

PARAMOUNT  
EDUCATION

PRESENTS

# THIRST FOR POWER

BASED ON THE BOOK BY MICHAEL E. WEBBER

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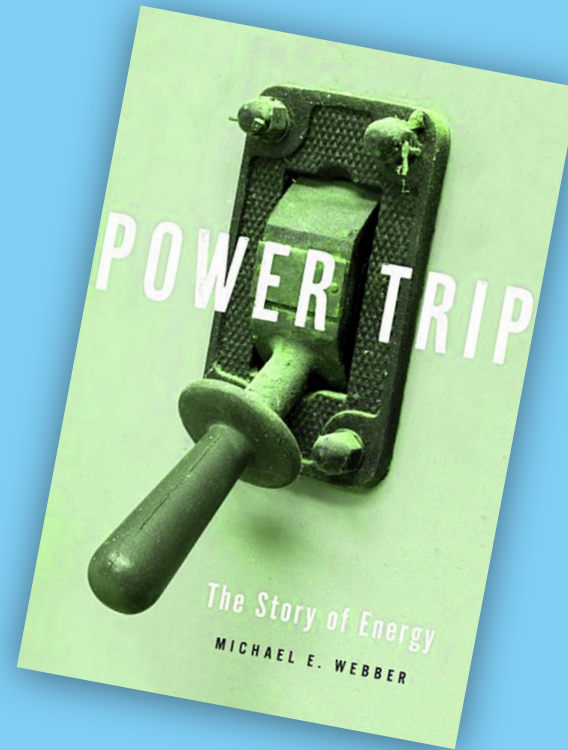
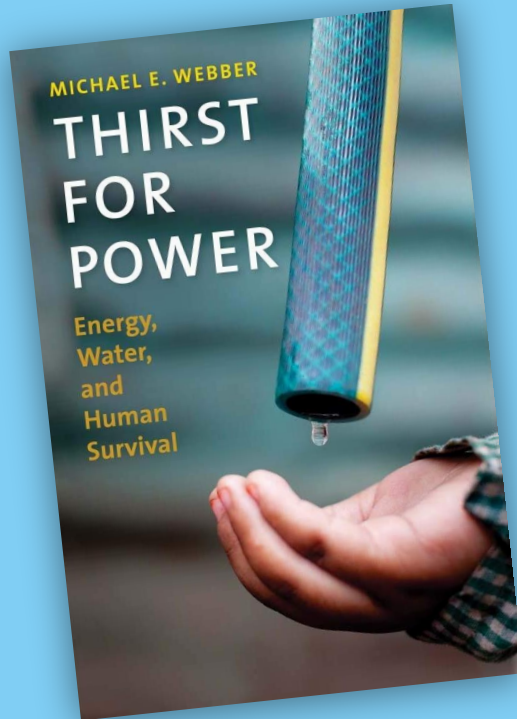


## Who is Dr. Michael E. Webber?



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 served 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



Erin is a producer for Post Script Media, who makes audio stories about the intersection of the environment and culture. Before this, she was a Senior Research Analyst at Utility Analytics Institute where she also hosted and produced the Beyond the Data podcast. In 2022, Erin became a Clean Energy Leadership Institute Fellow. Her goal is to create science-based communication about decarbonization and the changing planet.

