

PARAMOUNT
EDUCATION

PRESENTS

THIRST FOR POWER

BASED ON THE BOOK BY MICHAEL E. WEBBER

EVENT POWERED BY:



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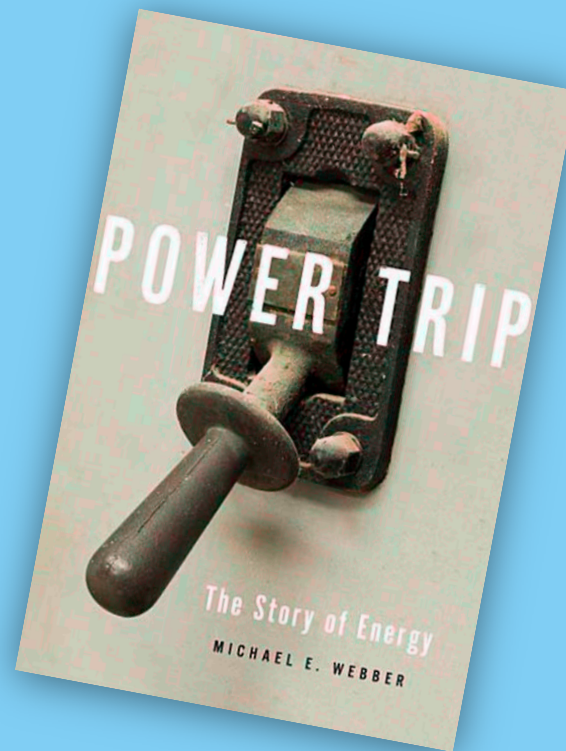
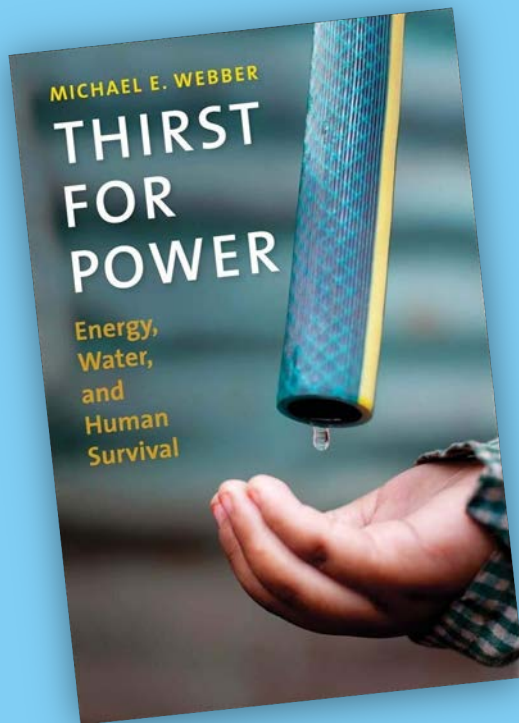


Who is Dr. Michael E. Webber?



Dr. Michael E. Webber is an internationally recognized professor, author, and energy expert. He trains the next generation of energy leaders at the University of Texas at Austin, where he is the Josey Centennial Professor in Energy Resources and a professor of Mechanical Engineering. He also serves as the Chief Science and Technology Officer at ENGIE, a global energy & infrastructure services company in France. In addition to *Thirst for Power: Energy, Water, and Human Survival*, he is the author of *Power Trip: The Story of Energy* which was published in 2019 and was developed as a 6-part series for PBS and is available for streaming on Amazon Prime Video, Apple TV, and Comcast platforms.

Dr. Michael E. Webber's Books:



Behind the Documentary: Director Mat Hames



Mat Hames is an Emmy-winning director, writer and producer. In addition to the documentary, *Thirst for Power*, and the series *Power Trip*, both adapted from Dr. Webber's books, Mat is known for his two PBS Independent Lens documentaries: *What Was Ours* (Amazon Prime Video, 2017) and *When I Rise* (2010). His films have screened at SXSW, HotDocs, and SundanceTV. He founded Alpheus Media in 2009 with his wife, Beth, who was executive producer on *Thirst for Power*.

Behind the Documentary: Producer Juan Garcia



Juan Garcia is an independent film and TV producer, and worked as executive producer on both *Thirst for Power* and *Power Trip*. For over 15 years, Juan Garcia has produced innovative educational content for companies like Apple, Disney, and Adobe. In 2014, he produced the Energy 101 Massive Open Online Course for The University of Texas, earning praise and recognition from *Forbes* and *The New York Times*. In 2015, Garcia co-founded Disco Learning Media, a company that specializes in digital experiences that help people learn.

About Dr. Kelly Sanders



Dr. Kelly T. Sanders is an Associate Professor in the University of Southern California's Sonny Astani Department of Civil and Environmental Engineering. She teaches classes related to energy and the environment. Her research aims to ease tensions between human and natural systems, with particular emphasis on reducing the environmental impacts of providing energy and water services. She has authored more than two dozen publications and has given dozens of invited talks on topics at the intersection of engineering, science, and policy.

About Erin Hardick



As the Senior Researcher and Content Strategist at Zpryme, Erin is responsible for creating content on energy, water, and technology topics such as utility digital transformation, distributed energy resources and intelligence, grid edge technology, smart cities, and mobility. She interviews stakeholders in these areas to understand the ecosystem as a whole. Erin is also the co-host of the Zpryme *On the Grid* podcast, curator of the Guest Contributor series newsletter, and host of the Weekly Mobility Update show. She is dedicated to finding sustainable clean infrastructure solutions for all communities.

