CLIMATE COUNCIL

FACTSHEET

CLIMATE CHANGE AND DROUGHT

JUNE 2018

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KEY FINDINGS

- Climate change is likely making drought conditions in southwest and southeast Australia worse.
- Climate change has contributed to a southward shift in weather systems that typically bring cool season rainfall to southern Australia. Since the 1970s late autumn and early winter rainfall has decreased by 15 percent in southeast Australia, and Western Australia's southwest region has experienced a 15 percent decline in cool season rainfall.
- Climate change is also driving an increase in the intensity and frequency of hot days and heatwaves in Australia, exacerbating drought conditions.
- Queensland and New South Wales are currently in the grip of severe drought, with drought declared for 16.4 percent of New South Wales and 57.6 percent of Queensland.
- Current drought conditions come after a 2016/2017 summer characterised by record-breaking temperatures, followed by a record dry winter. Rainfall over southern Australia during autumn 2018 was the second lowest on record.
- Time spent in drought is projected to increase in the future across southern Australia. Future drying trends in Australia will be most pronounced over southwest Western Australia, with total reductions in autumn and winter precipitation potentially as high as 50 percent by the late 21st century.

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FACTSHEET

Climate Change and Drought

June 2018

BACKGROUND

Australia's rural and regional communities are vulnerable to a wide range of impacts from our changing climate. Drought is one of the major events that can deeply affect communities, agriculture, our national economy, human health and natural ecosystems.

Current rainfall deficiencies in New South Wales and Queensland have recently received widespread media and political attention. This factsheet explains what drought is, the influence of climate change on drought in Australia, its impacts, and how, if climate change continues unabated, droughts are likely to worsen in severity and duration in southern Australia.

For more detailed information about climate change and drought, please refer to the Climate Council's report:

"Thirsty Country: Climate change and drought in Australia".

Over the past 30 years, there has been a discernible decrease in rainfall across southern Australia.

What is drought?

Drought is defined as "a prolonged, abnormally dry period when the amount of available water is insufficient to meet our normal use" (BOM 2018a). Droughts can be measured in many ways, but meteorologists monitor the extent and severity of drought in terms of rainfall deficiencies. A rainfall deficit occurs when an area's total rainfall over a period is less than the average for that period (BOM 2018a).

What is the influence of climate change on drought?

Warming of the climate has contributed towards a southward shift in weather fronts from the Southern Ocean, which typically bring rain to southern Australia during winter and spring. As these weather fronts have shifted southwards, rainfall in southern Australia has declined, increasing the risk of drought conditions. The region has also experienced significant warming during the last 50 years (Timbal et al. 2010). Climate change is driving an increase in the intensity and frequency of hot days and heatwaves in Australia, in turn increasing the severity of droughts. In summary, climate change is likely making drought conditions in southwest and southeast Australia worse. This is consistent with observations of decreases in cool season rainfall in southern Australia over the past 30 years, and consistent with future projections. At the same time, climate change is likely making northwestern Australia wetter (CSIRO and BoM 2014; 2015).

Observed trends on drought in Australia

Australia has experienced several major droughts during the 20th and early 21st centuries. The most severe droughts were the Federation Drought (1895–1903), the World War II drought (1939–1945) and the Millennium Drought (1996–2010). A recent study has found that these major droughts are without precedent in at least the past 400 years (Freund et al. 2017). Over the past 30 years, rainfall in the cool season (April to November) in the southwest of Western Australia and in southeastern Australia has shown a discernible decrease compared to natural variability. Southeastern Australia has experienced a 15 percent decline in late autumn and early winter rainfall and a 25 percent decline in average rainfall in April and May since the 1970s (Climate Council 2015; CSIRO and BoM 2014). The southwest of Western Australia has also experienced a decline in cool season rainfall of around 15 percent since the 1970s. These declines have contributed to large reductions in stream flows of up to 60 percent in both the southwest of Western Australia and the Murray-Darling Basin (CSIRO 2010; Potter et al. 2010). Average annual stream flow into Perth's dams has decreased by nearly 80 percent since the mid-1970s (Climate Commission 2013).

