

Communicating Climate Change

Module 3

October 2008

An initiative of the National Agriculture and Climate Change Action Plan

Observed climate change: South Australia

South Australia's climate is changing. Farmers have long been aware of natural cycles in the climate, but now human-induced climate changes are becoming apparent. These changes will have significant impacts on the way South Australia is farmed.

Key facts

- South Australia's climate has changed substantially over the past 100 years.
- Since the 1950s, the state has experienced a pronounced warming trend.
- Rainfall trends are less obvious but we are seeing seasonal shifts.
- 1998–2007 was one of the driest decades on record across the state's agricultural regions.
- The combination of higher temperatures, seasonal shifts, and reduced rainfall is having a significant impact on streamflow.
- Higher temperatures have increased the frequency of severe fire weather.

Observed changes in rainfall

Rainfall in South Australia can vary significantly from year to year, and over decades. This variability means that different generations of farmers can have quite different perceptions of what 'normal rainfall' is for the state's agricultural regions.

Since 1997, these agricultural regions have experienced a marked decline in growing-season (April–September) rainfall (Figure 1). This decline is mostly due to a drying trend in autumn, and, to a lesser extent, in winter (Figure 2). Season breaks are occurring later, and bringing less rainfall.

The spring rainfall trend shows a weak increase since 1950, while the summer rainfall trend shows an increase in the northwest. Overall, the trend in annual rainfall since 1950 shows a decline across the agricultural regions.

A cooperative venture between



Australian Government
Department of Agriculture,
Fisheries and Forestry
Bureau of Meteorology



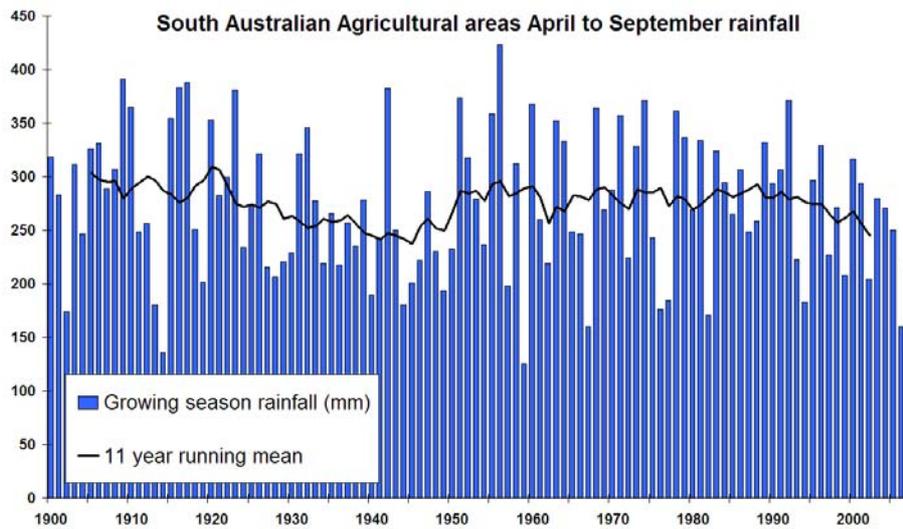


Figure 1: Growing-season (April to September) rainfall across South Australia's agricultural regions

