

What's With Weather?: Wind

You're on your way to becoming a junior meteorologist! Today we're going to learn more about another ingredient for weather—wind! Learn what causes wind, why it's important, and how scientist learn about wind before doing your own experiment to see what's blowing in your neighborhood and building another tool for your weather station!

(If you haven't checked out "What's With Weather: Forecast It!" you might start there first!)

Supplies:

- For Wind Experiment:
 - A few plastic lids
 - Petroleum jelly
 - Yarn
 - Hole Punch
 - Magnifying Glass (optional)
 - Windy day!
- For Anemometer:
 - 5 small dixie cups OR 1 egg carton
 - Scissors
 - Hole punch
 - Tape
 - 2 straws OR wooden dowels
 - 1 push pin
 - 1 pencil (with eraser)
 - Electric fan (optional)

What's With Wind?

We've already learned that **weather** is the mix of events that happen each day in our **atmosphere**. We know that there are many different pieces that make up weather, but **temperature**, **atmospheric pressure**, **wind**, **humidity**, **precipitation**, and **cloudiness** are especially important! We've also learned that **meteorologists** are scientists who study and **forecast**—predict—the weather and learned about some of the tools they use to make accurate forecasts! [TIP: If you haven't tried out "What's With Weather: Forecast It!, you might want to try that Discovery at Home first!]

Today we're going to learn about one of those important pieces for weather—**wind**!

Wind is **air in motion**, but what causes it? The Sun's rays heat up Earth's surface and its atmosphere. . .but don't heat it all evenly. Some parts of Earth's surface warm quicker. Warm air weighs less than cold air, so the warm air rises up and it is replaced by cool air. This movement—caused by uneven heating—is wind! If you remember from What's With Weather: Forecast It!, our weather is also caused by differences in **atmospheric pressure** (remember, that's what we measure with our **barometer**). Atmospheric pressure is also a part of wind! Warmer air is usually found in **low pressure systems** (L on our weather maps!) and cold air is usually

found in **high pressure systems** (H on our weather maps) so wind usually blows from high pressure to low pressure systems! Land formations can also affect wind. Mountains, valleys, lakes, and deserts will all change how the atmosphere warms and can funnel how wind blows. Humans can also impact wind! Skyscrapers and other all buildings close together can impact air pressure and funnel wind between them!

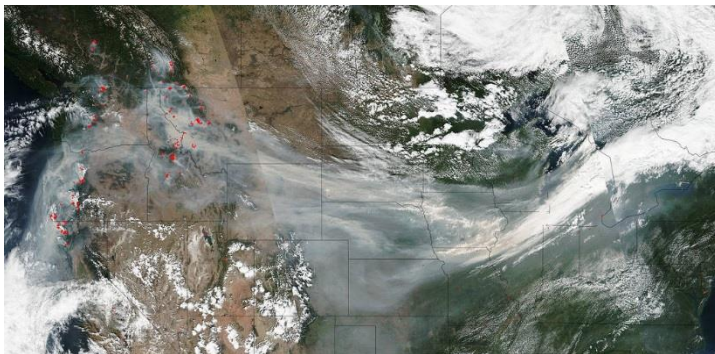
But the land doesn't just shape wind, wind shapes the land! Over time wind can cause **erosion** and even quickly change landscapes, such as sand dunes! You can experience this yourself if you ever visit Colorado's Great Sand Dunes National Park!



Colorado's Great Sand Dunes are shaped by wind daily!

Why Care About The Wind?

Wind is very important to our planet! It's a great source of **energy** for us humans to use, and it never disappears. Wind helps to **drive our ocean currents**, that humans and animals depend on. Maybe most importantly, **wind transports heat, precipitation, pollution, dust, smoke, and pollen across the planet** for good (and bad). A storm in one part of the globe can be blown to a different location, in the same way smoke from forest fires far away can be seen (and smelt) somewhere else. Maybe you've experienced this yourself when California wildfires can be smelt far away here in Fort Collins! Scientists can track where wind is blowing and



This picture taken by one of NASA's satellites shows smoke from burning wildfires in 2017 blowing across the country. Actively burning areas were noted in red. <https://climate.nasa.gov/news/2624/wildfire-smoke-crosses-us-on-the-jet-stream/>

what it's blowing where, by using a variety of tools. Today, satellites in space are one of the best ways for us to track (and see) wind! Scientists also use tools such as **windsocks, wind vanes, and anemometers** to track, forecast, and describe wind.