# Vocabulary Crossword

## DOWN

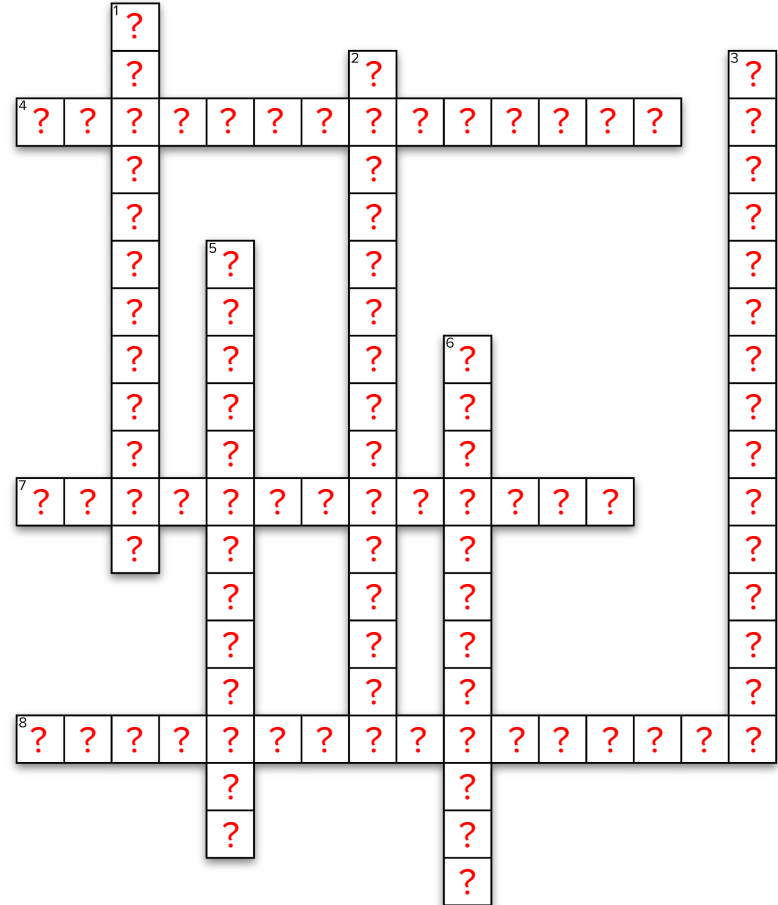
1. The process of using electricity to split water into hydrogen and oxygen.
2. Another name for the water cycling from the ocean to the atmosphere to the land.
3. Energy sources that replenish continually or annually.
5. A cause and effect chain.
6. The removal of salts and minerals from a substance.

## 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](http://smartenergyeducation.com)

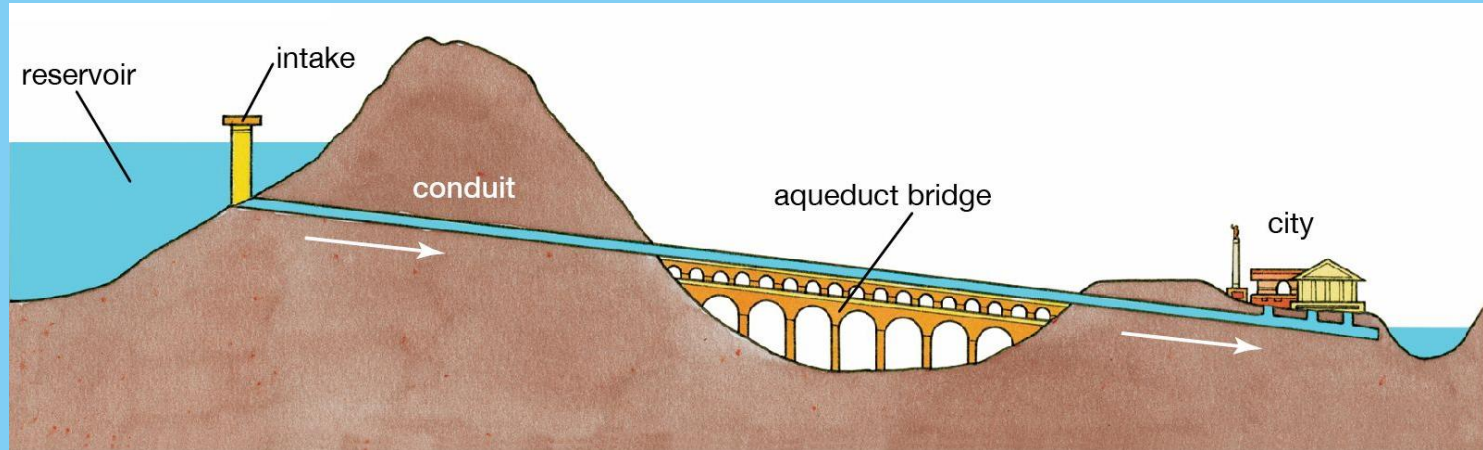
*Photo credit: "Destruction," 1836, part of the "Course of Empire" series, by Thomas Cole*



# 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.E. By the 2nd century B.C.E. vertical water mills 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:

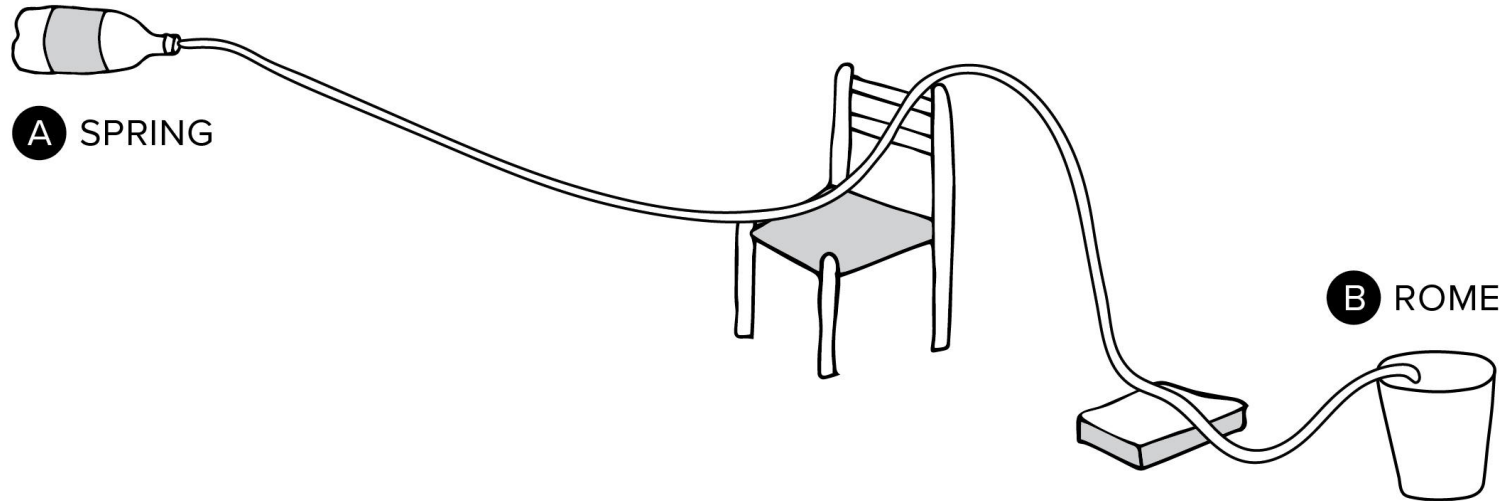
- empty 2-liter soda bottle and cap
- electric drill or screwdriver\*
- clear vinyl 3/8" tubing
- bucket
- items of varying levels (table, chair, block, books)
- Water



\*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.

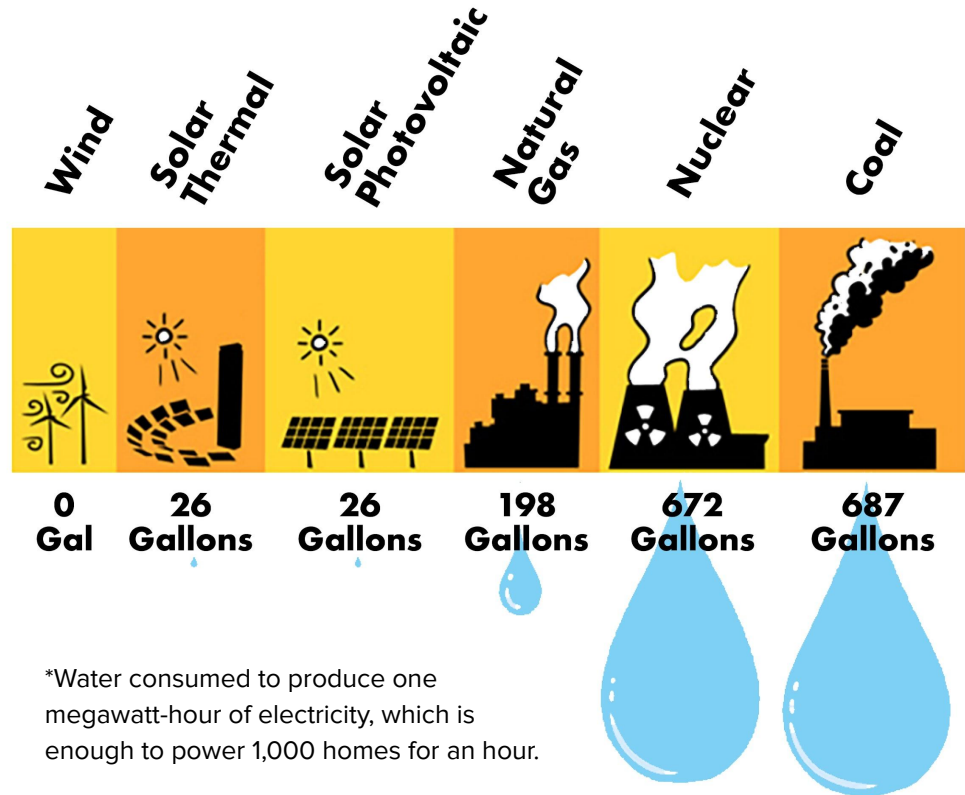
**Q: Which type of energy uses the least amount of water?**

