

## Getting to Know H<sub>2</sub>O – the Water Cycle: a short film about water

Study Guide for teachers

**Getting to Know H<sub>2</sub>O** – this 12-minute film covers: how much water we use; the water cycle; the Santa Ana River ecosystem; water purification and water labels that effect how we feel about our drinking water; plastic water bottles vs tap water; seven tips for conserving water.

This film is also broken into six short films for knowledge checking, and this study guide as well as links to the films are available through the Gluck Fellows Program of the Arts website - <https://gluckprogram.ucr.edu>

We recommend you watch the full **Getting to Know H<sub>2</sub>O** film (12 minutes), then refer to the short films for focus on specific learning points

Information in blue is not in the films, but is for extension learning

### **Getting to Know H<sub>2</sub>O – the Water Cycle** 12:15

What is something natural that we use every day, that we could not survive without?

We see it as a liquid, solid and gas.

It is running through the walls in the building right now!

Water

What are 10 things we use water for?

Drinking, playing in the pool, washing dishes, washing the car, bathrooms, cooking, watering plants...[car wash](#), [fish tank](#)...

### #1 **How much water does it take to make a hamburger?** 1:50

1. The typical person in California uses about 80 gallons of water each day in their home.

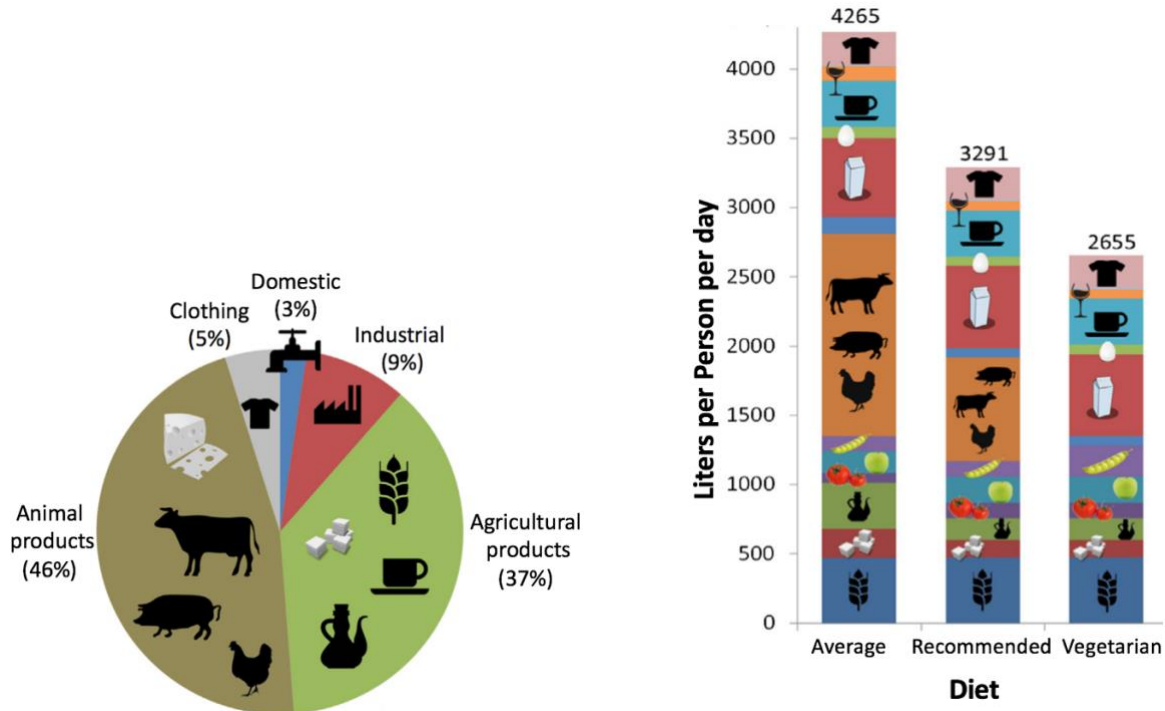
[This is roughly 684 pounds, or the weight of an 8-foot long Indo-Pacific Bottlenose Dolphin.](#)



- 80 gallons is a small fraction of overall water use (3%) – 90% of the water we use is hidden in the making of our food.

