Droughts - Teacher Notes

Drought is a prolonged (longer than usual) period of unusually low rainfall in an area. Rainfall is usually measured in centimetres of rain per year. The World Health Organisation estimates that each person needs at least 20 litres of water per person per day to survive – that means just water for drinking and cooking. People need 40 litres of water per person per day if they want to bathe and wash clothes, and 70 litres of water per person per day if they want to clean their home, grow food, and use water for waste and sanitation.

Task 1: Calculating water use in Australia

According to the Australian Bureau of Statistics, Australian's water use in 2009-2010 was approximately 13,454 giga litres of water. The table below shows how much water each group of users consumed:

Users	Water Usage (gigalitres)
Agriculture	6,987
Sewage/water treatment	1,887
Households	1,868
Manufacturing	674
Mining	539
Utilities (electricity, gas, etc.)	297
Everything else	1,213
Total	**13,454**

How many litres are in a gigalitre?
One billion or 1,000,000,000

In 2010, there were about 22 million people living in Australia. How many litres of water per person were used in Australian households in 2010? Show your calculations below.

$$\frac{1868\ giga\ litres}{22\ million\ people} = 84{,}909 \text{ litres per person per year}$$

Your answer above is in litres per person per year. To make it easier to compare the number with the World Health Organisations water needs estimates, let's convert the number into litres per person per day. How many litres of water per person per day did Australian households use in 2010?

$$\frac{84909\ litres\ per\ person}{365\ days} = 232.6 \text{ litres per person per day}$$

Is your answer to the above number more or less than what the World Health Organization estimates people need to survive?
Quite a lot more!

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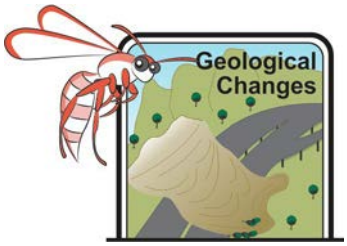

Note: you can find more information on water use in Australia in the Australian Bureau of Statistics Year Book at http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1301.0~2012~Main%20Features~Water~279

Task 2: The effects of drought on soils and compaction

When soil is dry and has few plants growing on top, the soil compacts or gets denser. In places experiencing drought, the soil gets denser over time. But what happens when it finally rains on top of dry, dense soil?

Materials

- Two prepared trays of the same size, with potting mix/soil spread unevenly to create a slope from one end of the tray to the other:
    - In one tray, spread moist potting mix loosely so it is light and uncompacted.
    - In the second tray, spread dry potting mix only.
- A glass of water

Method

1. In the tray with *dry* potting mix, ask students to help compact the soil. The dry potting mix should be pressed down firmly.
2. Observe the difference in soil compaction between the dry and damp trays.
3. Pour water slowly onto the higher end of each tray so that the water flows "downhill".
4. Observe what happens to the water in each tray.

Observations

What happened to the water on the moist, loose soil?
The water soaked into the soil.

What happened to the water on the dry, dense soil?
The water ran off the soil without soaking in.

Flash floods are local, very sudden floods that happen because of heavy rain. Flash floods can occur even where it is not actively raining, due to heavy rain upstream. Would a flash flood be more likely to happen in moist, loose soil, or dry, dense soil?
Flash floods are more likely on dry, dense soil.

Note: Consider watching this dramatic footage of a flash flood in New South Wales: http://www.abc.net.au/news/2016-01-27/hunter-valley-flash-flood-video-goes-viral/7116254

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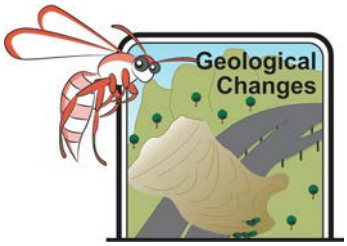

Task 3: Thinking about the impacts of drought

Drought can impact (or change) the environment and how people use water. Think about each item in the table below, and describe how drought might or might not impact that item. Don't forget to explain why you think the drought will have an impact.

Item	Impact of drought?	Explain your reasoning
Food crops	fewer crops	the plants die without enough rain
Stock animals	some animals die or get skinny	ranch animals suffer, but animals in stockyards are probably watered well
Farmers and their families	get poorer	fewer crops or stock means less income
Flower gardens	suffer	if drought is severe, it's more important to water people than flowers
Soil quality	suffers	as plants die in drought, soil becomes compacted and loses organic matter
Erosion	increases	as plants die in drought, soil gets blown away more easily

Extension: Rainfall in Australia over the past 100 years

Visit the ABC interactive map of 100 years of drought in Australia at:
http://www.abc.net.au/news/2014-02-26/100-years-of-drought/5282030

Note: If you would like to explore more up to date rainfall maps, visit the Bureau of Meteorology publications: http://www.bom.gov.au/climate/averages/maps.shtml

Does drought hit everywhere in Australia at the same time?
Rarely, some places in Australia get above average rain even if the rest of Australia is dry and vice versa; in other words, the map is always a mix of less rainfall (orange) and more rainfall (blue). See map in 1994, 1974, and 1947 for unusually wet and dry years.

Can you have periods of drought and flooding at the same time?
Yes, note the overlapping blue and orange bars on the timeline below the map.