Vocabulary Crossword

DOWN

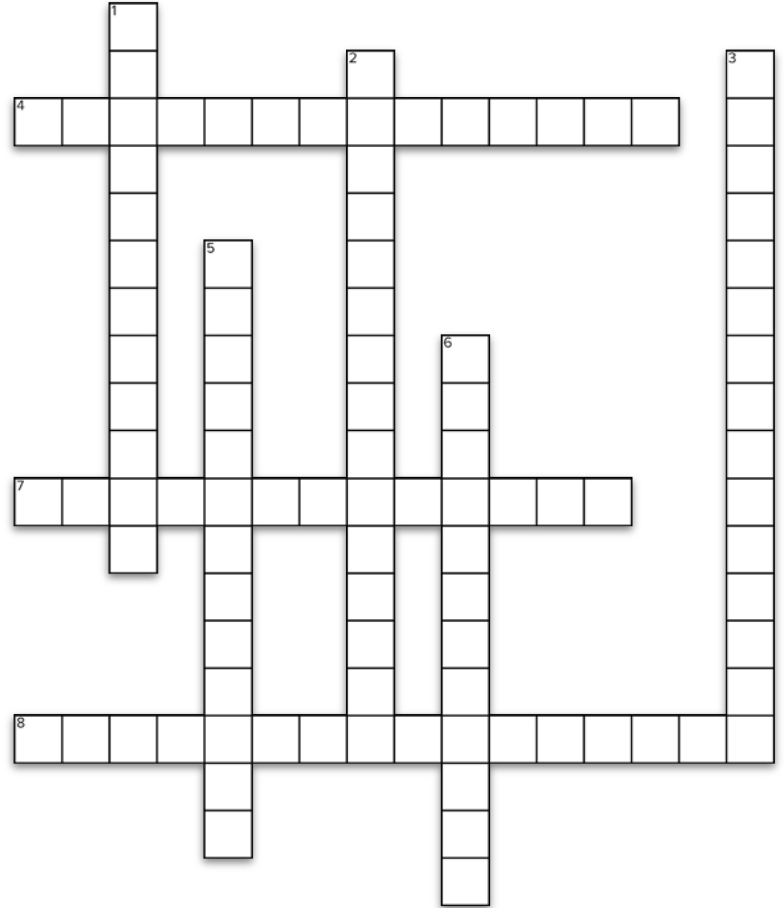
1. The process of using electricity to split water into hydrogen and oxygen.
2. Another name for the water cycling from the ocean to the atmosphere to the land.
3. Energy sources that replenish continually or annually.
5. A cause and effect chain.
6. The removal of salts and minerals from a substance.

ACROSS

4. The science of heat, temperature and energy.
7. Results in elevated ocean levels, more flooding, more droughts, and distorted snowmelt patterns.
8. Electricity made by generators that are pushed by movement of water.

WORD BANK

Thermodynamics
Hydroelectricity
Electrolysis
Desalination
Renewable Energy
Climate Change
Hydrologic Cycle
Feedback Loops



Water and Civilization Go Hand-in-hand

Just as many ancient civilizations thrived by using and controlling water, their collapse was often the result of water scarcity. Drought contributed to the collapse of the Roman Empire and several Chinese dynasties. Even the Maya Empire saw drastic population decreases as the result of climate change, drought, and the failure of a water transportation system.

Text from Disco Learning Media's Resourcefulness Curriculum
[smartenergyeducation.com](https://www.smartenergyeducation.com)

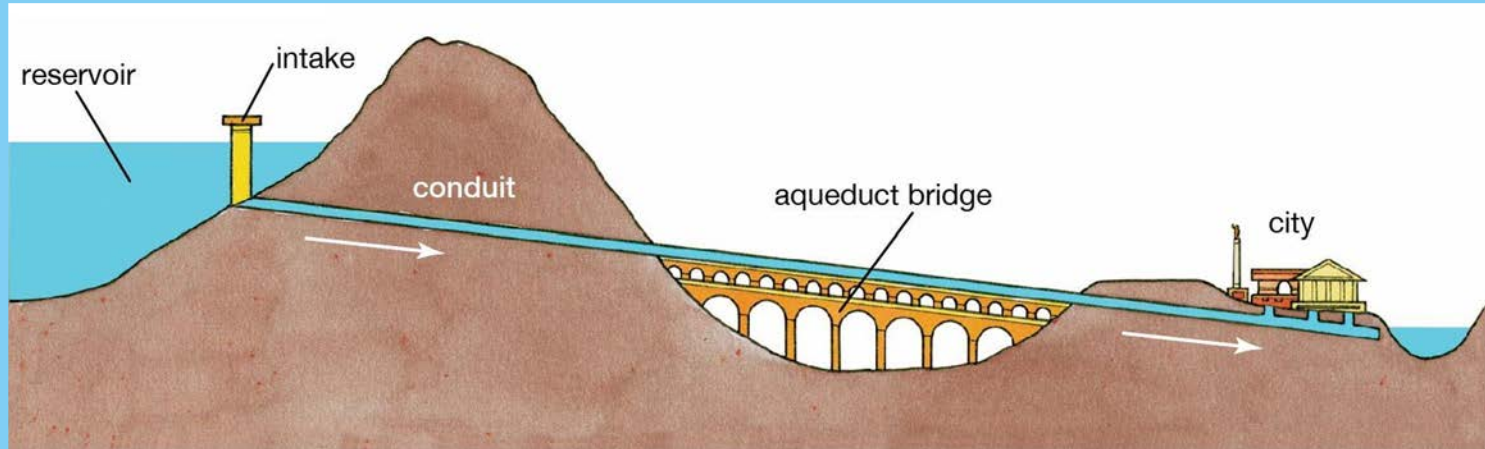
Photo credit: "Destruction," 1836, part of the "Course of Empire" series, by Thomas Cole



Water is Life

Ancient civilizations recognized that their survival was dependent on water. They built their cities where water was abundant. They learned to transport water using **aqueducts**. They knew that water was power, and controlling rivers meant ensuring their survival.