Type here

**Which type of energy uses the highest amount of water?**

Type here

## WATER USE BY POWER PLANT\*



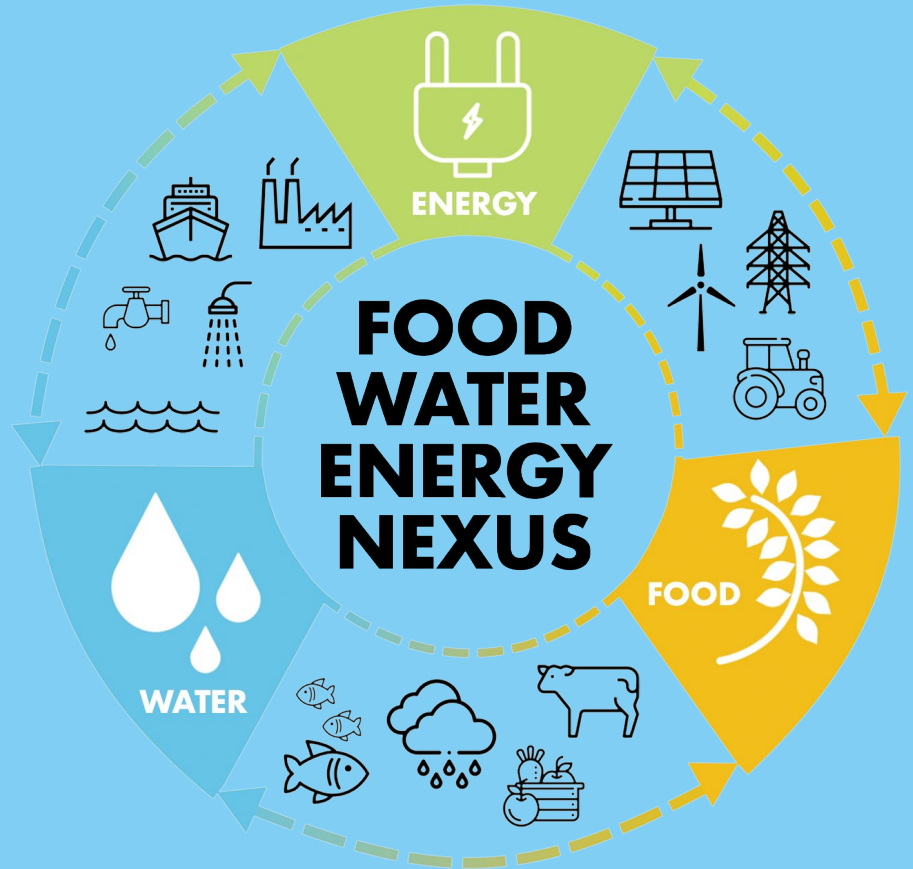


# Food-Water-Energy Nexus

**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.

**Q: Give an example of how one element impacts another:**

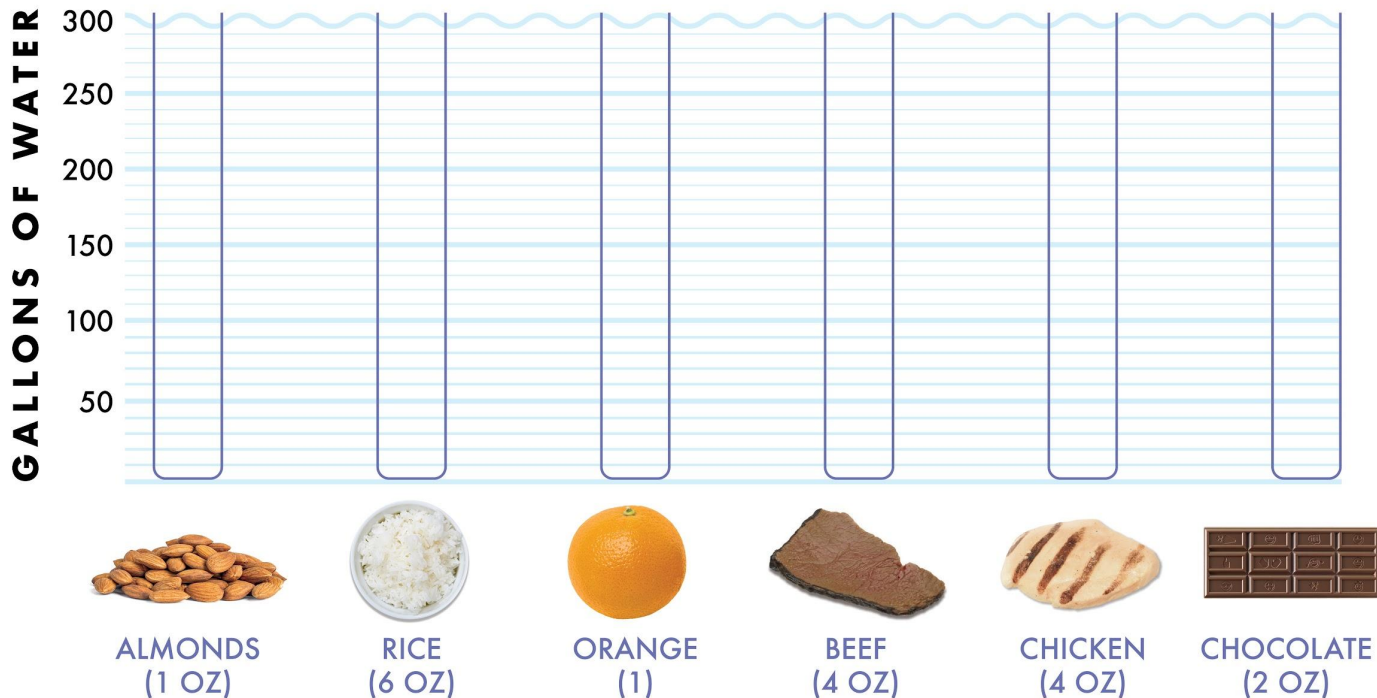
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# How Big is Your Water Footprint?