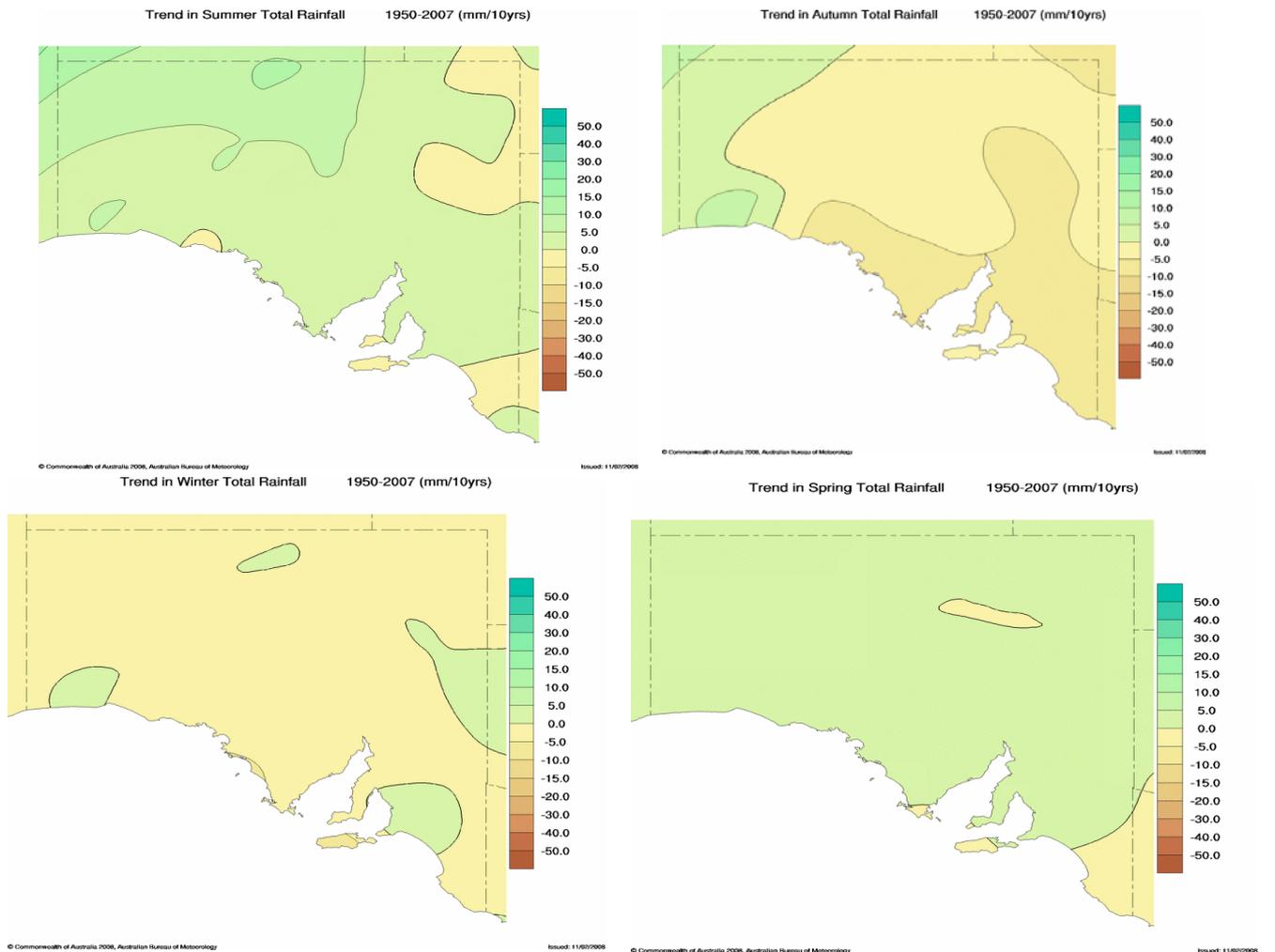


Figure 2: Trends in South Australia's rainfall (mm/decade), 1950–2007
summer (top left), autumn (top right), winter (bottom left) and spring (bottom right)

Since 1996, there have been few wet years across the agricultural areas of south-eastern Australia to balance the dry ones. Severe rainfall deficiencies in these areas since 1996, and across the Murray-Darling catchment since 2000, are in stark contrast with the much higher than normal rainfall experienced across much of northern and western Australia (Figure 3).