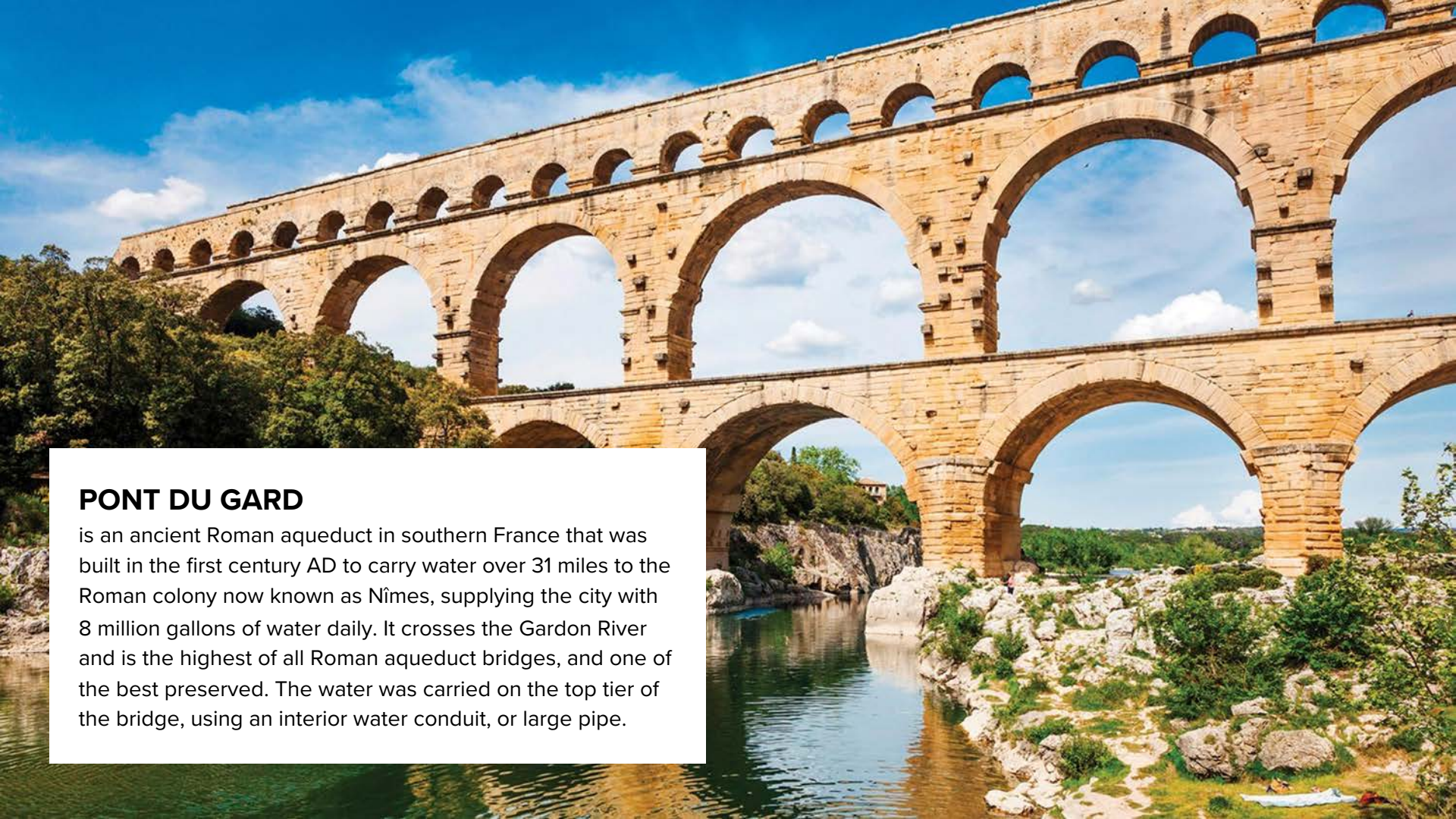
Aqueduct: an artificial channel used to carry water from a source to a distribution point far away



Water is Power

Ancient and modern societies learned to harness water to create power. The first examples of water wheels dates back to 4000 B.C. By the 2nd century B.C. vertical watermills were used in Syria and Asia Minor, later spreading to ancient Greece and the Roman Empire. These watermills used hydropower. The water was used to drive a mechanical process such as grinding, rolling, or hammering.





PONT DU GARD

is an ancient Roman aqueduct in southern France that was built in the first century AD to carry water over 31 miles to the Roman colony now known as Nîmes, supplying the city with 8 million gallons of water daily. It crosses the Gardon River and is the highest of all Roman aqueduct bridges, and one of the best preserved. The water was carried on the top tier of the bridge, using an interior water conduit, or large pipe.

Design Your Own Roman Aqueduct

MATERIALS NEEDED:

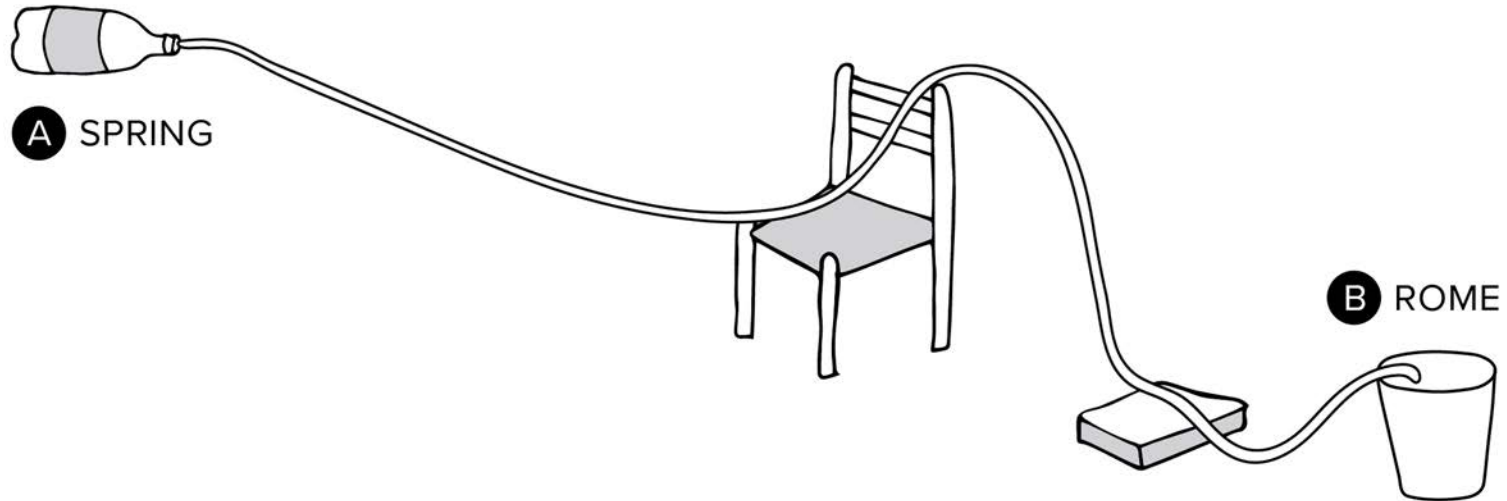
- empty 2-liter soda bottle and cap
- electric drill or screwdriver*
- clear vinyl 3/8" tubing
- bucket
- items of varying levels (table, chair, block, books)
- Water



*Please obtain permission or assistance from your parent or guardian before using a drill or screwdriver, and be careful!