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.

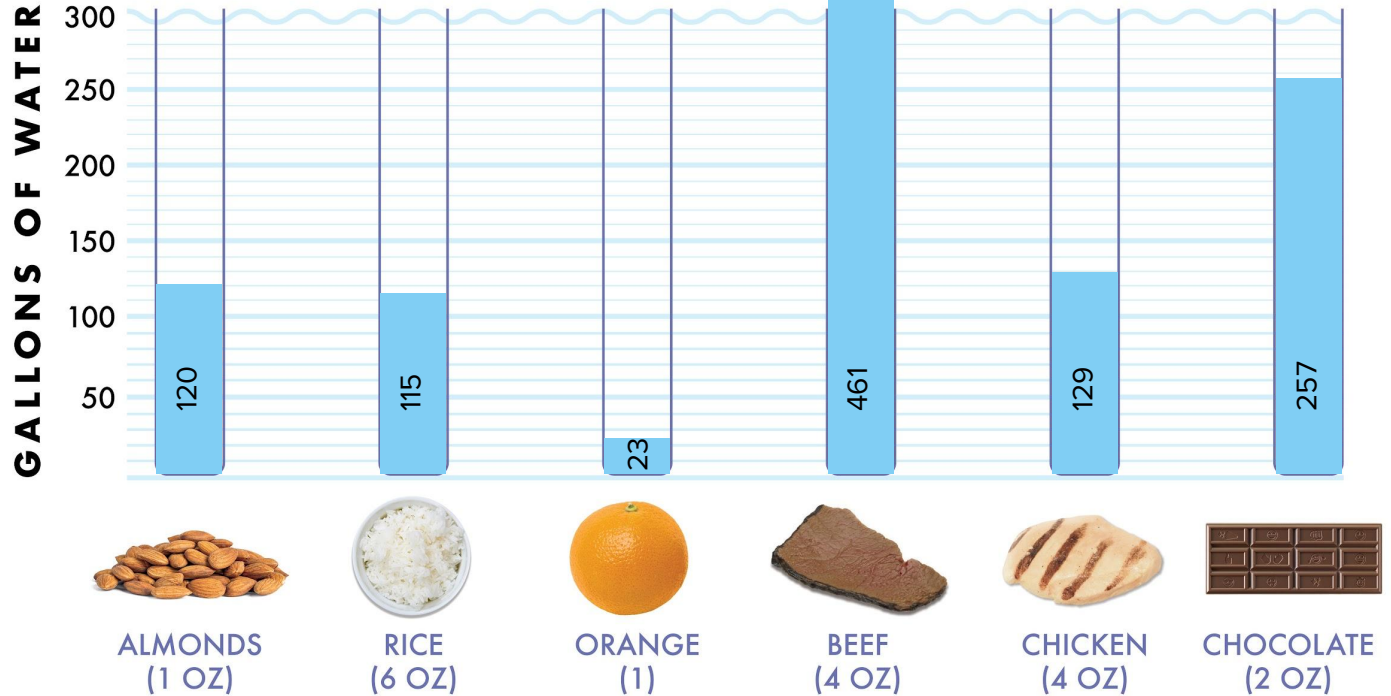


# How Big is Your Water Footprint?

Numbers according to the  
Water Footprint Network

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

Type here



# 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.

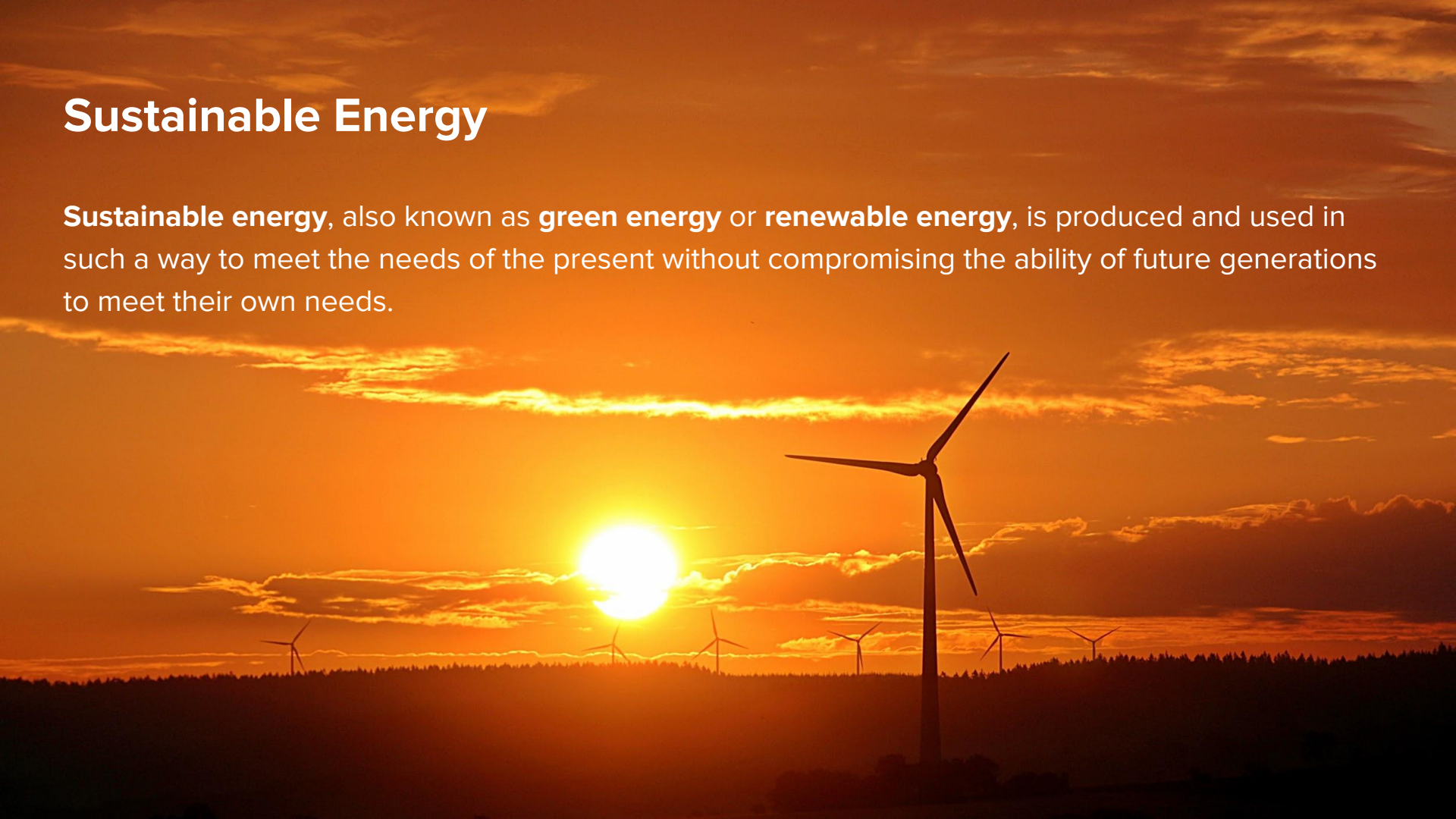
# Conservation

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

Type here