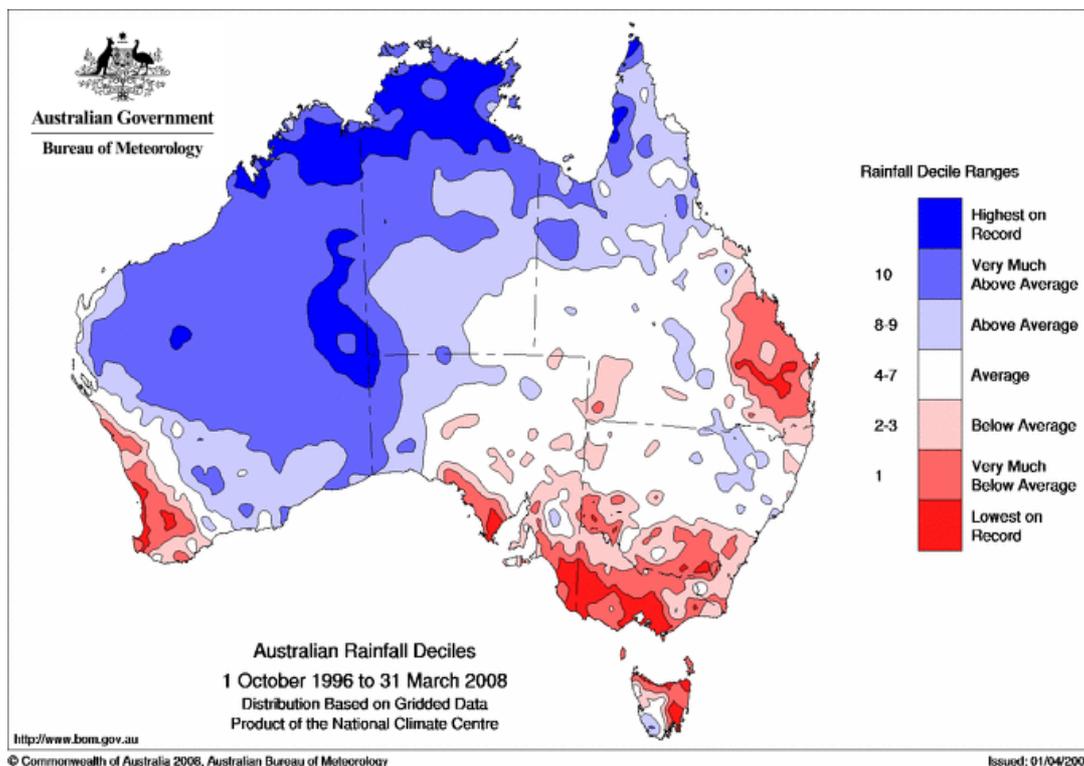


Figure 3: Rainfall for October 1996 to March 2008 compared with equivalent periods from the historical record

Observed changes in temperature

Temperature records for South Australia show strong warming since the 1950s (Figure 4). The total warming since 1910 is about 1.0°C, with 2007 being the warmest year on record. This warming is consistent with warming elsewhere in the globe.

Both maximum (day) and minimum (night) temperatures show warming, although with considerable year to year variability. The most recent decade (1998–2007) has seen particularly high maximum temperatures and a series of notable heatwaves across South Australia.