Design Your Own Roman Aqueduct

Water must flow from the spring (point A: the soda bottle) through the aqueduct (the plastic tubing) over obstacles to Rome (point B: the bucket). Water is precious, so any that escapes the system represents a costly mistake in engineering, construction, and/or operation.



Design Your Own Roman Aqueduct

INSTRUCTIONS

1. Drill 3/8" hole in the top of 2-liter soda bottle cap. Fit the end of your vinyl tubing into it.
2. Design a course for your aqueduct to travel through. Point A ("the spring") could be a table or another high point. Allow your aqueduct to generally drain down into your bucket. Prop up a book, block, or chair along the way to create obstacles. Start simple and adjust as you learn more about how the aqueduct works.
3. When you are ready to test your course, fill the soda bottle at least half full with water and allow it to flow into the tubing. Watch how the water moves through your aqueduct course... did it make it all the way to point B ("Rome")? Adjust as necessary. You want the water to freely flow through the tubing. This is how it would have worked in the Roman aqueduct system.
4. After successful completion, modify your course to make it a little bit harder.

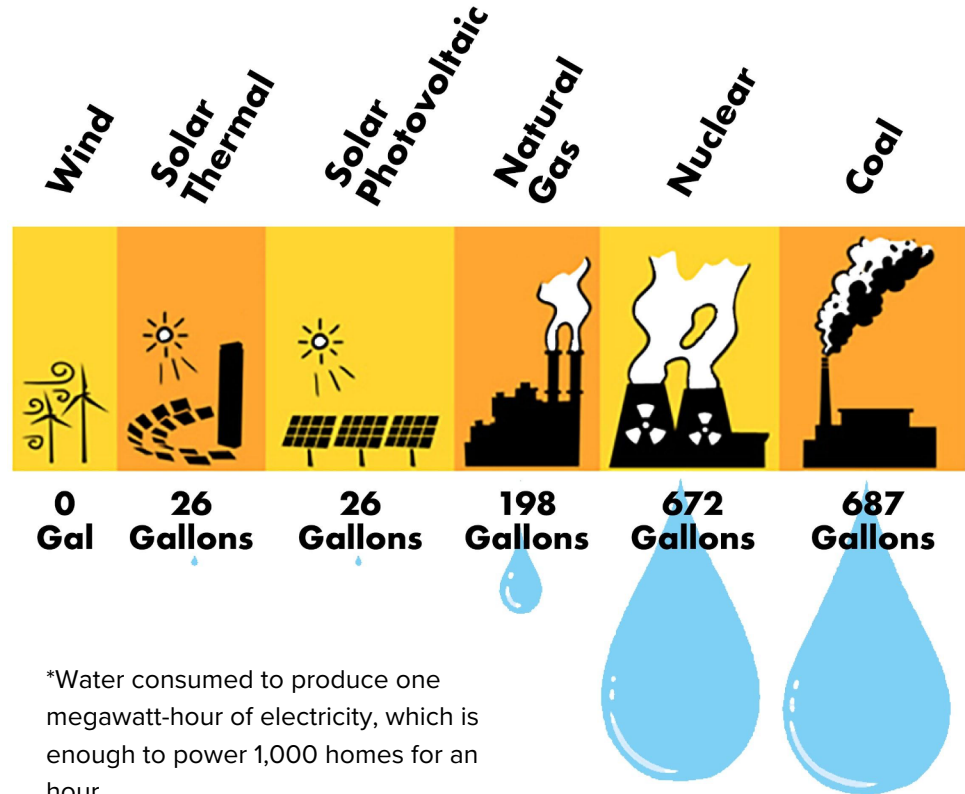
Where Water is Used

Today we are just as dependent on water for energy as ever before. Nearly every type of power plant utilizes significant amounts of water.

Which type of energy uses the least amount of water?

Which type of energy uses the highest amount of water?

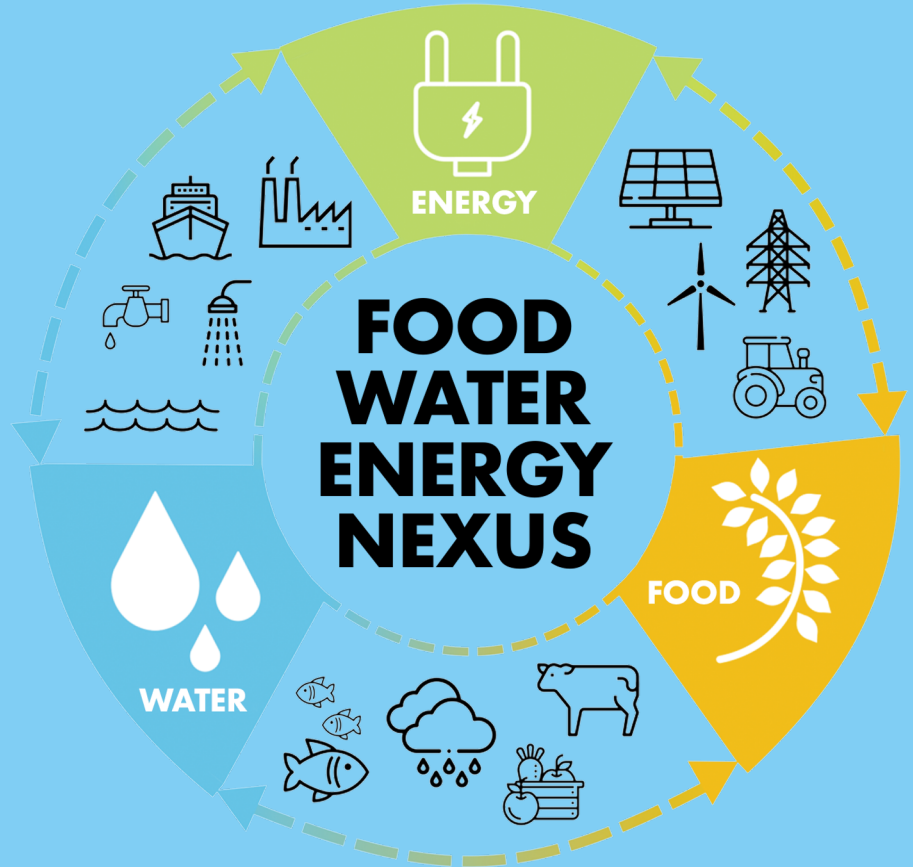
WATER USE BY POWER PLANT*



Food-Water-Energy Nexus

Food, water and energy are elements that are linked with each other. Impact on one will affect all three. To provide sustainable solutions on a global scale, all three have to be considered.