# 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:**

Type here

**Solar Power:**

Type here

**Geothermal Power:**

Type here

**Can you think  
of one more?**

Type here

# 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

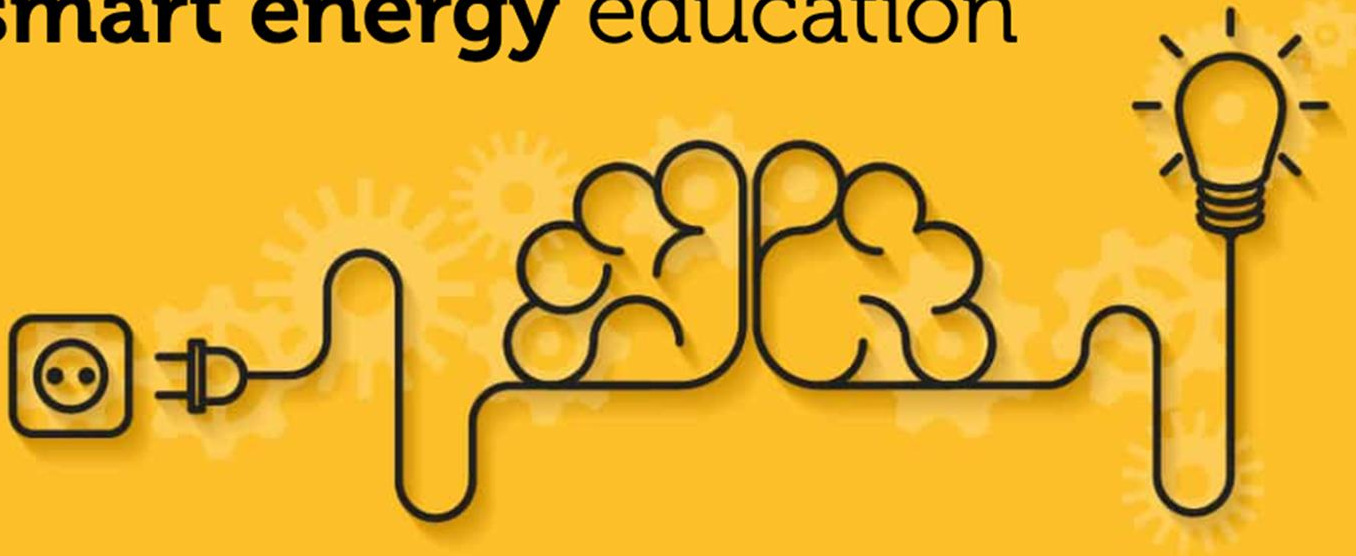
**Geothermal Power** converts heat from inside the Earth to generate steam, which is converted to electricity through an electrical generator. Most geothermal plants are