Soil Protection Progress Report July 2021

South Australia's Agricultural Lands

Giles Forward
Department for Environment and Water
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DEW Technical note 2021/20

Government of South Australia

Department for Environment and Water

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Particular acknowledgment is extended to Andy McCord, formerly of PIRSA, who originally developed the field survey methods.

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Summary

Key points:

- **Protection from soil erosion is a high priority natural resource management issue in South Australia (SA).**
- **In 2021 agricultural land was at risk of erosion for 22 days, a large decrease from 56 days of risk in 2002.**
- **Wind erosion prone land was at risk for 19 days in 2021.**
- **Water erosion prone land was at risk for 28 days in 2021.**
- **The risk of erosion has decreased since monitoring began, and has been at a relatively low level since around 2011.**
- **Groundcover in spring-summer 2019–20 was lower than the last 3 year mean due to dry seasonal conditions.**
- **Improvements in erosion protection mainly reflect improved land management practices; e.g. 83% of crop area sown using no–till in 2016; 16% in 1999.**
- **Further improvement in erosion protection will be limited by challenges of ongoing and emerging issues (e.g. dry seasons, bushfires).**

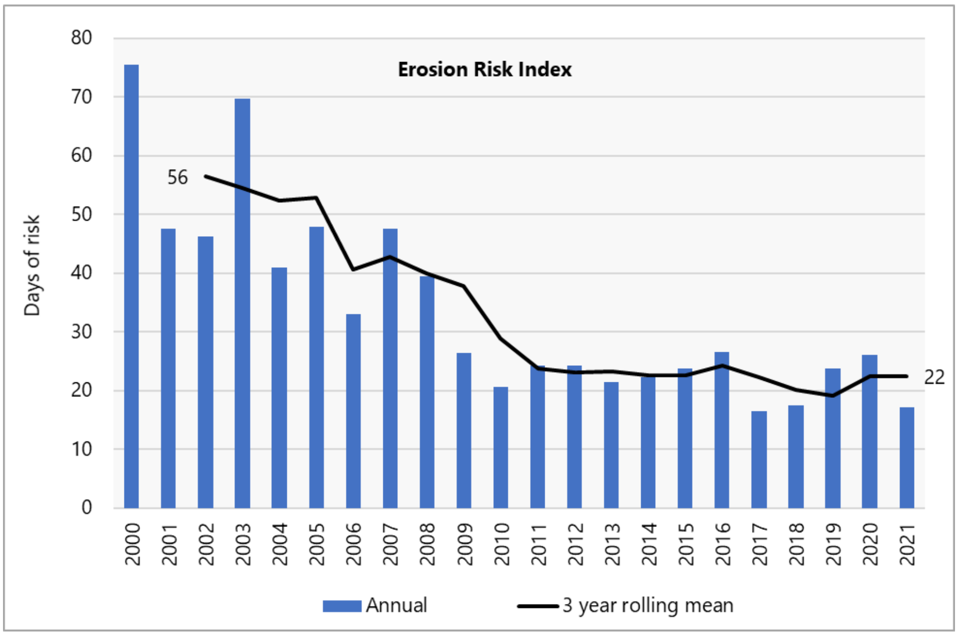


Figure 0.1. Erosion risk index based on erosion protection field surveys in SA 2000–2021

- Protection of soils from the risk of erosion is a high priority natural resource management issue in South Australia. The erosion risk is relatively low at present with the now widespread adoption of soil management practices that minimise erosion risk, but could increase due to adverse conditions (bushfires, dry seasons, or increased pests such as mice and snails).
- Based on field survey data, in 2021 agricultural land in SA was estimated to be at risk of erosion for 22 days (3 year mean; Figure 0.1). This is a decrease of 34 days of risk since 2002 (56 days of risk).
- Wind erosion prone agricultural land was regarded as being at risk of wind erosion for 19 days in 2021 (3 year mean). This is an improvement of 42 days since 2002 (61 days).
- Water erosion prone land was at risk of water erosion for 28 days in 2021. Overall, water erosion risk decreased by 19 days from 2002 (47 days) to 2021, although it has increased slightly since 2011.
- The mean surface cover level through spring and summer 2020–2021 in general was slightly better (higher) than the long term mean and the mean for the last 3 years. This is likely due to a generally better growing season in 2000 compared to 2019 and 2018 which produced higher plant biomass and cover.
- Despite the impact of some very dry seasons over the monitoring period, there has been a substantial decrease in wind and water erosion risk since monitoring began. This correlates well with the significant uptake of land management practices that improve soil erosion protection such as no-till cropping. Since around 2011, however, this improving trend has levelled off. As the adoption of no-till and stubble retention, and improved grazing management has now largely reached a practical maximum, it would be relatively challenging to achieve further improvement in erosion protection.
- To maintain and reduce the level of soil erosion risk, ongoing efforts are needed to investigate, develop and implement new or modified practices to manage ongoing and emerging agronomic issues (e.g. weed herbicide resistance, mice, snails, managing heavy stubble loads) and climate related issues (e.g. changing weather patterns or climate change, dry seasons, bushfires).

1. Background Information

1.1 Land resource information

South Australia (SA) has about 9 million hectares[1] of cleared agricultural land, of which about 8 million hectares are used for cropping.

Approximately 5.4 million hectares (61%) of cleared agricultural land in SA is inherently susceptible to wind erosion due to sandy textured soils (Figure 1.1). This land mainly occurs on Eyre Peninsula, the Murray Mallee and the upper South East.

There are also about 2.9 million hectares (32%) of soils with inherent susceptibility to water erosion (sheet, rill and gully) due to soil type and slope (Figure 1.2). This mainly occurs on sloping land in the Mt Lofty Ranges, mid and upper North, and parts of lower and eastern Eyre Peninsula.

Soil erosion protection has been the highest priority soil management issue in South Australia. The risk is relatively low at present with adoption of sound soil management practices, although tends to be higher in very dry seasons. It could increase due to adverse conditions such as bushfires, dry seasons (particularly two or more successive dry seasons), increased threats of pests such as mice and snails, or the effects of climate change such as more extreme weather events.

The frequency and magnitude of wind erosion and water erosion of soil in the agricultural areas of SA have steadily declined over the past 70 years due to improvements in farming practices.

Nonetheless, soil erosion still occurs at times, particularly associated with extreme wind or rainfall events, and after fires.

The risk of erosion is increased during and following very dry seasons when plant growth may be inadequate to provide sufficient groundcover for erosion protection. In annual crop–pasture systems, soil exposure is usually highest in late summer through to the time of crop sowing (May).

Modelling has shown that climate change will significantly increase the susceptibility of soils to wind erosion and water erosion.

Soil erosion results in more or less irreversible degradation of soil productive capacity, particularly as many of SA's topsoils are shallow and relatively infertile.

Wind erosion can damage plants and has a wide range of costly off–site impacts including damage to roads, disruption to transport and electricity supply, and raised dust can affect human health and wellbeing. Water erosion results in topsoil loss, siltation of watercourses and damage to infrastructure.

The use of agricultural land management practices that maintain protective groundcover and minimise soil disturbance are crucial to minimising the risk of wind or water erosion.

The key factors in reducing the risk of erosion are:

- keeping adequate groundcover on the soil surface for protection from wind and water erosion
- maintaining soil in a cohesive or undisturbed condition so that soil particles are not easily loosened, detached and transported
- keeping it in this protected state for as long as possible.

[1] Area data for cleared agricultural land and susceptible to wind and water erosion was revised in 2021.