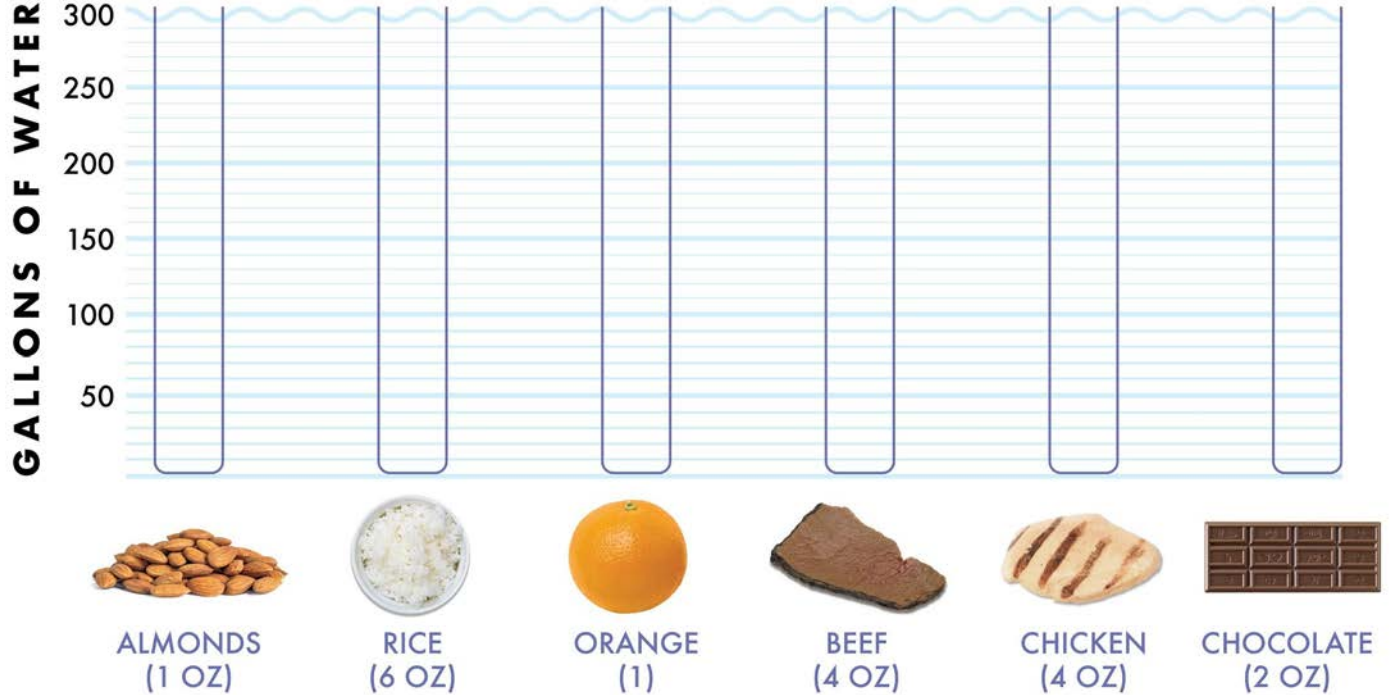
Give an example of how one element impacts another:



How Big is Your Water Footprint?

How much water do you think it takes to produce only one serving of the foods you eat? **Using the shape or scribble tool, fill in the containers with your guesses.**

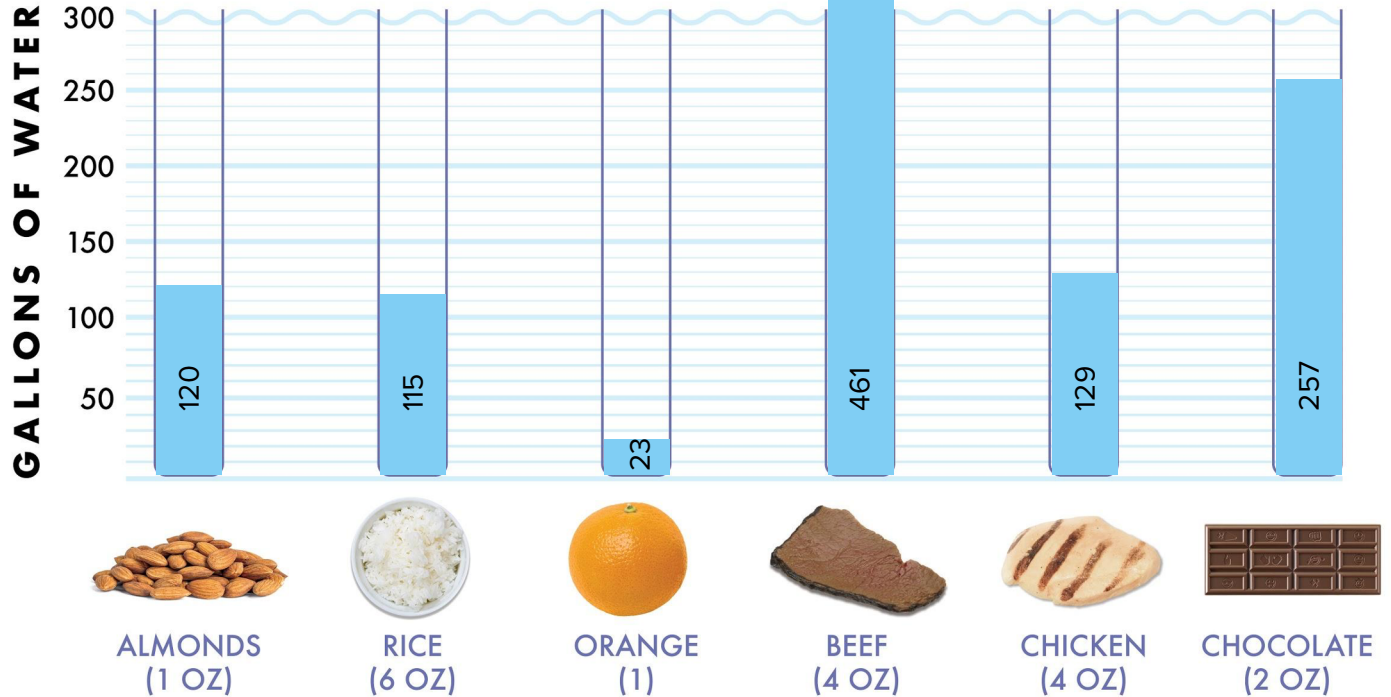
See the answers on the next page.