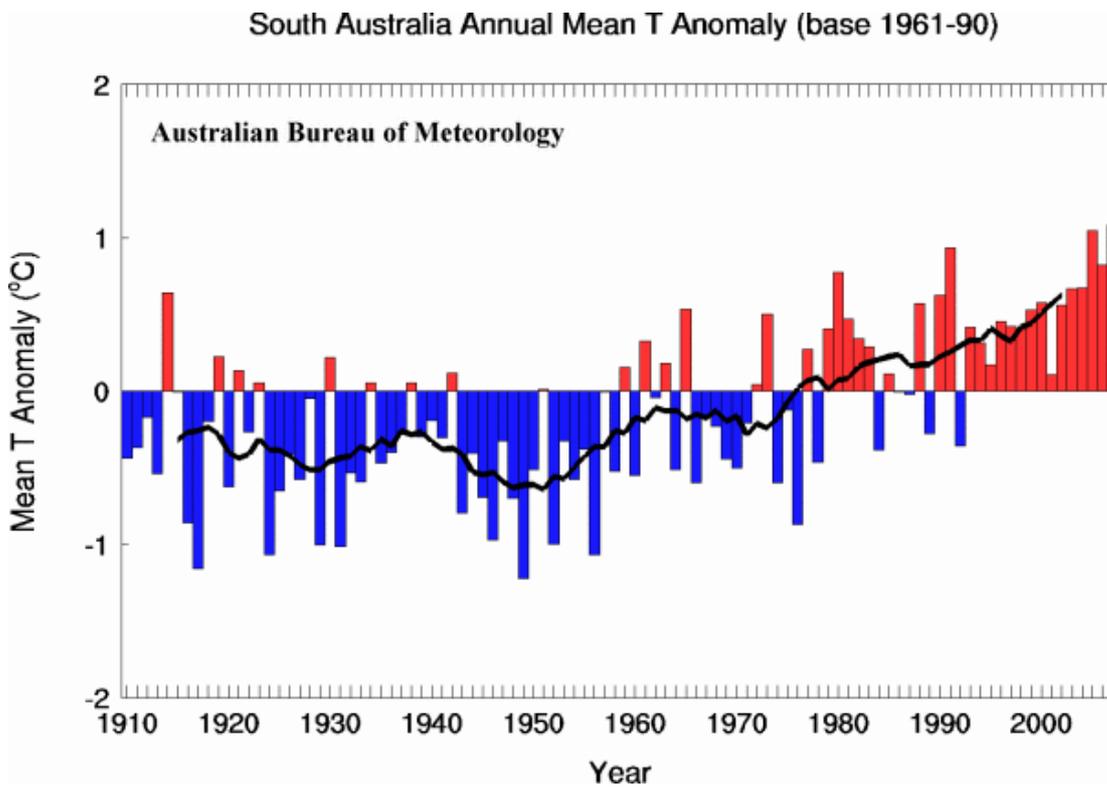


Figure 4: Annual mean temperature relative to the long-term average (°C), South Australia (red = above average temperature, blue = below average temperature)

Fire-ban days

The number of fire-ban days per year in South Australia has increased (Figure 5), partly due to higher temperatures. The fire-danger period is becoming longer, with 2007 being the first year a winter fire ban was issued in South Australia.

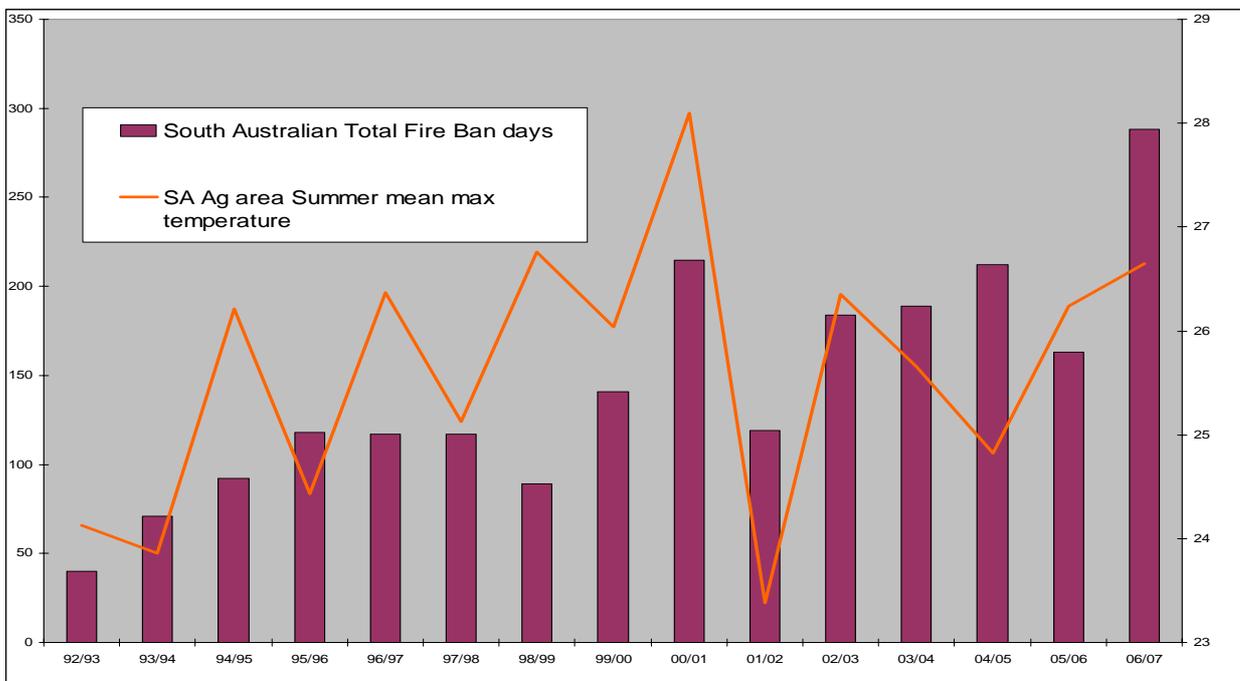


Figure 5: Number of total-fire-ban days and average summer maximum temperature 1992-2007, South Australia

Streamflow

The combination of small changes in one factor with small changes in another can have large impacts. For example, the combination of relatively small reductions in rainfall in the Murray-Darling catchment and higher temperatures has resulted in record-low streamflow in the Murray River (Figure 6). This effect on streamflow has significant implications for water supply in the future.