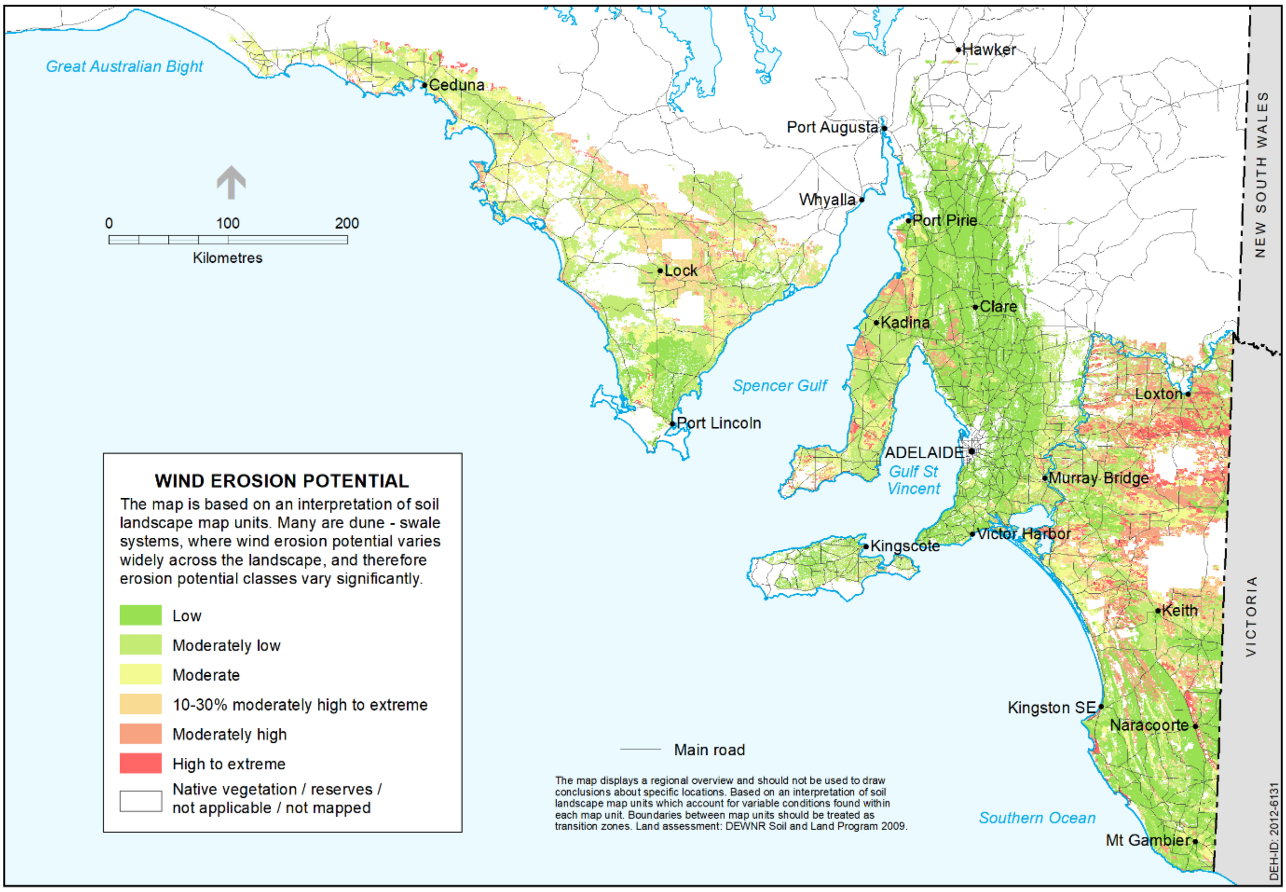


Figure 1.1 **Inherent susceptibility of agricultural land to wind erosion in SA.**

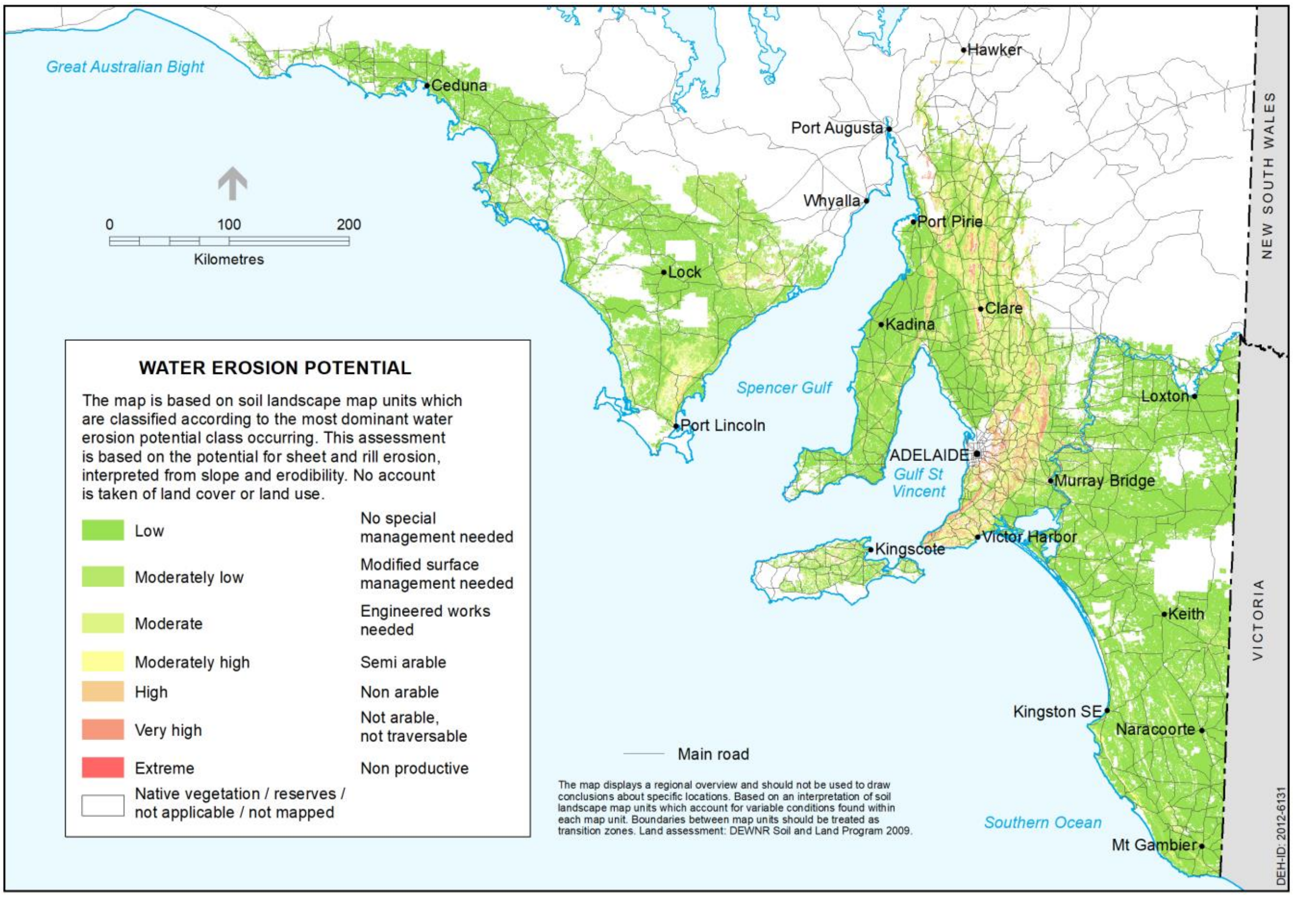


Figure 1.2 **Inherent susceptibility of agricultural land to water erosion in SA.**