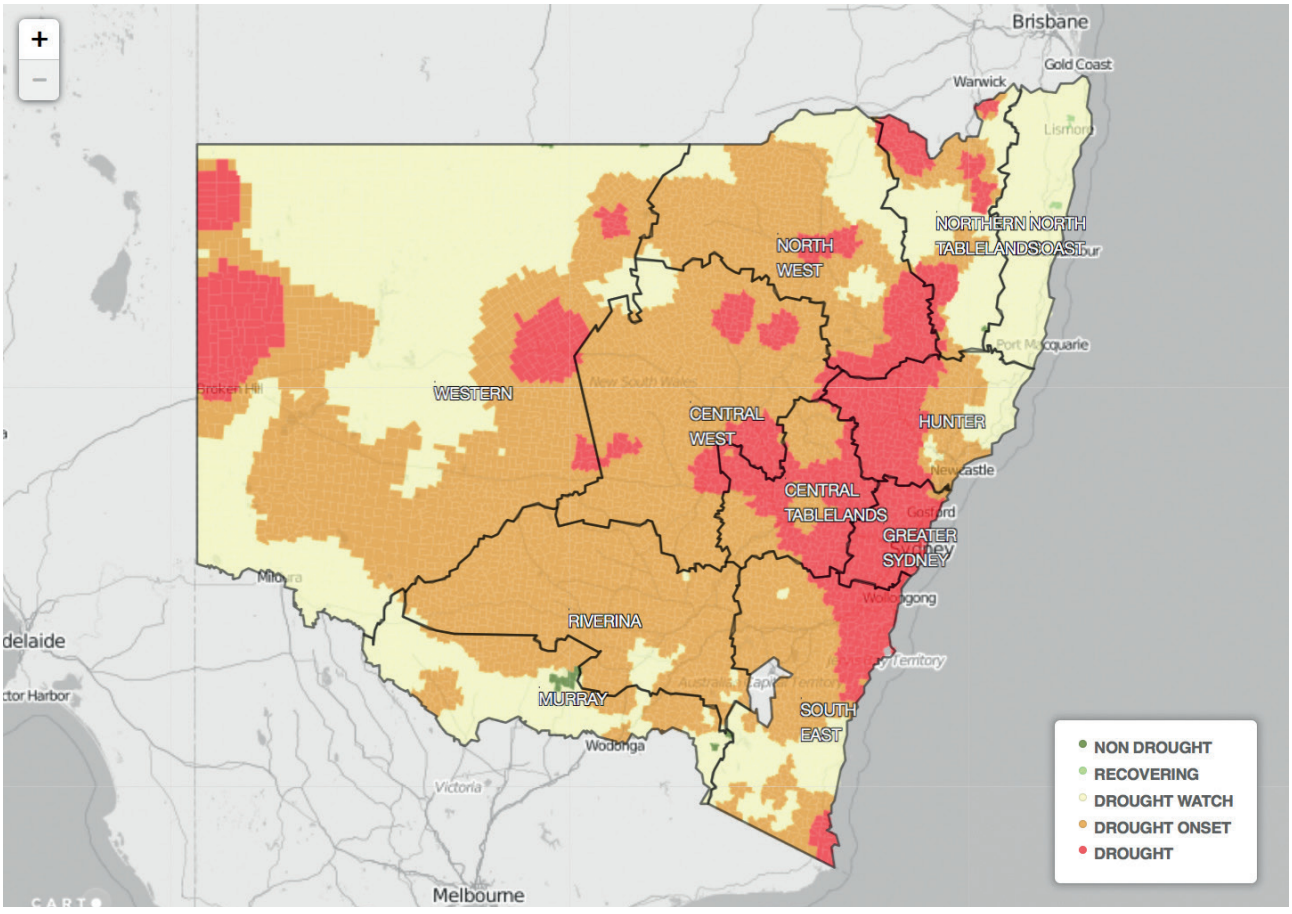
AUSTRALIA'S CURRENT DROUGHT SITUATION

The Australian summer of 2016/17 was characterised by record-breaking heat particularly in the east of the continent, driving intense heatwaves, hot days and bushfires in central and eastern Australia. This was followed by a record dry winter, exacerbating already existing drought conditions.

In the autumn just past, rainfall across southern Australia was the second lowest on record (based on all data since 1900) (BoM 2018b). In New South Wales, by 7th June 2018, 16.4 percent of the state was declared drought affected, 46.6 percent declared in drought onset and 36.3 percent in drought watch (Figure 1) (DPI 2018). This leaves only 0.7 percent of the state that is either recovering from drought or not affected.

The latest drought conditions update for New South Wales can be found here: edis.dpi.nsw.gov.au

Figure 1: Areas of NSW in drought, drought onset, drought watch, recovering or non-drought (DPI 2018).