located in the western United States, where hot water reservoirs are common. Geothermal systems can also be used for heating and air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



# Sustainable Energy

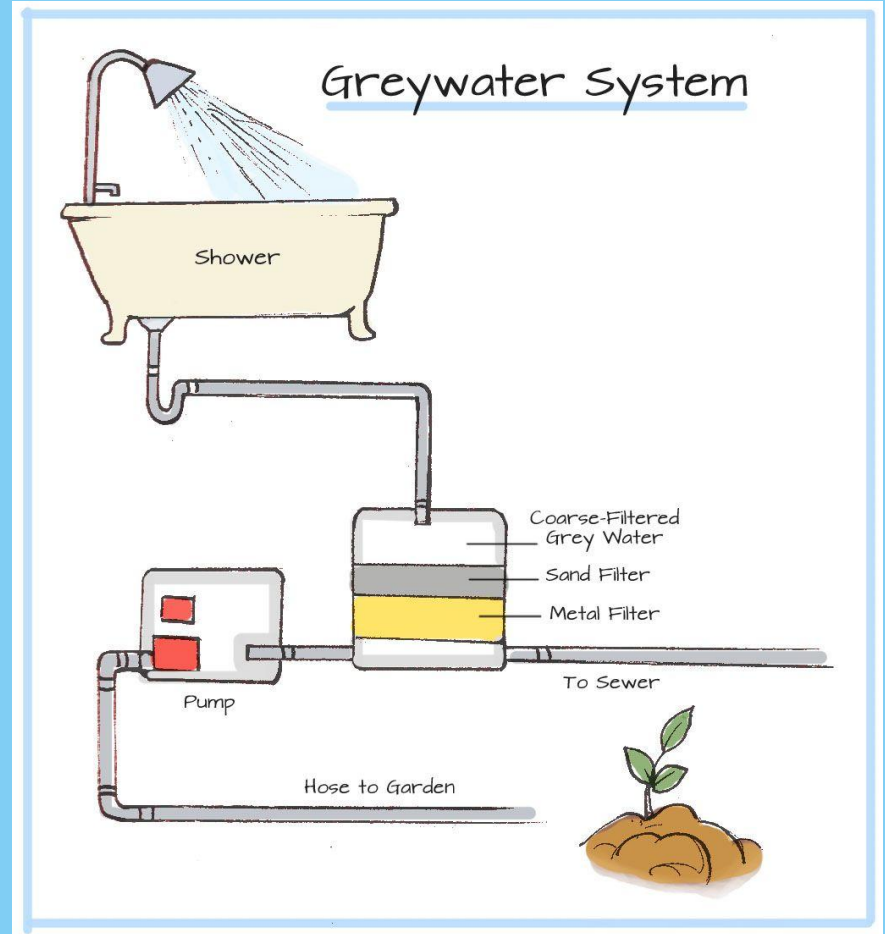
Spread knowledge! Advocate for forms of energy that don't require water consumption (wind and solar power). Learn more at: [smartenergyeducation.com](https://www.smartenergyeducation.com)