2. Soil surface cover

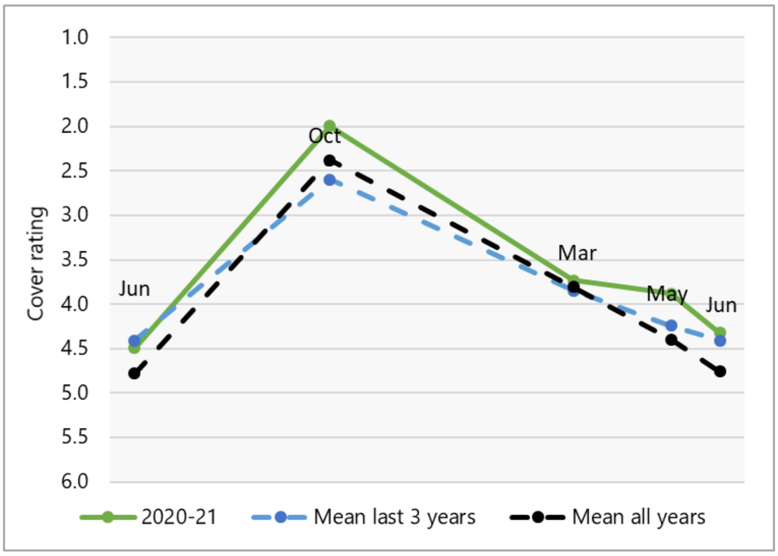


Figure 2.1 **Mean surface cover rating on agricultural land in SA from field surveys conducted from June 2020 to June 2021 compared to the three year mean up to 2020–21 and the average for all years monitored since 1999-2000. Data collected from Eyre Peninsula (EP), Northern and Yorke (NY), Murraylands and Riverland (MR), Limestone Coast (LC) Landscape Regions.**

Note: Cover rating 1 = full cover, 8 = bare soil

The mean surface cover level through spring–summer 2020–21 in general was slightly better (higher) than the long term mean and the mean for the last 3 years (Figure 2.1). This is likely due to a generally better growing season in 2000 compared to 2019 and 2018, which produced plant higher biomass and cover.

Drier than average conditions through autumn 2021 contributed to cover levels returning to average by March 2021. A late season opening (June 2021) led to less than the average area of crop being sown in May, resulting in higher cover levels than average.

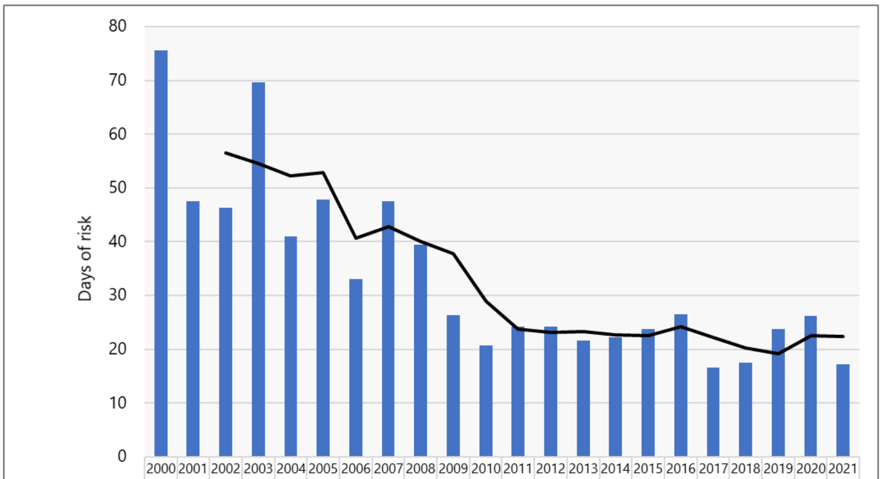
Mean cover levels for the past 3 years were similar to the long term average, reflecting drier than average conditions in 2018 and 2019, however cover levels were slightly better in June due to adoption of no till and stubble retention practices.

3. Wind and water erosion risk on agricultural land

Indices specifically for wind and water erosion risk on agricultural land are calculated from field observations of soil disturbance or looseness (e.g. cultivated or undisturbed) as well as the height and amount of vegetative cover on the ground surface. These indices take into account the inherent susceptibility of the survey sites to wind erosion (e.g. sandy soils) or water erosion (e.g. sloping land) and apply to crop and pasture land in the regions surveyed. This provides a relatively realistic estimation of erosion risk on erosion–susceptible agricultural land across the state.

These indices can be combined into a single index of erosion risk, or reported separately.

3.1 Erosion Risk



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Annual	76	48	46	70	41	48	33	48	40	26	21	24	24	22	22	24	27	17	17	24	26	17
3 year mean			56	54	52	53	41	43	40	38	29	24	23	23	23	23	24	22	20	19	23	22

Figure 3.1 **Days of erosion risk (annual and 3 year rolling mean) on agricultural land in South Australia from 2000 to 2021, based on field surveys. Data collected from EP, NY, MR, LC Landscape Regions.**

The trend in the erosion risk on agricultural land in SA is shown in Figure 3.1. This is presented as annual days of risk, and as a 3 year rolling mean. The 3 year mean tends to dampen annual seasonal effects on erosion risk and show overall trends that are mainly the result of land management practices.

In 2021, agricultural land in SA was estimated to be at risk of erosion for 22 days (3 year mean). This is a decrease of 34 days from 2002 (56 days). Much of this improvement occurred prior to 2011.

The annual days of risk has varied considerably from year to year, reflecting the impacts of drier (1999–00, 2002–03, 2006–08, 2018–19) or wetter (2009–10, 2016–17) seasons. It is evident that erosion risk levels in more recent dry seasons have been much lower than comparable dry seasons in the earlier years of monitoring, due to the uptake of improved land management practices.

There has been a significant reduction in erosion risk since monitoring began. Much of this improvement is due to the increased adoption of land management practices that reduce erosion risk such as no till and stubble retention, and improved grazing management. There have also been mostly favourable rainfall seasons from around 2009 to 2017 (except for dry conditions in LC region in 2014–16 and EP in 2017–18) which have helped produce good plant biomass and cover levels.

It should be noted that the extent of the field survey transects was reduced after 2014, and since then have no longer covered much of western EP nor the upper North. As very dry conditions affected parts of these districts through 2017–2020, the overall erosion risk in these years for the state may be higher than the data in this report is suggesting.

3.2 Comparison of wind erosion and water erosion risk

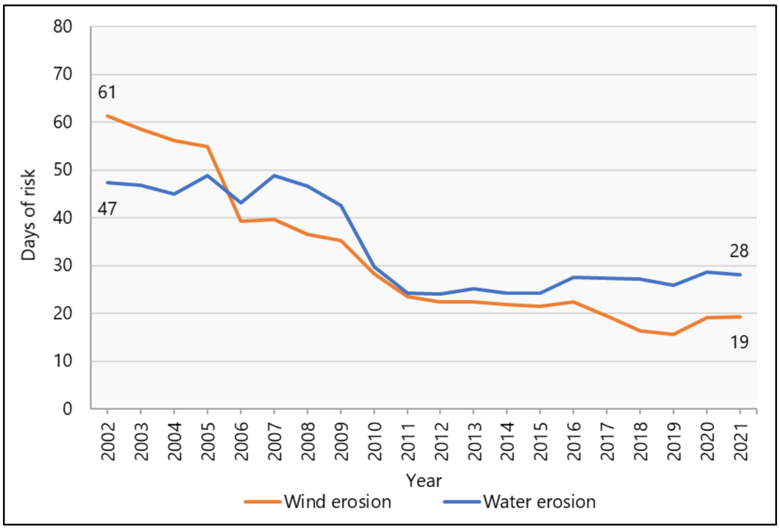


Figure 3.2 Days of wind erosion and water erosion risk (3 year rolling mean) on agricultural land in SA from 2002 to 2021, based on field surveys. Data collected from EP, NY, MR, LC Landscape Regions.

In 2021, wind erosion - susceptible agricultural land was regarded as being at risk of wind erosion for 19 days (3 year mean, Figure 3.2). This is a similar level to the past 10 years. Overall, there has been a considerable decrease in wind erosion risk (42 days) from 61 days at risk in 2002.

Water erosion susceptible agricultural land was regarded as being at risk of water erosion for 28 days in 2021. This index has decreased by 19 days from 47 days in the baseline year 2002, although has increased slightly in the last 10 years.

The higher baseline (2002) wind erosion risk than water erosion risk is probably due to two factors:

- Wind erosion susceptible soils mainly occur in lower rainfall agricultural areas; there was a significantly lower level of adoption of no till cropping in low rainfall areas than mid to high rainfall districts around this time
- Some very dry seasons (1999 on upper EP and 2002 in the Mallee) mainly affected wind erosion susceptible soils in lower rainfall districts, resulting in low vegetative growth and low groundcover levels.

