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Water Tower Challenge

This lesson is part of an ongoing monthly series that encourages young adults to learn about the environment through hands-on activities. These activities are recommended for ages 8+ and are designed using materials that most households have on-hand.

We use water in our everyday lives for drinking, cleaning, cooking, and playing in. When we turn on the faucet, the water flows out for our use. Where does our drinking water come from? This month, we will investigate where our drinking water comes from and build our own water tower.

Depending on where we live our drinking water can come from a variety of sources. We can drink water from deep in the ground or the surface of lakes, rivers, and streams. When rain and snow seeps into the ground, the water gets stored underground in the spaces and cracks in soil, sand and rocks called aquifers. This is where groundwater comes from. Rain and snow can also travel into lakes, rivers, and streams giving us surface water. The water that we drink is pumped from the water source (surface or groundwater) into pipes or tanks. These pipes eventually lead into the faucets in our homes, schools, and offices.

One method of storing drinking water is a water tower. How does a water tower work? Let's take a look and create our own model water tower.

Model Water Tower

Materials:

- Milk jug (cleaned with lid)
- Baking pan (to capture water flowing from the water tower)
- Tin Can (large enough to support a full milk jug)
- Tape
- Water
- Paper towels/towels for clean up



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Directions:

1. Make a small hole at the bottom of the milk jug approximately 2 inches from the bottom. **HAVE AN ADULT HELP WITH THIS STEP!**
2. Place a piece of tape covering the whole on the milk jug.
3. Fill the milk jug with water and put the cap on. Can add a few drops of blue/green food coloring to make water easier to see.
4. Place the milk jug on top of the tin can. *Note tin can must be taller than baking dish so the water will flow into the dish.
5. Place the baking dish next to the water jug and underneath the hole in the milk jug.
6. What do you think will happen when the tape is removed? Record your hypothesis in your nature journal. ([Upcycled Nature Journal Activity](#))
7. Remove tape from hole in the milk jug. Record your observations.
8. What do you think will happen when you remove the lid?
9. Remove the lid on the milk jug. Record your observations.
10. Observe the flow of water. Does the flow change as the water level in the milk jug drops? Record your observations.



What exactly is happening?

How did the water flow from the milk jug into the pan? Water flows out of the tank using hydrostatic pressure produced by the water tank's elevation. This is due to gravity! As the force of gravity pushes down, water flows out of the water tank. This was observed when we removed the tape from the milk jug.

Why did the flow of water change when we removed the lid? Before we added water into the milk jug, it was full of air molecules. These air molecules were forced out of the jug as the water was added. Therefore, when water molecules flow out of the milk jug air molecules come in. You can think of this as always having an even exchange of air and water molecules in the milk jug. When the tape only was removed, only a few air molecules were able to enter the jug causing a small stream of water to flow out. When the cap was removed, more air molecules were able to enter the milk jug and (along with gravity) pushed the water molecule out. As the water level in the milk jug continues to go down, there is not enough hydrostatic pressure (again from gravity) to keep the water flowing.

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Why is this important?

A water tower is simply a large, elevated storage container that was designed to safely hold drinking water. The water tower is built at a height sufficient to pressurize a water distribution system. The water tower needs to be big enough to supply residents of a community, or a building, with water, and maintain the quality of the water that is stored and delivered.

Here at Glen Foerd, you can visit our old water tower! Built in the 1800s, our water tower was built of stone that supported a large wooden tank. The tank held enough water for the Glen Foerd estate as well as some neighboring homes! Water was pumped up to the tank by a steam pump. Eventually the tank was removed, and it served as an observation tower.

Take it further! Engineer your own water tower!

Water towers can come in a variety of different shapes and sizes! No matter what the water tower looks like, engineers have to design the water tower, so it safely delivers drinking water to homes, schools and businesses.



1800s Glen Foerd Water Tower



Milk Bottle Water Tower
Philadelphia, PA



Globe Water Tower
Somerset, PA

<https://www.roadsideamerica.com/search/tip>

Now put your engineering hat on and design and build your very own water tower! In the activity below, design and build the 3 main components of a water tower: the water tank, the stand, and the frame. Using the suggested materials, design and build your own tower. Once your tower is built, test it out and see if it will hold a cup of water! Be creative and have fun!

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Engineer Your Own Water Tower

Materials:

- Water Tank
 - Plastic cup
 - Plastic water bottle (bottom half)
- Base of Tank
 - Cardboard
 - Index cards
 - Craft foam
- Frame
 - Craft sticks
 - Straws
- Scissors
- Tape
- Glue
- Nature Journal ([Upcycled Nature Journal](#))
- Pen/Pencil
- Cup of water



Directions:

1. Gather all materials needed.
2. Draw your own design in your nature journal. ([Upcycled Nature Journal](#))
3. Construct.
 - a. Build the base of the tank.
 - b. Build the frames of the tower.
 - c. Attach the base to the frames.
 - d. Place and attach the water tank on top of the base.
4. Test it out!
 - a. Add water into your water tank.
5. Did the tank hold the water? Did it stay standing? Record your observations in your nature journal.
6. Record what worked and what didn't work in with your design.
7. Resign and rebuild!



Want to share your Water Tower with us? Email us at kateriley@glenfoerd.org with Water Tower Challenge as the subject. We would love to see your work!