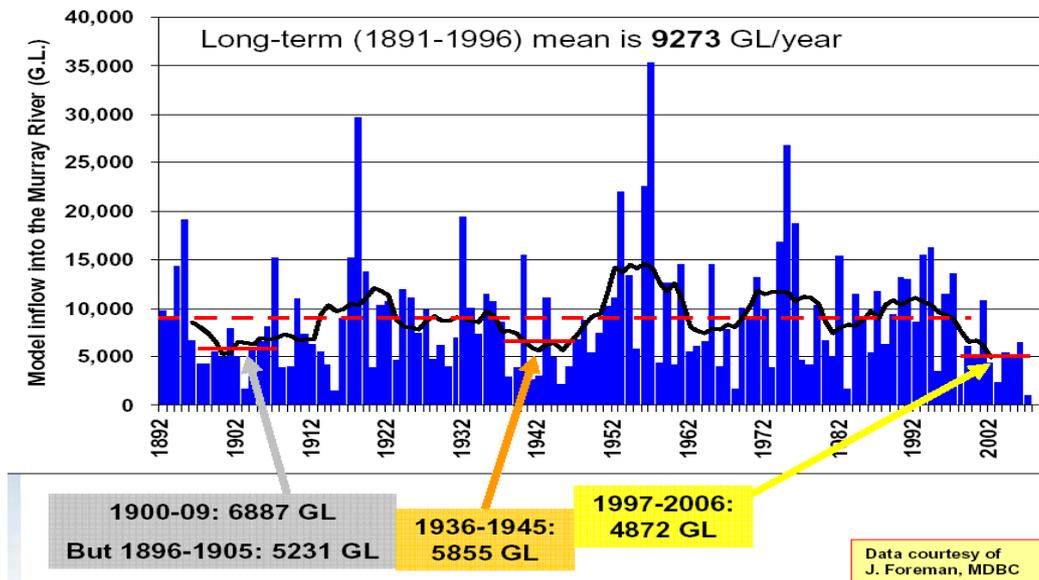


Figure 6: Murray River inflows, 1892–2006 (Source: Murray-Darling Basin Commission)

Observed changes in evaporation and cloud cover

Analyses of trends in pan evaporation and other climate variables show mixed results. Accompanying the reduction in rainfall, cloud cover during autumn and winter has decreased over the southern half of South Australia since the 1960s.

Observed changes in severe weather

The warming of the 20th century has been accompanied by fewer cold days and nights, and more hot days and nights. Exceptional heatwaves have occurred in recent summers and autumns. Trends in the frequency of extreme rainfall events are generally weak and mixed since 1950.

What is causing the changes we have observed?

Scientists are confident that warming over Australia in recent decades is linked to global increases in greenhouse gas concentrations caused by human activities

The reasons for the increase in summer rainfall in the northwest of the state are not certain, but may be a combination of increased monsoonal activity from a warmer continent, and the influence of aerosol pollution from south-east Asia.

Climate scientists have observed a stronger high pressure ridge in recent decades, attributed partly to increased greenhouse gas levels, as well as ozone depletion in the stratosphere. This stronger high pressure ridge has resulted in low pressure systems tracking further south in autumn and winter, reducing rainfall through the growing season.

It is premature to definitively link the recent extended dry across South Australia's agricultural regions to climate change. Nevertheless, this dry period is unusual in the context of past rainfall variability and has clearly been exacerbated by higher temperatures.



Further information

- Bureau of Meteorology's climate change tracker: <http://www.bom.gov.au/climate/change>
- the *Climate Change in Australia* report: <http://www.climatechangeinaustralia.com.au>
- the Intergovernmental Panel on Climate Change: <http://www.ipcc.ch>