In the period around 2006 to 2008, well below average growing season rainfall and dry springs tended to reduce average biomass and groundcover levels, particularly in pulse crops in the lower and mid north. These crops are grown mainly on the water erosion - susceptible hilly land. This is probably the reason for higher water erosion risk levels than wind erosion risk during this period. The slight increase in water erosion risk over about the past 10 years may be due to an increasing proportion of pulse crops grown on hilly water erosion prone land (lower stubble volumes and groundcover than cereals).

Note as described for erosion risk, the actual wind and water erosion risk in SA in 2017–19 may be higher than this data suggests because of the reduced survey transects.

4. Seasonal conditions, land management practices and impacts on soil protection

The following is a summary of conditions and impacts on soil erosion protection in the main agricultural cropping regions (EP, NY, MR, LC) over the past three years, which correspond to the period for the three year rolling mean erosion protection indices. Rainfall decile maps are shown in Appendix 2.

2018-19

- Growing season rainfall in 2018 was generally below average to very much below average, resulting in below average plant biomass production, particularly in eastern EP and the NY and MR regions. Above average production occurred in the LC region.
- A number of sandy rises, water repellent soils (mainly in central and eastern EP and northern Mallee) and parts of paddocks including heavier textured soils in some areas failed to grow adequate cover and suffered wind erosion on a number of windy days through 2018–19.
- Some paddocks with limited cover were bared out through overgrazing, while the majority of farms supplementary fed livestock. There were shortages of hay and grain.
- Summer rains were generally below average, with limited volunteer and weed growth.
- A major fire at Sherwood (approx. 12,000 ha) exposed agricultural soils to erosion.
- In eastern/northern parts of the NY region, due to ongoing very dry conditions, cover was below average on long term pastures and permanent grazing land, compounded by high Kangaroo numbers.
- Opening season rainfall in May and June 2019 was adequate in most areas for good crop and pasture establishment, but emerging plants on areas with poor residual cover suffered some wind blasting damage.

2019-20

- In 2019, growing season rainfall was mostly below average, and very much below average in some local districts (including far western EP, parts of NY, northern Murray Mallee), again producing below average plant biomass and cover.
- A number of crops failed on EP, upper North, northern Mallee and Murray Plains; some were grazed off, and resulted in dust storms on windy days.
- In addition, some poorly covered sandy rises from the 2018 season remained exposed to erosion, with wind erosion occurring on windy days.
- Bushfires in November 2019–January 2020 burnt nearly 300,000 ha (including Kangaroo Island, Cudlee Creek, Keilira, Miltalie, and fires on EP, Yorke Peninsula) exposing soils to erosion. Some wind and water erosion occurred but was less than anticipated.
- Most properties supplementary fed livestock. A 'feed drought' continued in permanent grazing land in the northern Murray Plains through eastern Mt Lofty Ranges areas to the upper North.
- Significant summer rains in February 2020 produced volunteer and weed growth resulting in a temporary increase in groundcover in most districts.
- Above average rain in April 2020 then below average May–June rain resulted in reasonable crop and pasture establishment on most soils. Some sandy soils on EP and the northern Mallee had poorer plant establishment due to dry topsoils and windy conditions.

2020-21

- The 2020 growing season had mostly average rainfall, producing average to slightly above average plant biomass and cover.
- There was partial restoration of plant cover on previously exposed sandy rises on EP and the Mallee, with some areas re–sown after rain in August, but some parts remained poorly covered.
- Spring–summer rain produced some volunteer plant growth, increasing cover levels. Spring rains produced growth of perennial pasture plants in northern and eastern permanent grazing land, providing some livestock feed after a prolonged 'feed drought'.
- Lightning strikes in November 2020 resulted in fires affecting agricultural land, particularly at Yumali (nearly 5000 ha); and Blackford fire near Lucindale in January 2021 (approx. 14,000 ha) exposed agricultural soils to erosion.
- It appeared that generally lower stocking rates in paddocks resulted in fewer areas being bared out than in the previous few seasons.
- A very dry autumn and late season opening (particularly in northern Mallee) resulted in many areas being sown later than average, with larger areas of crops dry–sown. Dust storms occurred on windy days through April–June on relatively small overgrazed areas and some dry topsoils recently dry–sown.

5. Trends in land management practices

The Department for Environment and Water has commissioned a series of telephone surveys of agricultural land managers in SA (broadacre cropping, livestock grazing, dairy) between the years 2000 and 2017 to obtain data on the soil and land management practices used in their farming systems, including their understanding of soil and land management issues. Over the survey period, data from these surveys have shown increasing adoption of land management practices that improve protection of the soil from erosion. This trend is confirmed by data from other survey sources such as the Australian Bureau of Statistics' (ABS) agricultural census and land management surveys.

Figure 5.1 shows that the proportion of the crop area reportedly sown using no–till methods (i.e. sown using low disturbance points or discs without prior cultivation) in SA has increased markedly from 16% in 1999 to 83% in 2016. This trend was fairly consistent in the main cropping regions of SA. The practice of cultivated fallowing is now rare, and if any cultivation is done it is usually strategic and limited, for specific purposes. According to the 2017 survey, 37% of croppers did some pre-sowing cultivation in 2016, which was done on only 14% of the total cropped area. The main reasons given for doing cultivation were to control weeds (45% of those who cultivated), and break up compacted soil (43%).

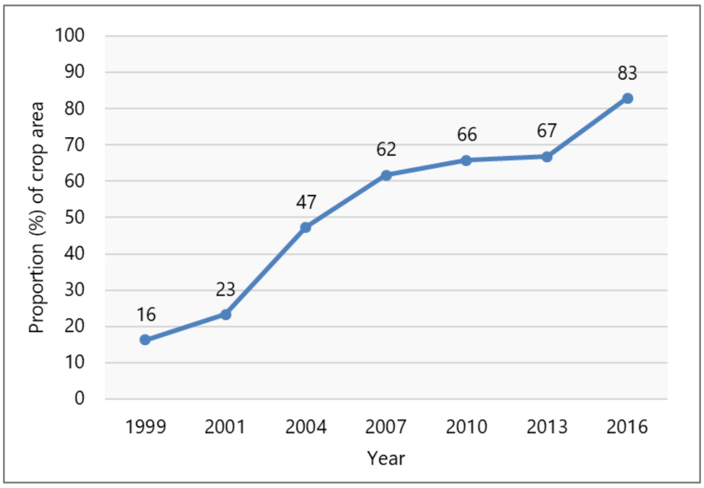


Figure 5.1 Proportion (%) of crop area in SA sown using no–till methods (including zero till) according to survey respondents

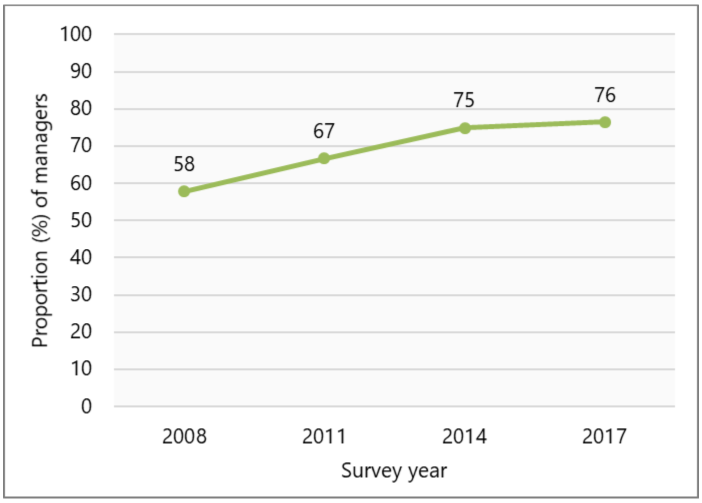


Figure 5.2 Proportion (%) of cropping land managers in SA who aim to leave on average at least 50% groundcover immediately prior to sowing.

Figure 5.2 shows that there has been an increase in the proportion of croppers who aim to leave on average at least 50% surface cover prior to sowing, since the 2008 survey (when the question was first asked).