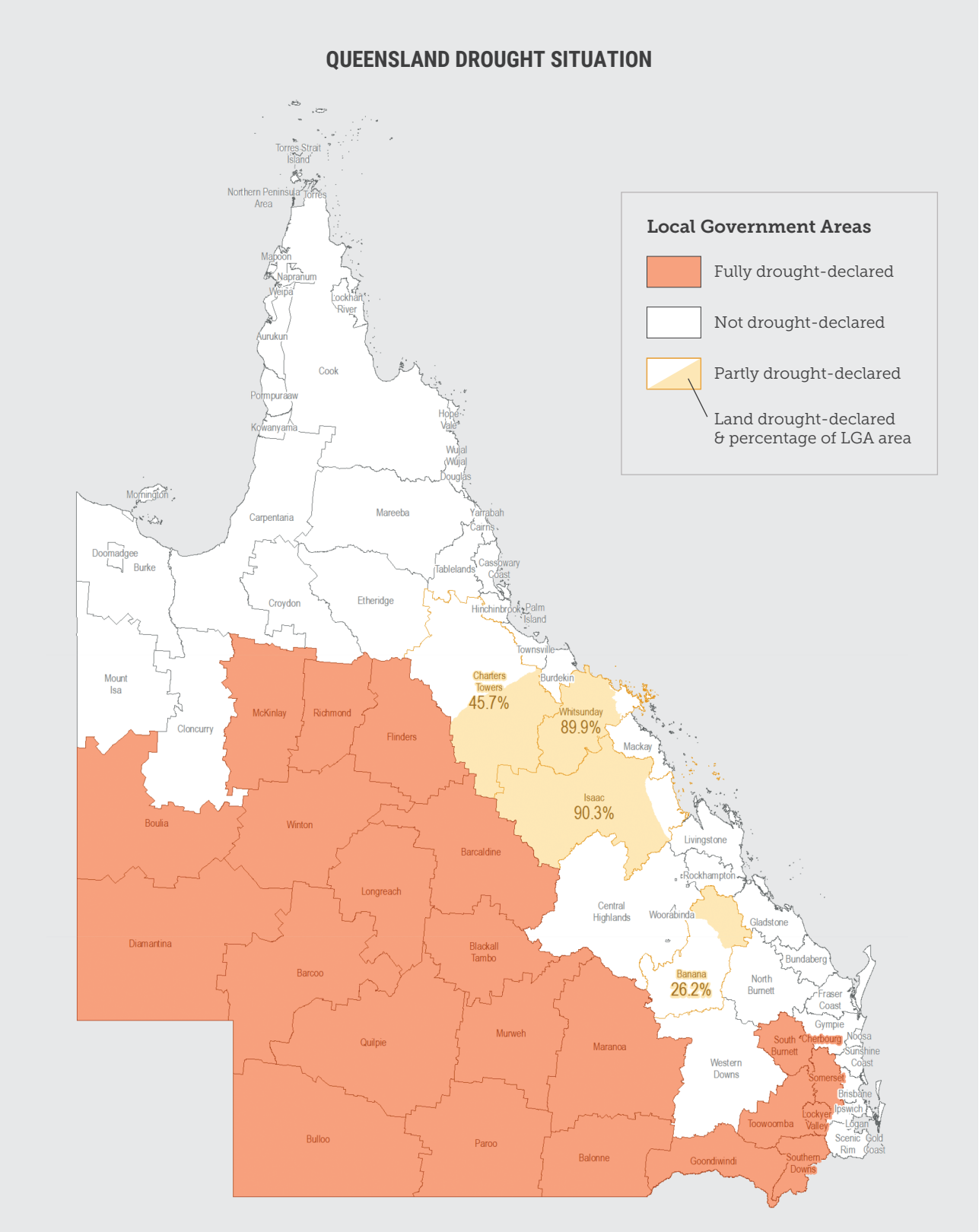
Drought declarations are made by state and federal governments, taking into account a variety of factors including but not limited to rainfall deficiencies.

In Queensland, more than 87 percent of the State was declared in drought in March 2017. Currently 57.6 percent of Queensland is in declared drought conditions (as at 17th May) (Queensland Government 2018).

