



DIRECT AND INDIRECT WATER USE WORKSHEET

How do we use water?

Water can be used for direct and indirect purposes. When you use water for things like bathing, drinking, or cooking it is direct use. In other words, if you turn on the tap and use the water then it is considered direct use.

Indirect water use is when water is used to produce or make the goods that people need. Water is being used during the growing, production, and delivery of those goods. An example of indirect water use would be making paper. In this example water is used to grow the tree that eventually is cut down for paper and water is used in the process that makes the actual paper.

Table 1. At home what are some examples of direct water use? Give 3 examples of direct water use and estimate or guess how much water it takes to do each of those.

	Direct water use	How much what do you think it takes?
1.		
2.		
3.		

Arizona's diverse land and climate give us the opportunity to have many kinds of industries that produce goods that we consume, use, or need. Water is used in the production of those goods.

Table 2. At home what are some items that were produced with indirect water use? Give 3 examples.

	Indirect Water Use Items
1.	
2.	
3.	



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Did you know? Read about industries in Arizona that use water.



Frito-Lay: is part of the Pepsi Company. It has 29 snack brands! The company has a manufacturing facility in Casa Grande, Arizona where they produce your favorite chips like Ruffles, Fritos, Tostitos, Doritos and Cheetos. It turns about 500,000 potatoes into potato chips every day. It takes about 49 gallons of water to produce a small bag of potato chips. The water is used to rinse the potatoes and water is also mixed with potatoes to make a chip. There is additional water used when making plastic bags and growing the potatoes. The Casa Grande facility generates its own power and generates nearly zero waste! This means they use recycled water during the production! If they do need additional water, they use groundwater.



Cattle Ranching: Ranchers are one of the largest land users in Arizona. In Arizona 73% of Arizona's total land area is used for grazing livestock. Meaning most of the land in Arizona is used to raise cattle. There are approximately 1 million cattle which equals 455.7 million lbs. of red meat (beef). Beef provides 10 essential nutrient that includes zinc, iron, protein, and B vitamins. Ranchers not only produce beef, but they also produce milk. There are 4.5 billion lbs. of milk produced each year from 205,000 cows! It takes 48 hours for the milk to get from the dairy farm to the store. Water is used in every step on the production of beef and milk! Specifically, to make a hamburger patty it takes approximately 660 gallons of water and 50 to 60 gallons of water for a small glass of milk (~8 oz). Water is used to clean cattle, for cows to drink, to wash cut meat, to clean equipment, and water is also mixed with milk. There are 3 main water sources: Groundwater, Surface water (lakes and rivers), and Colorado River water (brought through canals called Central Arizona Project).



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Intel: A technology company, Intel has been in Chandler, Arizona for over 40 years! And is one of the largest manufacturing companies in the state. It produces small microchips made of semiconducting materials for your computer. The microchips are super small but during manufacturing it is important to keep parts clean so ultra-pure water is used (water that has no minerals). So much water is used during production, ~2 million gallons per day (30,000 bathtubs)! To reduce water use Intel recycles the water. After manufacturing, water is collected and cleaned. The cleaned water can then be used again during the production process or is sent to irrigate golf courses and replenish urban lakes around the City of Chandler. Water from the Salt River Project and the Central Arizona Project Canal, along with groundwater, is brought to the facility through pipes.



Freeport-McMoRan Copper & Gold Mines: One of the largest copper companies in the world. Copper mining is an industry that helped found Arizona's economy and it's represented in the seal of Arizona. In 2014 Arizona produced ~65% of the country's copper. Copper is essential in the production of smart phones, mobile devices, airplanes, solar panels systems, home plumbing, vehicles, and medical care products. Copper also kills bacteria! Copper is extracted from hard rocks that are crushed into smaller rocks. Water is used to keep dust down during mining and crushing. Also, water is used to extract the copper from the rocks. Freeport uses about 18 billion gallons of water per year between all it's 5 mines in Arizona. It takes about 400 to 800 gallons of water to produce one ton of copper (or 2,000 pounds), that is like a very large boulder or rock! Because of the location of the mines more of the water used is groundwater.



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Your Turn:

Table 3. Using what you read above, fill in the information on the table below.

Item or activity	How much water does it take?	How is water being used?	Where is the water coming from?
Small bag of potato chips			
Hamburger (including bread, meat, lettuce, tomato)			
One ton of copper			
Small glass of milk			
Semiconductors (per day by company) (see Intel below)			
Flush toilet	1.6-7 gallons	Direct use.	
Shower (5 minute)	27 gallons	Direct use.	

Some more interesting indirect water use numbers -

- **One sheet of paper:** ~3 gallons. It takes water to harvest the trees. Wood is made in to pulp in which water is used.
- **One apple:** ~17-22 gallons. It takes water to harvest the trees and to rinse and sanitize the fruit.
- **One slice of cheese:** ~40 gallons. This includes water used for raising and grazing cattle. It requires water during the production process of making milk to cheese.

To find more water footprints of other items we use visit:

<https://www.watereducation.org/post/food-facts-how-much-water-does-it-take-produce>

<https://www.watercalculator.org/water-footprints-101/>