How Big is Your Water Footprint?

Numbers according to the
Water Footprint Network

Check out the
graph and write
how many gallons
of water it takes
from least to most:



A dashed rectangular box intended for writing the answer to the question: "Check out the graph and write how many gallons of water it takes from least to most:"

Conservation

Understanding the relationship between water, energy, and food will also help you understand the need to make changes in your own life. Conservation is the first and most important tool we have in our tool kit. The following pages have some ideas of how to conserve your use of power or water.



Conservation



Turn off the faucet
when brushing
your teeth.



Take shorter
showers. Make it a
game!



Turn off the lights
when you leave a
room.

Conservation



Use the sun to dry your wet clothes (instead of a dryer).




Don't leave the door open when your AC is on.



Replace incandescent light bulbs with LEDs.

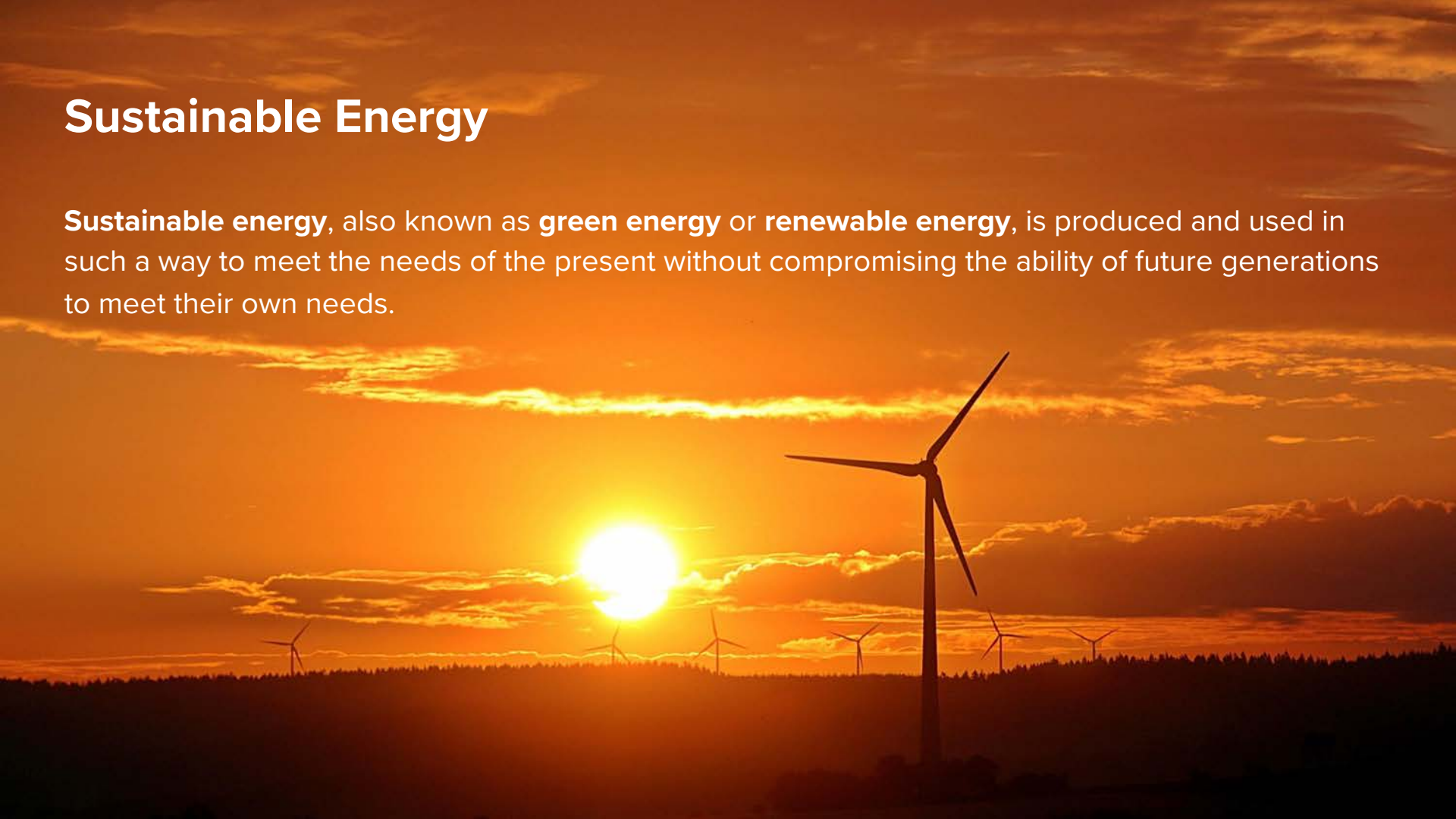
Conservation

What are some more ideas on how you can conserve power/water?

A large, empty rectangular box with a dashed black border, occupying the lower two-thirds of the page. It is intended for the user to write their ideas on conserving power and water.

Sustainable Energy

Sustainable energy, also known as **green energy** or **renewable energy**, is produced and used in such a way to meet the needs of the present without compromising the ability of future generations to meet their own needs.



Sustainable Energy

Here are a few examples of sustainable energy. Explain each one in your own words, and check the definitions on the next pages.

Wind Power:

Solar Power:

Geothermal Power:

**Can you think
of one more?**

Sustainable Energy

Wind Power is the process of creating electricity using the wind. Modern wind turbines capture the wind's kinetic energy and rotate, turning it into mechanical energy, spinning electric generators to create electricity. Wind energy is clean because it doesn't put any pollution into the air or water.



Sustainable Energy

Solar Power is usable energy generated from the sun. It can be used as heat energy or converted into electric energy. Solar panels work by absorbing sunlight with photovoltaic cells, generating direct current (DC) energy and then converting it to usable alternating current (AC) energy with the help of inverter technology. The Earth receives more energy from the sun in an hour than the entire world uses in one year!