The latest drought update for Queensland can be found here:
www.longpaddock.qld.gov.au/drought/drought-declarations/

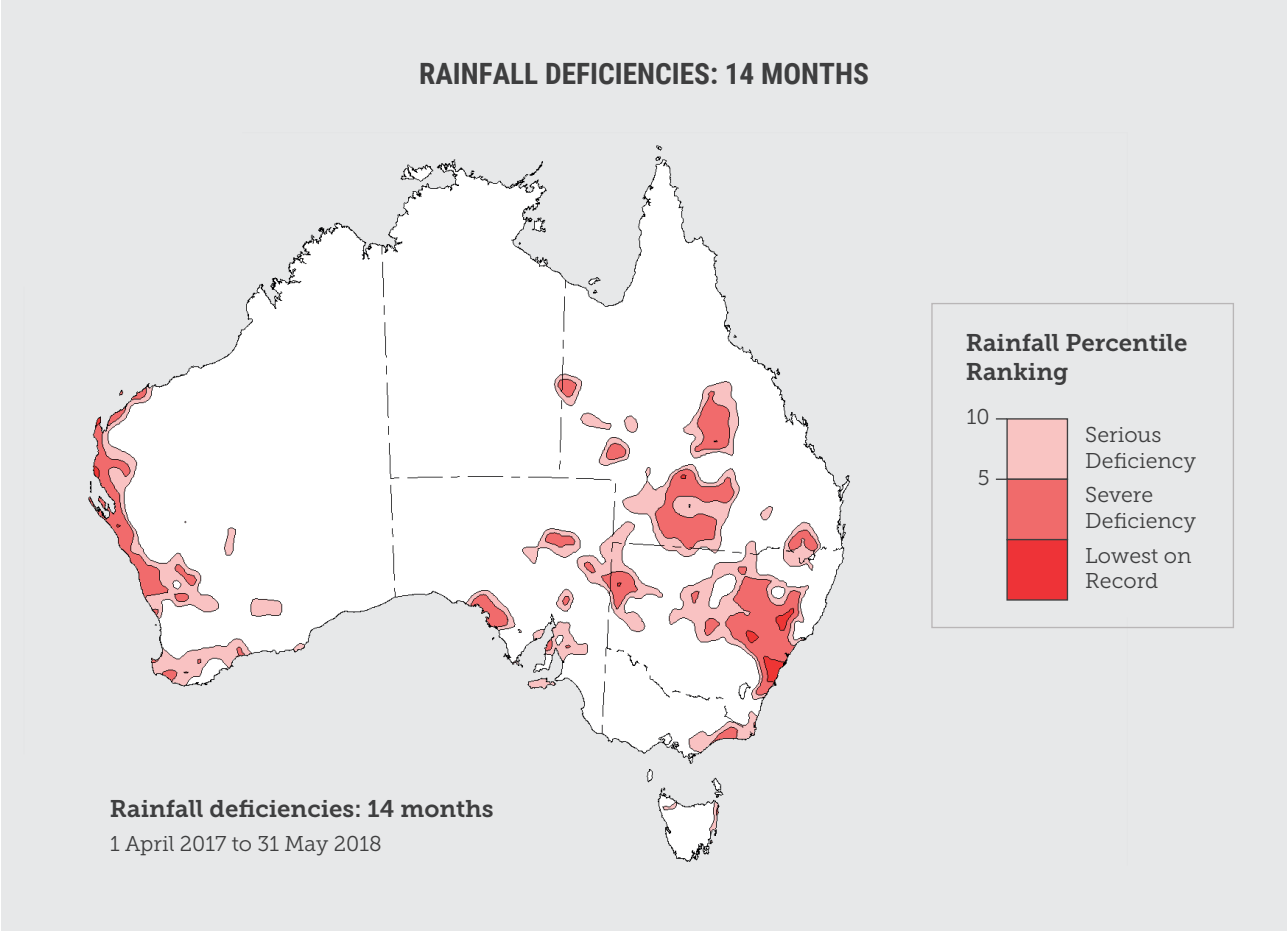
Queensland and New South Wales are currently in the grip of severe drought, with drought declared for 16.4 percent of New South Wales and 57.6 percent of Queensland.

Figure 2: Areas of Queensland fully or partly drought-declared, and areas not in drought. Orange areas are drought-declared, yellow areas are partly drought-declared and white areas are not drought-declared (Queensland Government 2018).



The latest drought statement by the Bureau of Meteorology (issued in June 2018) shows that rainfall across Australia in May 2018 was the third-lowest on record (based on all data available since 1900). A large number of sites in New South Wales received record low May rainfall or their lowest May rainfall for at least 20 years (BoM 2018a). The map below (Figure 3) shows serious and severe rainfall deficiencies over the past 14 months across Australia (where rainfall was either within the lowest 10 percent or 5 percent of historical observations respectively), including areas where rainfall has been the lowest on record.

