Jane Goodall Institute

Learning Resource

California in Crisis

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Between 2000 and 2022, all but 3 years have seen significantly below average rainfall in California[1] leading to historically low water levels in reservoirs and aquifers. This resource looks at the problems that drought brings, and the compounding effects of water extraction for use in agriculture and bottled water.

In this activity you and your students will:

- Learn what a drought is
- Explore some of the problems drought causes
- Look at how human activity can make drought worse
- Take action to reduce your water use and convince others to follow suit

What is a drought?

National Geographic defines a drought as a 'period of time when an area or region experiences below-normal precipitation' [2]. This means less rain or snow is falling in an area, and if that continues for some time then the effects can be catastrophic for people, animals and the environment.

Bridge with no water João Cautela, CC0, via Wikimedia Commons

Where does rain go?

When rain falls or snow melts in a region, it has to go somewhere, but where? There are two main things that happen:

1. **The water will run off**. This can either be in the form of **surface runoff** or **channel runoff**. A simplified way to think about these two is that channel runoff is a controlled flow of water in rivers and streams whereas surface runoff is what we see when there is a large rainfall and water can be seen flowing across places it isn't normally seen, such as fields, roads, etc.
2. **The water will infiltrate the ground**. Infiltrate in this sense is the scientific term for what happens when water soaks into the ground, just like when you water the plants in a garden or in a pot. This water may then flow underwater until it reaches a river, it may be taken up by plant roots, or it may stay stored underground in an aquifer[3].

1 bit.ly/3Mm9Gnj
2 bit.ly/3nKZzhz
3 An aquifer is an underground layer of water-bearing rock – learn more on Wikipedia here: bit.ly/3Ud90Cu

What happens in a drought?

As a drought means less rain and snow falling, the primary effects are very simple: there is less runoff and less water will infiltrate the ground. It's the effects that that causes that are problematic.

Exercise

Split your group into two – one sub-group will consider the potential problems of reduced runoff and the other potential problems of less infiltration. Encourage them to think through a number of steps – for example, if reduced runoff causes one problem, what further problems can that lead to? Give them some time to come up with a list of key points then have them report back to the others.

Some of the problems are:

- Less runoff means less water in streams and rivers. In extreme cases they may dry up completely, just like in the picture above. This has consequences for animals and plants that live in or near the river, and for humans who may rely on that river for drinking water or irrigation.

The Klamath River Basin

The Klamath River flows 257 miles (414km) through Oregon and northern California. The water flows into the river from a basin 12,000 square miles (31,000km^2) in size and has been suffering from drought for many years. This excellent article on Inside Climate News goes into detail on the problems this is causing for people, animals and the environment: bit.ly/3MoeEjC

- Less infiltration has two big, immediate consequences. Near-surface soil can dry out completely causing plants to die with knock-on effects for animals and people that rely on those plants. Dry vegetation makes wildfires much more likely and very dry surface soil is also difficult to penetrate, meaning that when rain does fall, much of it may run off (perhaps causing flooding) rather than infiltrate, making recovery difficult. The second effect is that the amount of water in aquifers decreases. Many people rely on these aquifers for drinking water and irrigation.

Drought in California

Unlike other places, scientists think that recurrent drought is a natural part of California's climate. However, the frequency and severity of these droughts has been increasing in recent years (partly due to global heating), and human behaviour is exacerbating their effects.

There were three years of drought conditions from 2007-2009, contributing to some of the worst wildfires in Southern California's history in 2007 which burnt over 1.5 million acres of land. December 2011 - March 2017 was the longest drought in California's history and 2020-2022 was another drought period leading to the lowest water levels recorded in Lake Mead since it was filled in after the building of the Hoover Dam (see this interactive graphic on NASA's Earth Observatory website: bit.ly/3Mu4DkC).

Water extraction

California's drought problems are greatly increased by two particular practices: agriculture and bottled water.

Almond (Prunus dulcis) fruit with seeds – in shell, shell cracked open, shelled and blanched seed
Ivar Leidus, CC BY-SA 4.0 <https://creativecommons.org/licenses/by-sa/4.0>, via Wikimedia Commons

A significant portion of all fruits, vegetables, and nuts for the United States are grown in California, using about 40% of all the water consumed in the state each year. They also produce 80% of all the almonds produced across the world – almond production alone uses more water than the entire city of Los Angeles every year (a city of almost 4 million people).

