall events at various times caused water erosio, and the Mannum-Palmer-Cambrai-Sedan area was subjected to damage on at least three occasions.

The proportion of land cultivated in the region in March was estimated to be 2%, which is considerably less than the March 2000 to 2011 average of 8.6%.

The proportion of land protected from wind erosion in March was 93%, higher than the March average of 81% over the monitoring period from 2000 to 2011.

It is expected that a higher than usual number of paddocks will be burned this year due to concerns that crop stubbles will be too dense to work through when sowing crops or to control pests such as snails and herbicide-resistant weeds. Mice are of particular concern to farmers because of the damage they caused last year. Their numbers are very high again due to the high amount of seed present in the environment so burning or more tillage might be used to disturb their habitat.

It is expected that farmers will not need significant rains to start sowing this year's crop given the amount of stored moisture in the soil profile. It is quite likely that some will sow at optimum sowing times for their crop types and local climates, rather than wait for opening rains. In this event, the length of time land will be exposed to erosion is expected to be quite short provided that adequate rains fall within a few weeks of sowing.

For further information, contact: Giles Forward, DENR (08) 8303 9450.