The relative incidence of stubble or residue burning can be estimated from Geoscience Australia's Sentinel Hotspots infra–red remote sensing data (Figure 5.3). This shows the number of fires (mainly 'hot' burns) detected on agricultural land, which gives an approximate indication of the incidence of deliberate paddock burning each year. This shows marked seasonal variation in the use of burning. This reflects the volume of stubble or residues remaining from the previous year (i.e. high volumes can interfere with the seeding operation) and the perceived threat to crops from pests such as mice or snails. These issues were most prominent in 2011, and to a lesser degree in 2017, following high–producing seasons.

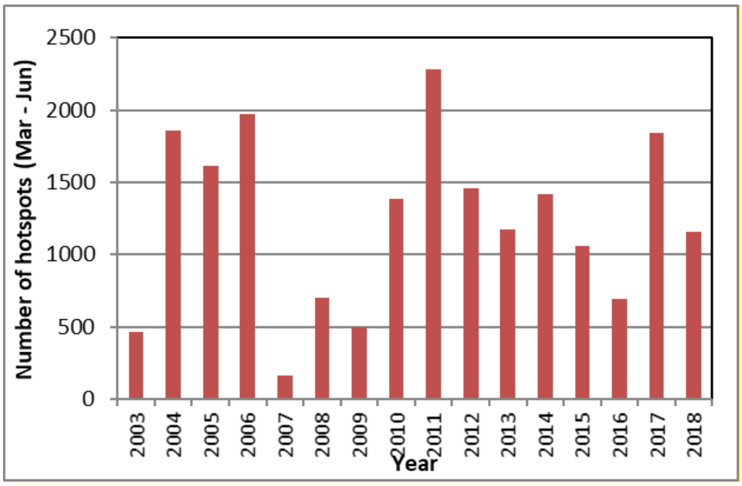


Figure 5.3 Number of hotspots detected (infra–red remote sensing) on cleared agricultural land in SA from March to June each year from 2003 to 2018; data from Geoscience Australia Sentinel Hotspots

Burning of windrows or stubble dumps is often done to reduce weed seed numbers which leaves the rest of the stubble intact to provide protection from the risk of erosion. Figure 5.4 shows that in 2016, windrow burning was more commonly used than full burning, according to survey respondents. There was slightly less full burning done in 2016 compared to 2013, and a 'swing' towards windrow burning in 2016 compared to 2013.

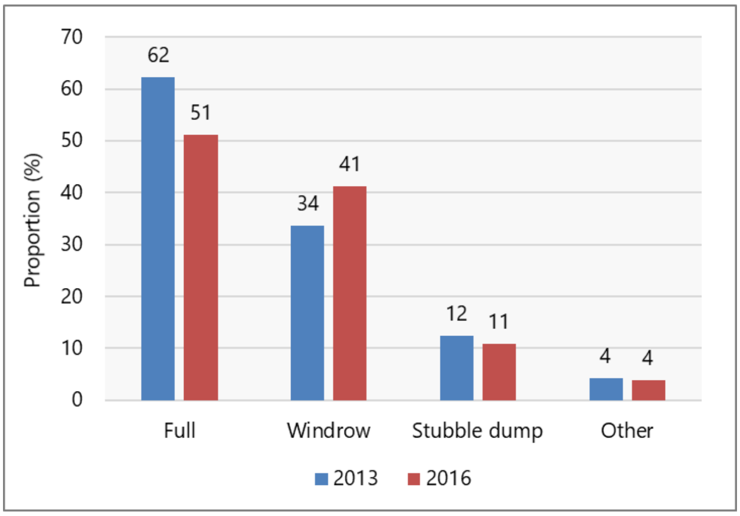


Figure 5.4 Type(s) of burning done by cropping land managers in SA when preparing to crop in 2013 and 2016 (proportion of those who burnt).

Figure 5.5 shows the most common reason given by croppers for burning was snail control, while weed control and reducing (high) stubble loads were also common reasons.

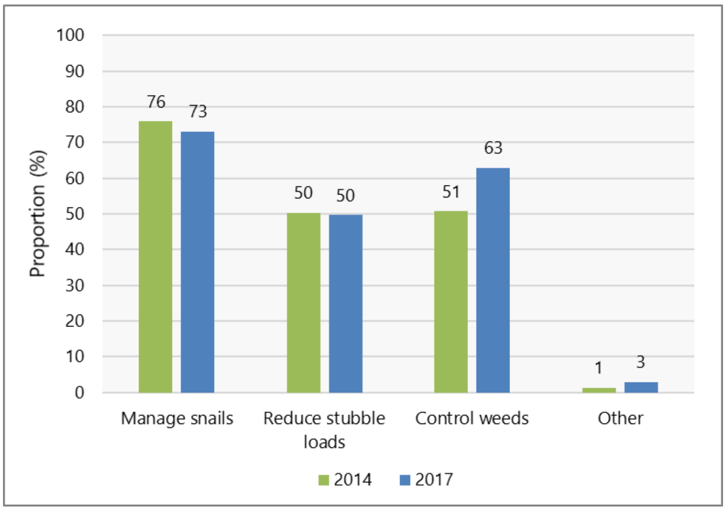


Figure 5.5 Main reasons given for burning stubbles/residues, cropping land managers who ever burn when preparing to crop; 2014 and 2017 surveys.

Removing stock from paddocks and feeding them in containment areas particularly in the autumn–early winter period helps stop paddocks from becoming devoid of protective surface cover. Around half of surveyed managers in SA (who have or manage livestock) reported using this practice in surveys since 2011 (Figure 5.6). Supplementary feeding of stock in paddocks is also commonly used through summer and autumn when pasture feed quantity and quality declines, although this may not necessarily protect surface cover.

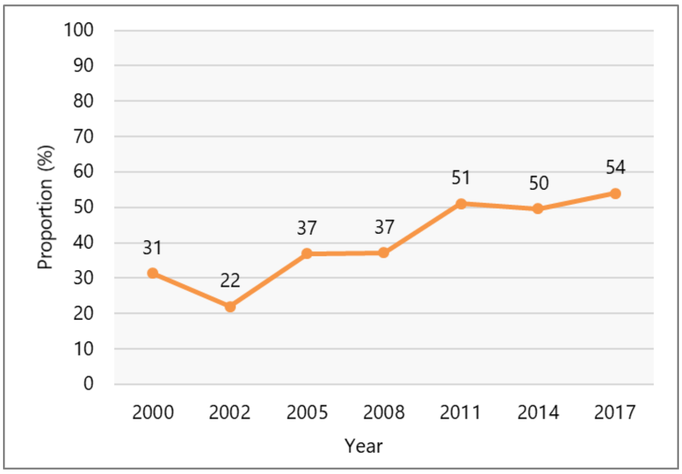


Figure 5.6 Proportion of land managers (that manage livestock) in SA who use confinement feeding areas for stock when necessary to manage erosion risk in paddocks

These survey results indicate that most farmers are increasingly using practices that protect the soil from erosion, apart from burning residues where they are perceived to be likely to cause problems for establishment of next season’s crops.

The uptake of improved land management practices over the survey period, particularly no–till, correlates with the improving trend in protection of agricultural cropping land from wind and water erosion.

6. Climate change implications

The risk of soil erosion in South Australia's agricultural zone is likely to increase in the future due to climate change[2], which is expected to deliver:

- A warmer, drier climate with reduced 'growing season' rainfall
- An increase in the frequency and severity of extreme weather events.

Lower rainfall agricultural areas will have increased risk of crop and pasture failure due to more extreme dry seasons. This would result in reduced plant cover, increasing erosion risk. In dry seasons, crop failure will be more acute on finer (heavier) textured soils because moisture from limited rainfall is held more tightly in the soil compared to sandy soils, making it more difficult for plants to take up. An increased incidence of strong wind events will exacerbate the effects of dry conditions on plant growth by potentially causing more physical damage to emerging plants including sandblasting.

Soils on sloping land will be more at risk of water erosion with more intense (particularly summer) storm rain events.