Bottled water
Adapted from an original by Thad Zajdowicz, CC0, via Wikimedia Commons.

A number of companies extract water from California for bottling and selling in single use plastic bottles across the US and the world. The amount they take is small compared to agriculture but it is still significant enough to put pressure on an already overburdened water supply in areas such as San Bernadino (e.g. bit.ly/40Rlouz).

Take action

You can take some simple actions to reduce the impact of drought, wherever you are.

1. **Switch up your eating habits.** Producing meat uses an awful lot of water, over 10 times as much per ton of food than vegetables, so if you are a carnivore just reducing the amount of meat you eat can save a lot of water. Switching from cow's milk to plant milk helps too, but some are better than others – consider switching out that almond milk for hazelnut milk.
   - **Spread the word:** Lobby to get your school or college involved in the Meatless Monday campaign bit.ly/40Ym4OE

2. **Recycle and upcycle your clothes.** Growing cotton for clothes, processing it into thread, dying it and transporting the final product to your local shop all uses a lot of water. Can you go a little longer with that old T-Shirt? Or why not upcycle it into something new and exciting?
   - **Spread the word:** Run a clothes swap at your school where everyone brings along an item they no longer wear that others might want. Or get your local community excited about upcycling by running a Trashion Show (bit.ly/3wQfNYL)!

3. **Do a water audit.** 10% of water is used by households. It may not sound much in percentage terms, but that 10% amounts to a worldwide average of 506,000 litres per person per year. Why not do a water audit (bit.ly/3kIx2EF) and see where you can save water at home?
   - **Spread the word:** Make a poster with the results of your water audits to display at school. Can you convince others to also make a water saving pledge?

4. **Cut out PET bottled water.** If you live in an area where your tap water is safe to drink then get yourself a reusable water bottle and carry it with you to avoid buying water in PET bottles. Even if the bottled water does not come from a drought area such as California, making the packaging it comes in and transporting it uses far more water than filling up a reusable bottle, plus you will be helping to cut down on plastic waste.
   - **Spread the word:** If your Roots & Shoots group has the funds, why not buy some plain reusable water bottles, decorate them and sell them at your school?

Want to help improve this activity?

This activity is a living document! Help us by editing this activity to make it as good as possible, just use this short link (just type it into your web browser's address bar): bit.ly/3nSupVY – full instructions are provided. Any edits that can make this resource easier to use in the classroom are very welcome, so please follow the link and make your contribution!

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JGI & DP World

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The Jane Goodall Institute has partnered with DP World to support the growth of the Roots & Shoots programme. DP World are a leading provider of worldwide smart end-to-end supply chain logistics with a presence in 55 countries, enabling the flow of trade across the globe. This exciting partnership supports the creation of resources on the wider marine ecosystem as well as supporting the expansion of Roots & Shoots groups around the world. **Find out more: bit.ly/jgi-dpw**

Tell us how you got on

When your project is finished we'd love to see what you did! If you already have an account you can upload a story with images to the Jane Goodall's Roots & Shoots UAE website (find us at **www.rootsnshoots.ae**) to show off pictures and videos of your ships to a wider audience. If your school or youth group does not already have an account then just fill in the form on the website and we can set you up.

UAE Year of Sustainability

2023 is the Year of Sustainability in the UAE where we ask the question how can we be sustainable as a **community**, with our **nature**, and our **resources**? Through knowledge-sharing and storytelling, together we can spread essential information about sustainability and its importance, so share your work as wide as you can and tag/mention the campaign on Instagram, Facebook, Twitter, YouTube and TikTok with the account @UAEYearOf and the hashtags #UAE52 and #TodayForTomorrow. Learn more at **UAEYearOf.ae**.

Keep up to date with Jane Goodall's Roots & Shoots UAE

As well as the website you can also find us on Facebook at **facebook.com/RootsnShoots.ae** or on Twitter as **@JaneGoodallUAE**

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