Californians use an average of 2,060 gallons of water per day

[http://digitalassets.lib.berkeley.edu/etd/ucb/text/Fulton\\_berkeley\\_0028E\\_15265.pdf](http://digitalassets.lib.berkeley.edu/etd/ucb/text/Fulton_berkeley_0028E_15265.pdf)



- One pound of beef uses 1800 gallons of water.  
That amount of water would weigh 15,000 pounds!  
40 hamburgers uses enough water to fill an entire swimming pool!  
Cows eat 6 times their weight in corn – that means you need at least 6 times as much water to produce a hamburger than if you were to just eat the corn yourself.

## #2 Where does our water in Southern California come from? 1:40

- Icy snow packs melt and make lakes or reservoirs and fills underground aquifers. The water evaporates and the water cycle continue
- Many scientists believe that our water originates from asteroids slammed into the earth 4.5 billion years ago. That means that the water we use today was used by the ancient Egyptians and even the dinosaurs.
- Desert regions import water from Sacramento Delta, Colorado River, and Sierra Nevada Mountains through a complex series of aqueducts, dams, reservoirs and pipelines.

The Earth might seem like it has abundant water, but in fact less than **1 percent** is available for human use. The rest is either salt water found in oceans, fresh water frozen in the polar ice caps, or too inaccessible for practical usage. While population and demand on freshwater resources are increasing, supply will always remain constant. And although it's true that the water cycle continuously returns water to Earth, it is not always returned to the same place, or in the same quantity and quality. For example, the Tijuana River at the United States-Mexico border, rises way up high in the mountains in the United States AND Mexico -- where there are dams in both countries to control water flow and velocity. That river flows through natural tributaries AND man-made concrete channels through natural land AND the city. Then it flows into the Tijuana Estuary and into the Pacific Ocean.

As ice melts or rain falls, rivers collect biotic and abiotic matter (living and non-living things) along the way -- leaves, pebbles, and soil -- but also plastics and trash, gas and oil from city streets and pesticides and chemicals from lawns, AND bacteria. All of that runoff can make its way into our water.

Estuaries are places where the river meets the sea. They are often described as filters or sponges, because they filter out all of the matter collected along the river. Along the San Diego-Tijuana coast, scientists have found traces of personal care products like sunscreen, heavy metals, pesticides, and caffeine in the estuary.

Many cities have several man-made flood control and water transport systems like dams, concrete channels, gutters, culverts, and storm drains. These un-natural waterways also collect biotic and abiotic matter -- but the water does not percolate into the soil. It flows into rivers, lakes, reservoirs, or the ocean.

### #3 Parsa at the Santa Ana River 1:42

1. Santa Ana River is in Southern California and water comes from springs underground, snow melt from the San Bernardino mountains and recycled water from cities such as Riverside.
2. This river is an ecosystem. Ecosystems have many different organisms that rely on each other to survive. The Santa Ana ecosystem has fish, insects, endangered birds.
3. The river relies on our recycled water to exist.

California has a never-ending cycle of drought – we should be planning for the next one.

More information about water ways  
Water in a Changing World

In European cities in the 1500s, human waste was thrown into the streets until the King of France issued a “hygiene edict” in order to confine it to the domestic sphere until it could be dumped in the nearest body of water. English sanitarians used slow sand filtration systems in the early 1800s throughout London, and by the late nineteenth

century, American cities were with hydraulic technology used fresh water usage to get rid of waste.

In many parts of the world today though, our global waterways are still used for washing, bathing, and not all countries use sewage systems. Less developed countries and informal urban settlements are often lacking wastewater infrastructure.

Human waste management systems generally fall into three categories: pit latrines, septic tanks, and sewerage but where does human waste go after septic tanks are emptied or when the toilet flushes?

Humans have been dumping waste in waterways for centuries -- and many rivers still continue to receive human waste, trash, and even hazardous waste.

#### **#4 An Introduction to Water Purification 2:40**

How does water from a stream get cleaned? Get rid of the chunks with a wire mesh screen. Flocculation uses alum flocculants to cause the particles to clump together and fall to the bottom. Cotton and sand make a finer filter to get out the rest of the particles. Chlorine is used to then kill germs.