## 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.





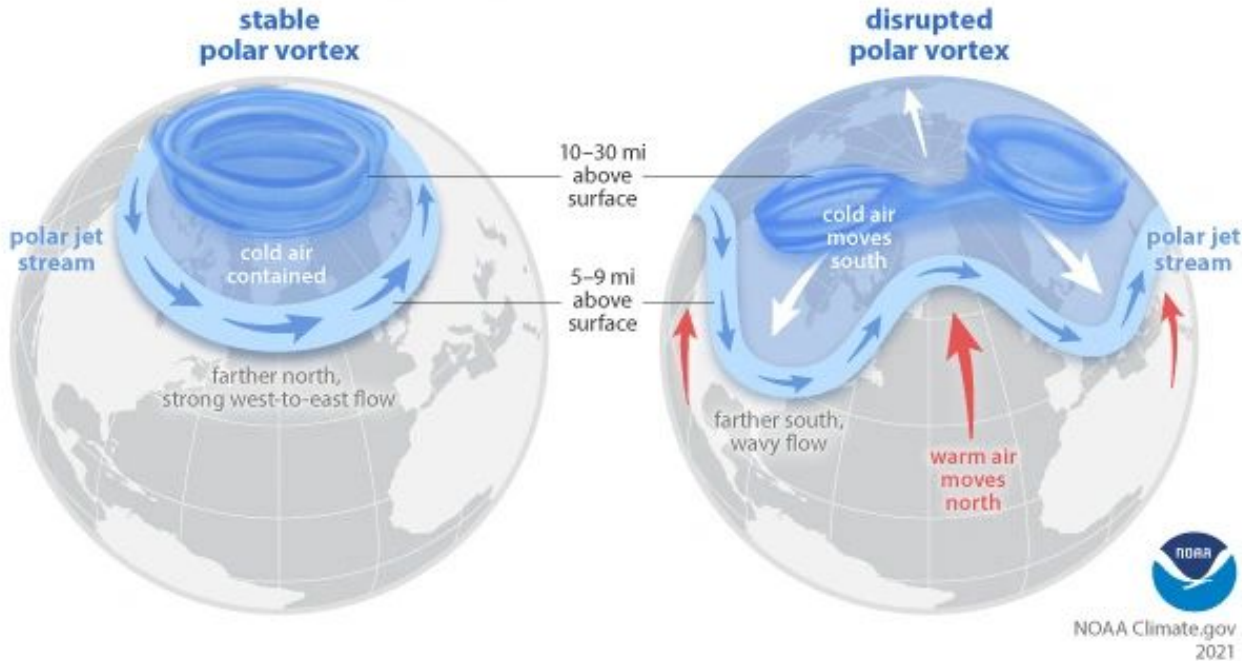
# Texas Winter Storm - February 2021

Texas faced record-low temperatures and 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.



*Text and images from The Texas Tribune and The New York Times*  
<https://www.texastribune.org/series/winter-storm-power-outage/>  
<https://www.nytimes.com/2021/02/20/us/texas-winter-storm-explainer.html>

# 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.

Text and images from AccuWeather and National Snow and Ice Data Center

<https://www.accuweather.com/en/climate/climate-change-arctic-linked-to-texas-severe-winter-weather/1016025>

[https://nsidc.org/cryosphere/arctic-meteorology/climate\\_change.html](https://nsidc.org/cryosphere/arctic-meteorology/climate_change.html)

# About The Paramount Theatre

**The Paramount Theatre** was built over 100 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 on the left side. The ceiling is also highly decorated with intricate patterns. The overall atmosphere is one of classic elegance and grandeur.

To take a virtual tour of  
the Paramount Theatre now!

# Thank you to our 2022-2023 Education Partners



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