Sustainable Energy

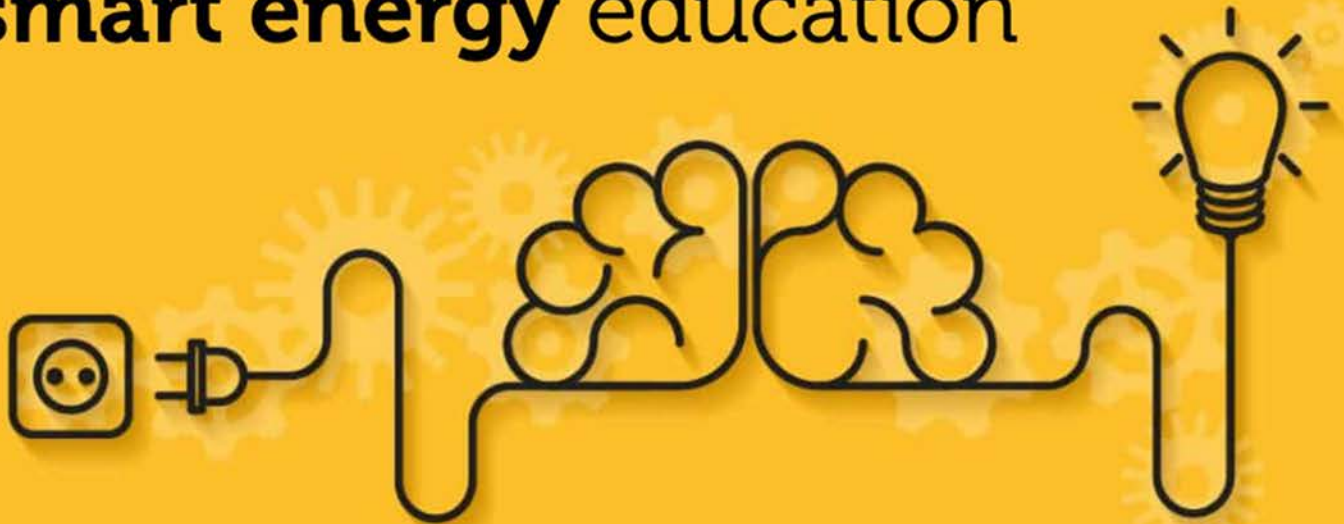
Geothermal Power converts heat from inside the Earth to generate steam, which is converted to electricity through an electrical generator. Most geothermal plants are located in the western United States, where hot water reservoirs are common. Geothermal systems can also be used for heating and air conditioning homes, schools, and other buildings.



Sustainable Energy

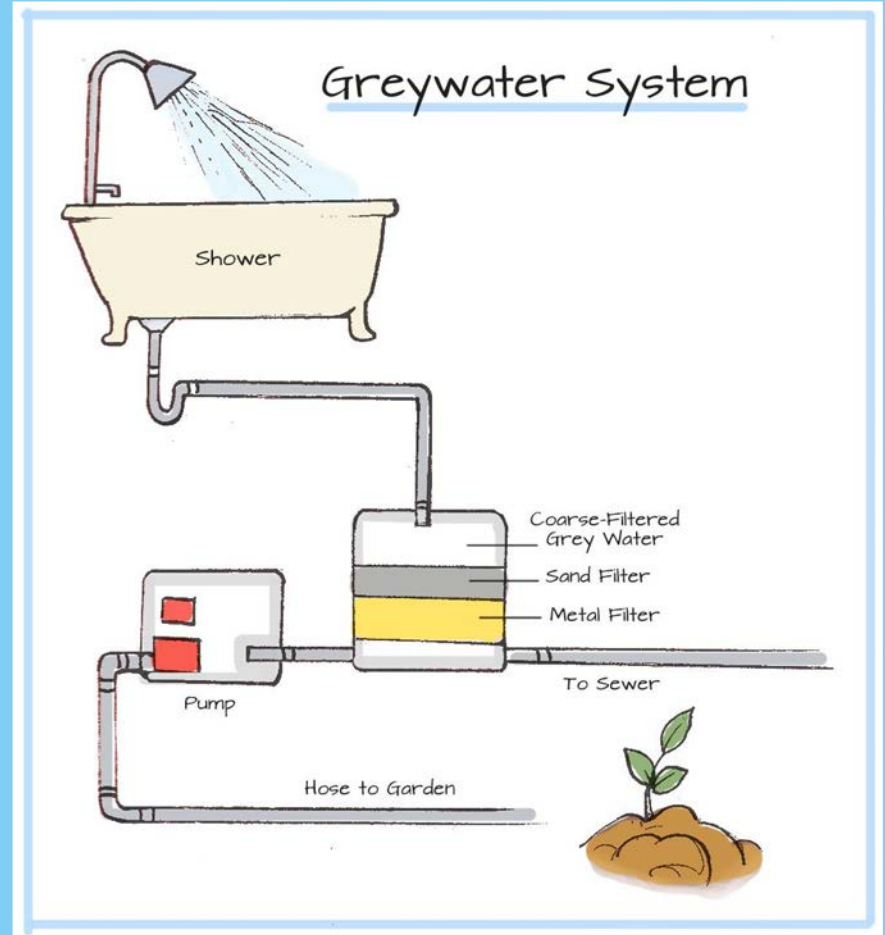
Spread knowledge! Advocate for forms of energy that don't require water consumption (wind and solar power). Learn more at: [smartenergyeducation.com](https://www.smartenergyeducation.com)