#### **#5 What is the difference between tap and bottled water? 2:33**

'Natural' is used to describe bottled water but tap and bottled water is the same level of 'natural'. Words like natural, pure and fresh are used to describe bottled water; recycled and waste water are words used to describe tap water. The words used to describe water make us feel differently about the water, but both tap and bottled water are from the same sources, both are purified, both are natural.

#### **#6 Seven Tips for Conserving Water 1:31**

1. Turn off the water when brushing your teeth
2. Take shorter showers
3. Use a reusable water bottle
4. Drink tap water, add fruits or ice to flavor it
5. Eat less meat – try Meatless Mondays and veggie spaghetti
6. Water your lawn in the evening, or replace the lawn with drought resistant plants
7. Throw things away in the garbage, not in the toilet. Things in the water can get back to our rivers and oceans

...collecting rainwater for household chores (not for drinking), eating less meat, washing dishes the British/Belgian way (no rinsing), doing laundry during certain times of day to reduce strain on infrastructure, fix dripping faucets...

#### **Ecological impacts of natural waterways due to plastic**

Every year we produce about 300 million tons of plastic, up to 10% of which enters our oceans, mostly through rivers. That means that every one second, 1600 pounds of plastic enters the ocean. That's the weight of 3 bottlenose dolphins! At the rate we're going, by 2030, we will double this to 3,200 pounds per second. By 2050, there will be

more plastic in the ocean than FISH by weight. Since plastic can stick around in the ocean for up to 600 years, this problem will not go away soon!

What can YOU do to make a difference?

REDUCE REUSE RECYCLE

REFUSE unnecessary plastic like straws and plastic bags

## Glossary

Aqueduct - an artificial channel for conveying water, typically in the form of a bridge across a valley or other gap.

Aquifer - a body of permeable rock which can contain or transmit groundwater.

Asteroid - a small rocky body orbiting the sun.

Chlorine - the chemical element of atomic number 17, a toxic, irritant, pale green gas.

Dam - a barrier constructed to hold back water and raise its level, forming a reservoir used to generate electricity or as a water supply.

Delta - a landform that forms from deposition of sediment carried by a river as the flow leaves its mouth and enters slower-moving or standing water. This occurs where a river enters an ocean, sea, estuary, lake, reservoir, or (more rarely) another river that cannot transport away the supplied sediment.

Drought - a prolonged period of abnormally low rainfall, leading to a shortage of water.

Estuary - the tidal mouth of a large river, where the tide meets the stream.

Evaporate - turn from liquid into vapor / gas.

Flocculation – to form compound masses of particles.

Gallon – a unit of liquid: 8 pints, 4 quarts; 3.79 liters

Gas - a substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape (unlike a solid) and no fixed volume (unlike a liquid).

H<sub>2</sub>O - water (the chemical symbol, as used in non-scientific contexts).

Liquid - a substance that flows freely but is of constant volume, having a consistency like that of water or oil.

Percolate - (of a liquid or gas) filter gradually through a porous surface or substance.

Porous - (of a rock or other material) having minute spaces or holes through which liquid or air may pass.

Reservoir - a large natural or artificial lake used as a source of water supply.

River- a large natural stream of water flowing in a channel to the sea, a lake, or another such stream.

Runoff - the draining away of water (or substances carried in it) from the surface of an area of land, a building or structure, etc.

Solid - firm and stable in shape; not liquid or fluid.

Tributary - a river or stream flowing into a larger river or lake.

Velocity - the speed of something in a given direction.

**Getting to Know H<sub>2</sub>O – The Water Cycle** - UCR PhD and IGERT Water SENSE fellows collaborated with a GluckTV fellow to make a film to show the water cycle and give tips on how to protect one of Earth's most precious resources.

IGERT stands for Integrated Graduate Education Research Training; Water SENSE IGERT fellows are students of various disciplines – more information can be found at: <https://watersense.ucr.edu>

The Gluck Fellows Program of the Arts at UC Riverside supports UCR students doing arts outreach in the Inland Empire.

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