Changes to land management practices that may be required to adapt to such climate changes could include:

- Reduction in cropping and an increase in pasture grazing of marginal areas (e.g. low rainfall, heavier textured, shallow or marginally saline soils etc.)
- Retraction of cropping from heavier soils to sandier textured soils that have moisture more freely available to plants
- Increased use of perennial vegetation (pasture species, shrubs) in grazing systems
- Increased summer cropping (fodder, grazing, grain).

[2] Liddicoat C, Hayman P, Alexander B, Rowland J, Maschmedt D, Young M-A, Hall J, Herrmann T, Sweeney S, 2012, Climate Change, wheat production and erosion risk in South Australia's cropping zone: Linking crop simulation modelling to soil landscape mapping, Government of South Australia, through Department of Environment, Water and Natural Resources.

7. Current and emerging issues

While land managers have no control over seasonal climatic variability, there are opportunities to manage and improve soil protection through land management, including strategies to adapt and respond to climate variability.

There are, however, a number of current and emerging issues that could compromise the level of erosion protection in SA’s agricultural regions.

Stubble and residue management

Stubble burning remains one of the main tools to manage snails, herbicide resistant weeds, hay production, improved herbicide efficacy, and high stubble loads in higher producing areas. More ‘full’ paddock burning is observed after high producing seasons, usually for reducing heavy stubbles. Most burning however is confined to header rows which leaves some cover over the remainder of the paddock. Overall, stubble management is improving as older seeding implements are being phased out and replaced by machinery with improved stubble management capability.

There is a significant demand for straw in agricultural regions, particularly for bedding in piggeries and poultry sheds. Farmers baling straw on their own land tend to leave some straw behind (‘beer can height’), whereas contractors tend to cut as low as they can, leaving less cover on the soil.

Weed control

The profitability of using herbicides for summer weed control is marginal in lower rainfall areas, particularly in sandy soil types that are unable to store ‘out of season’ rainfall in the soil profile. Consequently, cultivation is used in some situations. Grazing of summer weeds leaves more surface cover on the ground than applying herbicide.

On cropping land in the vicinity of vineyards, off-site impacts of herbicides is a threat to the use of herbicides for summer weed control. The option of using chemicals to control summer weeds or other vegetative growth is vital to protect soils from erosion (rather than using cultivation) as well as moisture conservation.

Herbicide resistant weeds

The reliance on herbicides in place of tillage has led to herbicide resistance and this is being managed at a high cost. Tools and techniques are being developed to tackle weed resistance, for example the Harrington seed destructor. Stubble retention has resulted in an increase in some crop diseases as material is carried over from year to year.

Tillage

Most farmers are using direct drill, no–till or zero till practices to a significant extent on their land but some still use tillage as a ‘strategic cultivation’ to loosen the soil, stimulate weed growth, or to replace a herbicide application. In lower rainfall and lower production areas, the costs of herbicide compared to diesel can favour tillage, particularly where larger, perennial weeds occur, such as onion weed. Weeds that are difficult to control using herbicide alone such as Fleabane are a significant problem for no-till or intensive cropping (no livestock) farmers.

Grain legumes

The significant area sown to grain legumes, particularly peas, in higher rainfall areas continues to constitute an erosion risk due to the sparse stubbles left by such crops. The increase in the area sown to lentils (replacing cereals or canola) in the past couple of seasons is adding to this issue. The disease management, weed control, nutrition and crop diversity benefits in crop rotations that such commodities offer to producers outweigh the actual or potential damage from erosion.

Grazing management

Sheep enterprises have become more profitable in recent years, and consequently more medic and vetch pastures are being sown. Legumes produce less biomass and hence less residues than cereals and grasses, and break down more rapidly so do not provide as much surface cover. Overgrazing of pastures hastens loss of cover. Dry springs finish pastures off earlier with less bulk of biomass so peak cover levels occur earlier.

More stock could lead to over grazing of paddocks. However, producers generally understand that to achieve good returns, livestock need to be maintained in sound condition, so farmers are ensuring they have adequate fodder supplies or paddock feed to keep stock in condition, or adjust stock numbers according to the amount of feed available. They are unable, however, to control the grazing pressure exerted by abundant numbers of kangaroos which take advantage of the feed left in destocked paddocks.

Sowing to a set date

Farmers in more reliable rainfall areas are sowing more to a set date to get the crop in around the optimal sowing date rather than waiting for opening rains. This is evidently becoming a more common practice as farms are increasing in size, and is extending into lower rainfall districts. This potentially extends the period of soil exposure to erosion (if soil is significantly disturbed and/or has inadequate groundcover) before crop establishment if there is a time delay between sowing and enough rainfall occurring to germinate crops. However, there is a risk of patchy crop emergence on non-wetting soils if crops are dry–sown.

GPS guidance

There is increasing use of GPS controlled steering systems for sowing operations, and it has been observed that this is leading to more paddocks on sloping land being worked up and down the slope, including very steep slopes. This increases the risk of water erosion, although to date no serious soil erosion has been observed in such situations.

Fire risk

Ironically, the gains in production and erosion protection farmers have achieved through improved farming practices, have also created a very large biomass load that can fuel extremely large fires as was the case in the Pinery fire. Farmers are now considering ways to manage biomass growth so that it does not pose such a large fire risk but still maintains cover to protect the soil.

To maintain or improve soil erosion protection in SA, there is a need for ongoing efforts to investigate, develop and implement new or modified practices and systems to achieve greater soil erosion protection, particularly relating to managing pests, weeds and high stubble loads.

Appendices

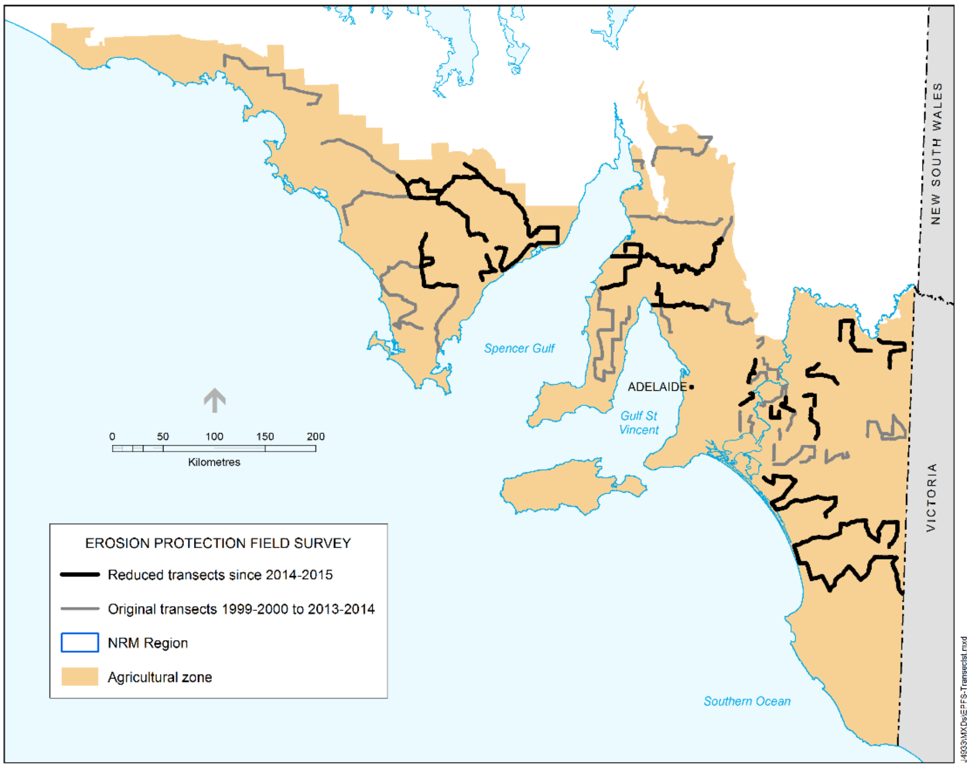
Appendix 1 Monitoring erosion risk

Field surveys

The Department for Environment and Water (DEW) conducts observational field surveys to monitor trends in the protection of soil from the risk of erosion in the main agricultural cropping regions of SA (Eyre Peninsula, Northern and Yorke, Murraylands and Riverland, Limestone Coast Landscape Regions). The surveys are undertaken in October, March, May and June each year. Soil surface cover and soil disturbance have been visually rated during these surveys at over 5500 sites in the agricultural zone (see map below). It should be noted however that since October 2014, the field survey transects have been down–scaled, with data collected from a reduced number of sites (approximately 2800 sites - see map below). This has slightly reduced the accuracy of results, although the reduced transects were chosen objectively to maintain as much statistical representation as possible.