smart energy education



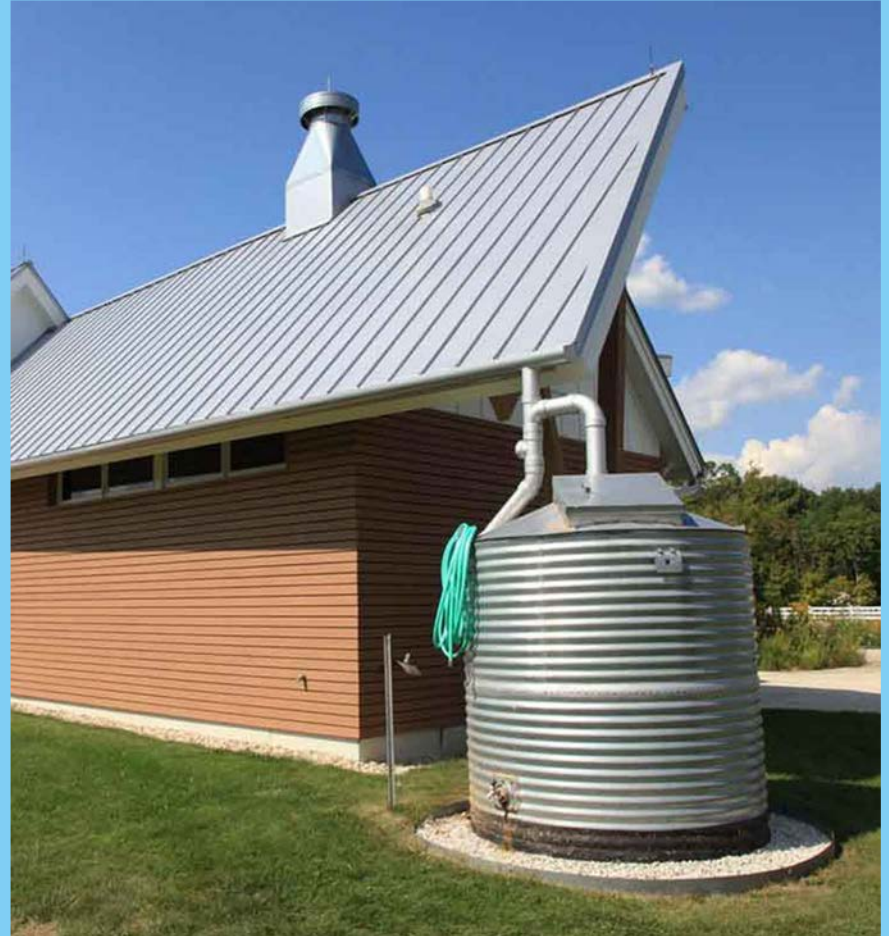
Water Reclaiming

GREY WATER is the relatively clean wastewater from baths, sinks, washing machines, and other appliances. Using your water twice can make a big impact on your water footprint. Grey water can be used for mopping, flushing the toilet, watering landscapes, and more. It reduces the amount of household freshwater used, and reduces the amount of wastewater entering sewer or septic systems.



Water Reclaiming

RAINWATER HARVESTING is the process of collecting rainwater and storing it for a future purpose. The easiest way to collect rain at your house is through a rain barrel (make your own from a large trash can or an old drum) linked to a pipe fitted to collect rainwater from the rooftop. The rainwater can then be used to water plants, wash cars, and more. It can also reduce flooding and stormwater pollution around your house.



Water Reclaiming

Draw a Diagram:

Choose **grey water**
or **rainwater**

harvesting. Using
the shape or
scribble tools (or
print out and use
pencil), draw a
diagram showing
how it might work
at your own house.
Label each part.



Texas Winter Storm: February 2021

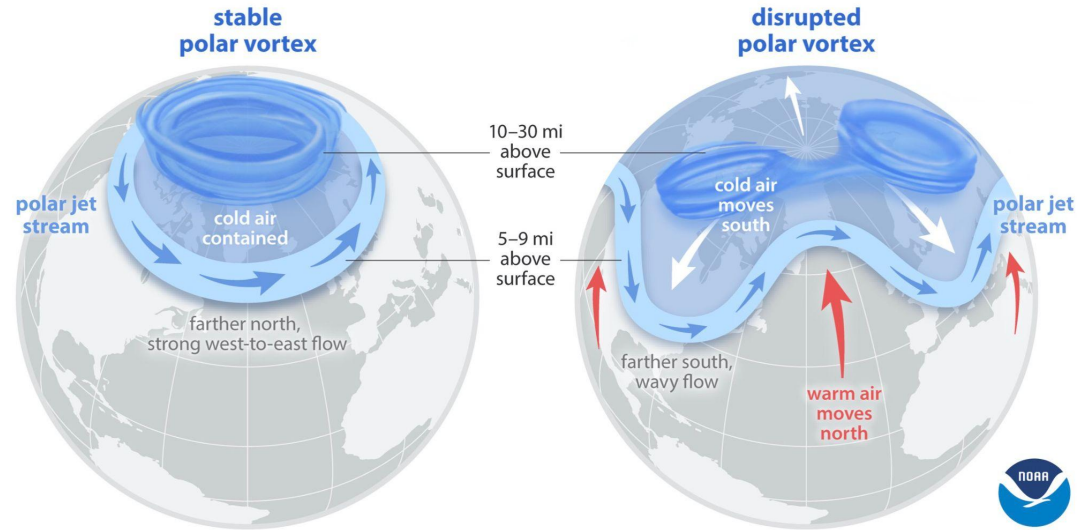
Texas faced record-low temperatures. Snow and ice made roads impassable. The power grid failures left millions without electricity and heat in the cold. They discovered that their taps had run dry, pipes had burst, or water treatment plants had failed, and that they had to boil their water before using it, if they even had any.

Sources: [The Texas Tribune](#) and [The New York Times](#)



How did this happen in Texas?

Over the past 30 years, the Arctic has warmed at roughly twice the rate as the entire globe, a phenomenon known as **Arctic amplification**. Most scientists agree that this rapid warming is a signal of human-caused **climate change**. Meteorologist Brett Anderson says that rising temperatures in the Arctic can cause an area of strong high pressure to develop in the atmosphere surrounding the North Pole, which can "push" the polar vortex farther south, into places like North America or Europe and Asia, Anderson explained.



NOAA Climate.gov
2021

Sources: [AccuWeather](#) and [National Snow and Ice Data Center](#)

About The Paramount Theatre

The Paramount Theatre was built 105 years ago in 1915. Back then, Congress Avenue was a dirt road and the automobile was a new invention. As one of the first examples of early theatre architecture, the Paramount has been bringing Austin families together for generations. When you visit the theatre, you enter a place that feels exciting and welcoming. From your seat, you can almost reach out and touch the performers on stage! Many famous people have performed at the Paramount. From magician Harry Houdini to the premier of the original Batman movie, the Paramount and its audiences have seen it all over the past 100 years...here's to the next century!



About Paramount Education

We inspire the intellect and imagination of young people by providing opportunities to experience, perform, and learn through the arts. We can't wait to see you again at our theatre or in our school programs! Paramount Education programs are made possible through generous donations from our community. [Learn more about us](#) or [make a donation](#). Thank you!



The image shows the interior of a grand, ornate theatre. The stage is dominated by a large, vibrant red curtain. The architecture is highly detailed, featuring gold-colored carvings, arches, and a balcony with decorative railings on the left. The ceiling is also highly decorated with circular patterns. The overall atmosphere is one of classic elegance and grandeur.

To take a virtual tour of
the Paramount Theatre now!

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