Figure 3: Rainfall deficiencies across Australia between 1 April 2017 and 31 May 2018. Light pink shows areas that have received rainfall within the lowest 10 percent of observations, medium pink shows areas that have received rainfall within the lowest 5 percent of historical observations and red shows areas that have received the lowest rainfall on record (BOM 2018a).



HOW DO DROUGHTS AFFECT AUSTRALIANS?

The Millennium Drought from 1996-2010 serves as a recent reminder of the wide-reaching impacts that drought can have on our health, the economy, ecosystems, agriculture and urban water supplies.

Health: Droughts can have wide ranging effects on health, including impacts on nutrition, infectious diseases, on forest fires causing air pollution, and on mental health, such as post-traumatic stress and suicidal behaviour (Haines et al 2006; Climate Commission 2011). Droughts can also contribute to increases in mortality rates. Declines in physical health are also particularly prevalent amongst the elderly in drought-affected rural communities in Australia (Horton et al. 2010). Drought can also exacerbate mental health issues and is associated with increased suicide rates, especially amongst male farmers (Alston 2012). For example, a study in New South Wales found that the relative risk of suicide can increase by up to 15 percent for rural males aged 30–49 as the severity of drought increases (Hanigan et al. 2012).

Urban water supplies: Water scarcity in major cities, particularly Melbourne, Sydney and Perth, has been exacerbated by drought and remains an ongoing challenge. As of 2013, 89 percent of Australia's population lived in urban areas (World Bank 2013), placing high demand on urban water supplies as populations continue to grow. Pressure on urban water supplies is projected to intensify as droughts increase in frequency and severity in the southwest and southeast (Collett and Henry 2011).

Droughts have wide-ranging impacts on our health, agricultural production, ecosystems, economy and urban water supplies.

Ecosystems: The Millennium Drought was associated with a marked decline in water bird, fish and aquatic plant populations in the Murray-Darling Basin (LeBlanc et al. 2012). Many terrestrial ecosystems are also affected by drought, with iconic species such as the river red gum dying over extensive areas in the Murray-Darling Basin during the Millennium Drought (Bond et al. 2008; Murray-Darling Basin Commission, 2003; Victorian Environment Assessment Council, 2006). Drought also poses risks to planted forests. During the Millennium Drought, for example, 57,000 ha of planted forest in Australia were lost (van Dijk et al. 2013). This is equivalent to the area of 28,500 cricket pitches.

Economy: Drought has direct, substantial impacts on the Australian economy. Drought reduces livestock numbers, destroys crops, and results in soil erosion and loss. Local loss of production has flow-on effects to regional employment, local processing and other dependent industries, and to both domestic food prices and export earnings (ABS 2004; Quiggan 2007). The Millennium Drought caused the contribution of agricultural production to Gross Domestic Product (GDP) to fall from 2.9 to 2.4 percent between 2002 to 2009 (van Dijk et al. 2013). It is estimated that between 2006 and 2009 the drought reduced national GDP by roughly 0.75 percent. Between 2007-2008, regional GDP in the southern Murray-Darling Basin fell 5.7 percent below forecast and was accompanied by the temporary loss of 6000 jobs (IPCC 2014).

Figure 4: Cows in a drought-stricken paddock in Wagga Wagga in September 2006.

HOW WILL CLIMATE CHANGE AFFECT DROUGHTS IN THE FUTURE?

Across southern Australia, climate change is projected to result in further declines in cool season (winter and spring) rainfall, mainly driven by the southward movement of winter storm systems.

There are no reliable predictions yet as to the direction of change in rainfall in summer and autumn (CSIRO and BoM 2015). By 2030, winter and spring rainfall is projected to decrease by up to about 15 percent. Late in the century, rainfall is projected to decline by between 20-30 percent, depending on the greenhouse pollution scenario, with some important regional exceptions. Future drying trends in Australia are projected to be most pronounced over southwest Western Australia, with total reductions in autumn and winter precipitation potentially as high as 50 percent by the late 21st century (Delworth and Zeng 2014; CSIRO and BoM 2015). The combined effect of increasing temperatures and declining rainfall across southern Australia mean that there is high confidence that time spent in drought will increase over the course of the century in southern Australia in the future if greenhouse gas emissions are not cut deeply and rapidly (CSIRO and BoM 2015).

Climate change projections show that cool season rainfall in southern Australia will continue to decline and that temperatures will continue to rise, causing the time spent in drought to increase in the future.

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IMAGE CREDITS

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Figure 4: Page 8 - "Australian drought Wagga NSW December 2006 Schilling" by Flickr user John Schilling licensed under CC BY-NC-ND 2.0.

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