The surface cover rating system used is based on a scale of 1—8 where 1 = full cover and 8 = bare ground.

Data from these field surveys is used to estimate the cumulative number of days each year that agricultural land (inherently susceptible to wind or water erosion) is at risk of (or protected from) erosion, at the regional and state level. For analysing trends in this data, a 3 year rolling mean is used to help dampen the effects of seasonal variability on cover levels and erosion risk (or protection). The days of protection (or risk) are an estimate only, and should be used as a relative rather than an absolute measure. The data is best used for identifying changes or trends over time.

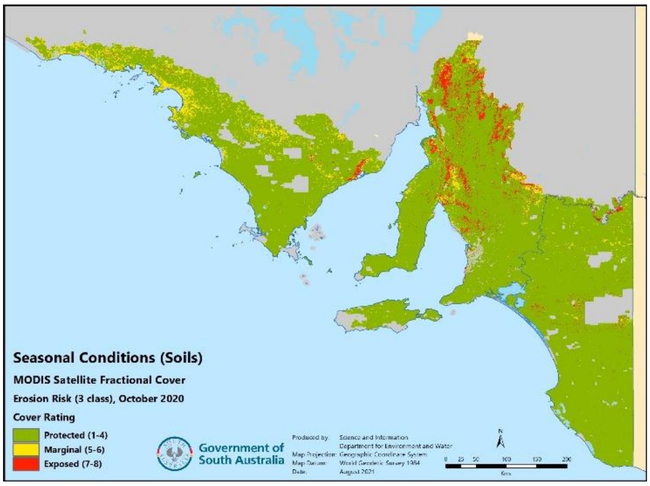


Satellite data

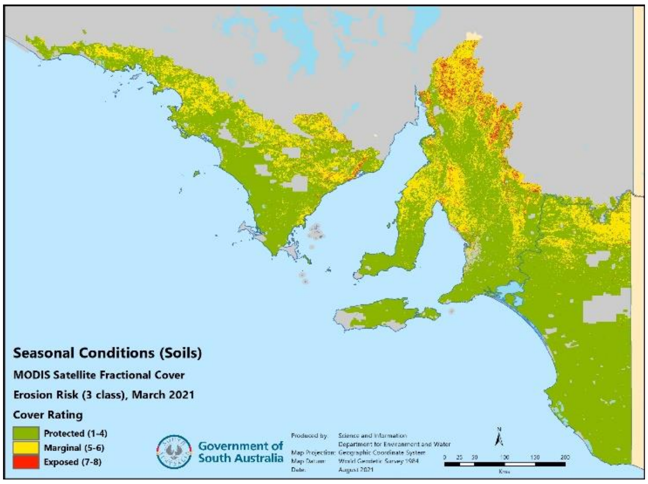
DEW has recently developed a method to monitor groundcover levels across the region using monthly MODIS Fractional Cover satellite data, which has been calibrated against the surface cover rating data from the field surveys. While this method does not capture field observations of soil disturbance, cropping phase and other land management factors, it does provide a relative estimate of groundcover level (therefore erosion risk) on all agricultural land across the regions. Maps of modelled erosion risk on agricultural land in SA corresponding to the four field survey months in 2020–21 are shown as follows.

Note that the reproduction of these maps at this reduced size tends to produce 'colour wash' distortion that, for example, makes the high risk red areas look more widespread than they actually are.

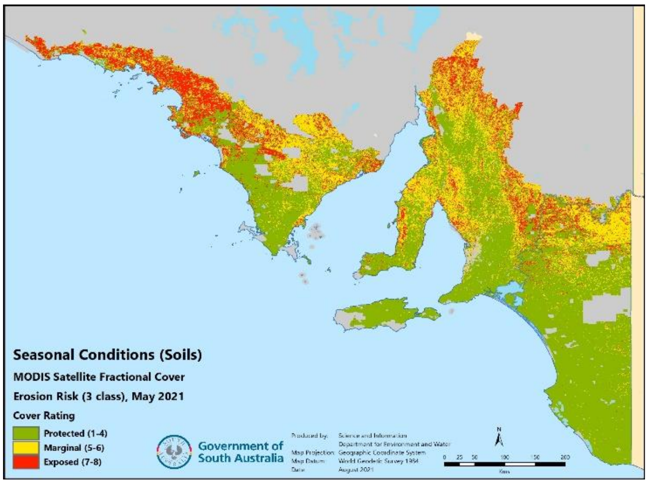
October 2020



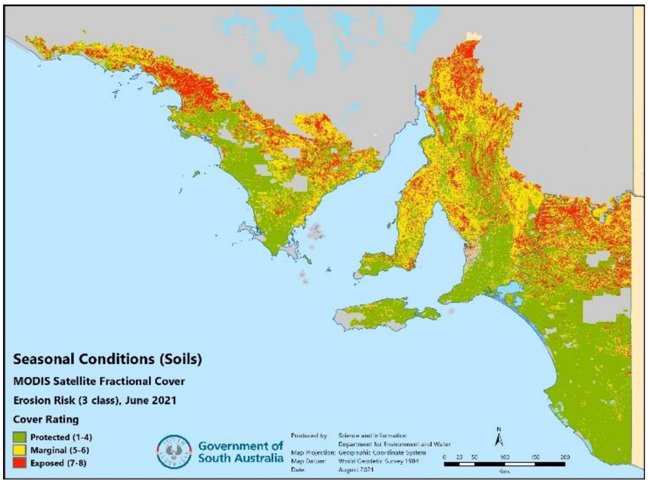
March 2021



May 2021

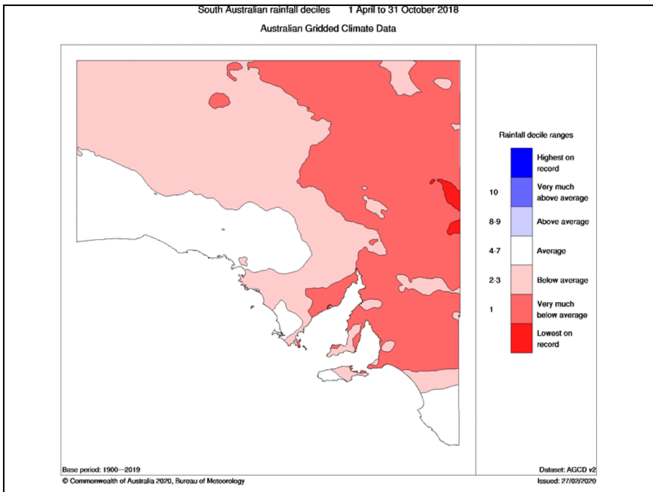


June 2021

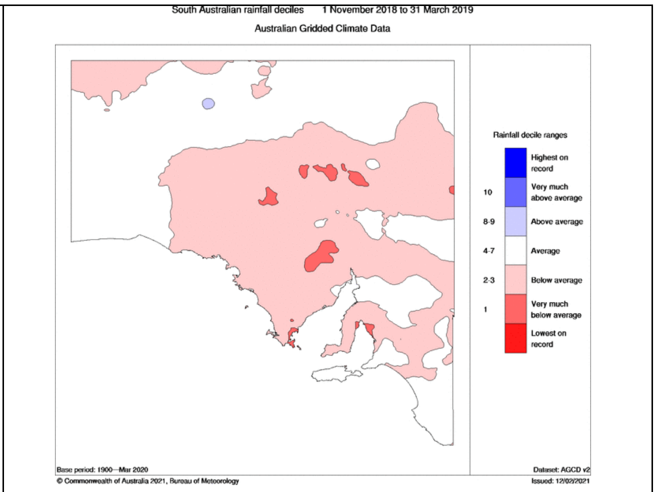


Appendix 2 Rainfall decile maps

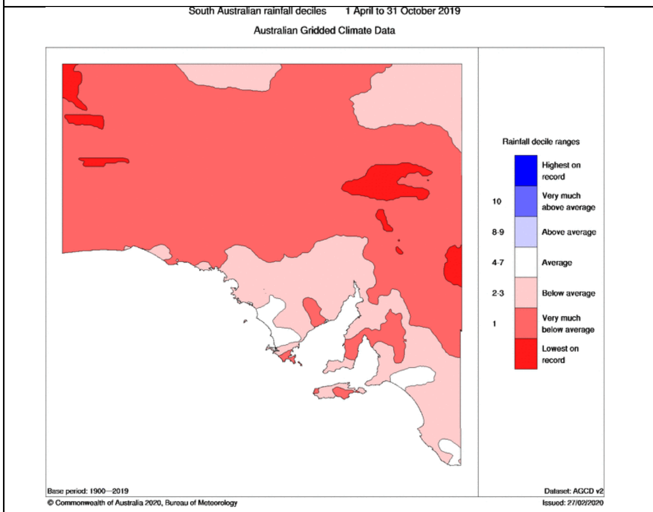
SA Rainfall Deciles for southern 'growing season' April–October 2018, 2019, 2020, and corresponding 'out of growing season' rain November–March.



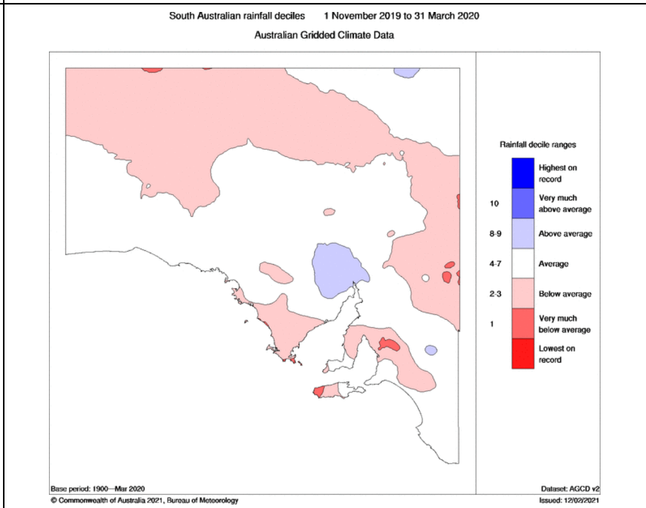
April–October 2018



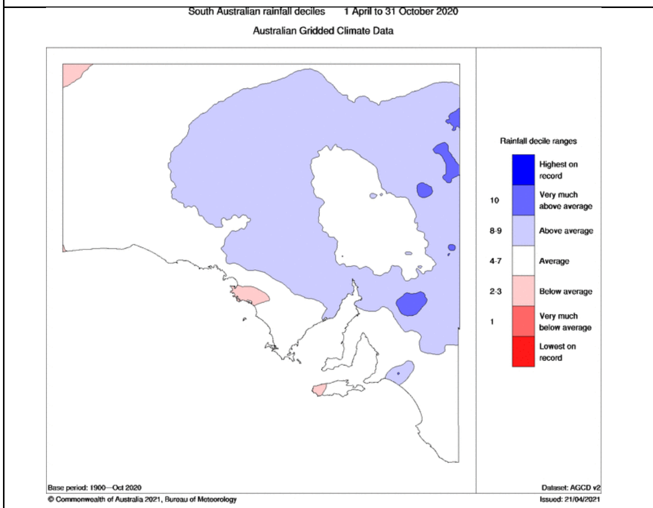
November 2018–March 2019



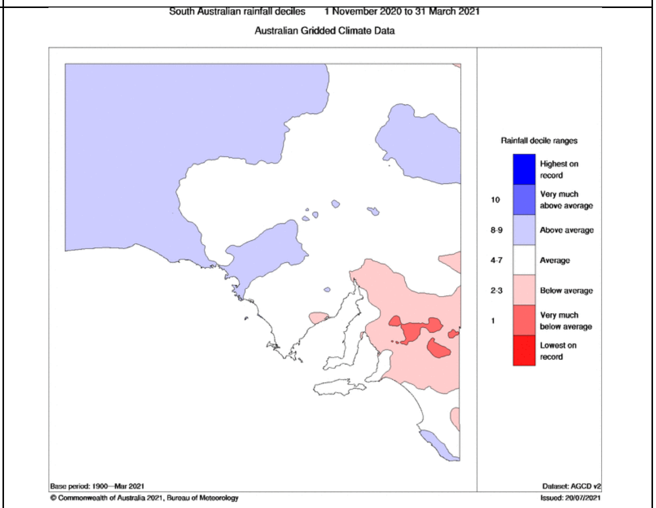
April–October 2019



November 2019–March 2020

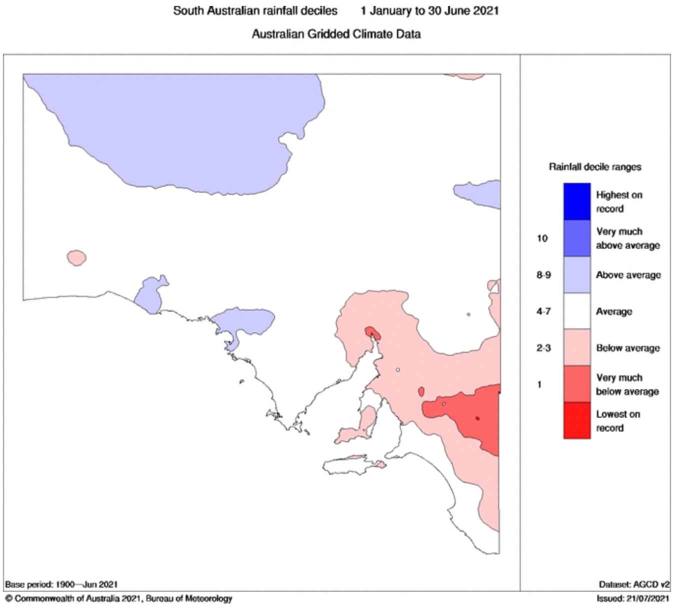


April–October 2020

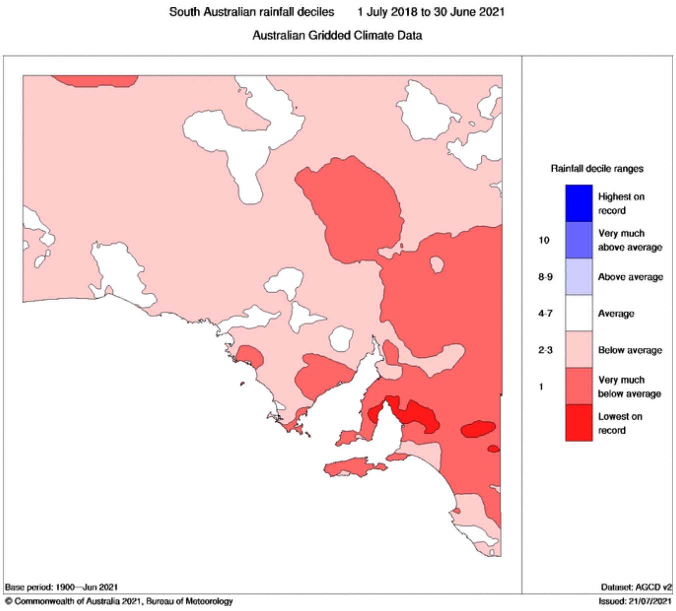


November 2020–March 2021

SA 6 month rainfall deciles January–June 2021



SA 3 Year Rainfall Deciles to June 2021



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