How Do We Describe Wind?

Scientists describe wind by wind direction (the direction the wind is blowing from) and speed. They calculate speed using tools like **anemometers** (see below).

Why Track & Forecast Wind?

Why track and forecast wind? Wind does a lot of great things for our planet, but it can also be damaging and deadly for humans! Hurricanes, typhoons, blizzards, and tornadoes can wreck a lot of damage—and even more if we don't know these storms are coming. By tracking wind and knowing how fast storms are moving, forecasters can help keep people safe—even save lives!

DISCOVERY AT HOME

Your Turn!

Now that you know a bit about wind it's your turn to track information about wind in your neighborhood! Conduct an experiment to see what's blowing around your house and add your own anemometer to your meteorologist tool kit!

Experiment: What's In The Wind?

Wind transports all sorts of things around the world—precipitation, pollution, pollen and more! You can see some of what is blowing through your neighborhood! Set up this experiment to discover what's in the wind!

1. Gather your supplies! You'll need some plastic lids, a hole punch, scissors, string, and petroleum jelly.



2. Punch a hole near the edge of all your lids and tie a string through the hole to create a hanger.



3. Cover both sides of your lids with petroleum jelly...careful this can get messy!

4. Hang your lids in different locations around your yard on a windy or breezy day.

Hypothesize:

What do you think will get caught on your lid?

5. Leave your lids outside for a few hours to collect whatever's blowing in the wind. Then bring them inside. Place them on a paper towel or cookie sheet and observe!



Observe:

Observe with your eyes.

- **What got caught to your wind sample tools?**
- **Do you see anything that surprises you?**
- **Does it match your hypothesis?**

Get out your magnifying glass.

- **Do you see anything you didn't notice with your plain eyes?**
- **What does this tell you about what's blowing through your neighborhood?**

Level Up: Try this experiment over the course of several days or during different seasons. **What changes from week to week or month to month? What does this tell you about weather?**

This tool can't catch everything that the wind might be carrying. It's hard to catch things like smoke or pollution or precipitation, but you might see dust, leaves, seeds, maybe even insects or pollen!

Make Your Own Anemometer:

Meteorologists and other scientists use a tool called an **anemometer** to measure **wind speed**. While tools like windsocks and weathervanes can tell us which direction the wind is blowing, anemometers can help us measure the velocity of the wind too and help us make better forecasts and see if wind speeds might cause damage. Add your anemometer to the weather station you might have built from “What’s With Weather: Forecast It!”

The word anemometer comes from the Greek words “anemos” which means wind and “metron” which means measure!

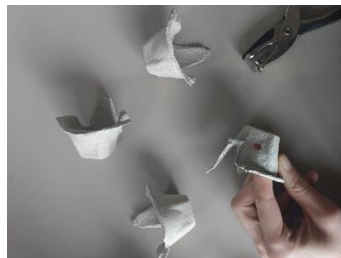
1. Gather your supplies! You’ll need tape, a push pin, scissors, a hole punch, a pencil, two straws (or wooden dowels) and five small dixie cups...if you don’t have cups on hand (like us!) you can use an egg crate instead!



2. If you’re using an egg carton instead of small cups, start by cutting off the four corners of the carton and one other carton piece. These will serve as your cups! (If you have cups skip to step 3).



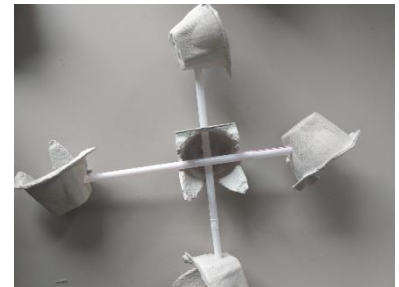
3. Lay out four cups/carton pieces in this pattern and punch a hole on the inside side of each cup/piece.



4. With your last cup/piece poke a hole in the bottom. Add holes on all four sides (you may only need to punch one hole in your carton piece.)



5. Push your straws through the holes middle cup/piece to form an X. If you have a carton piece you may be able to cradle the X in the spaces. Poke the ends of the straws through your 4 outside cups/pieces. You may need to secure them together with tape or glue.



6. Poke your pencil (eraser side up!) through the bottom hole, using a push pin, secure through the two straws into the eraser. Your anemometer is now complete!



Dixie cup example for reference.

7. Make sure all four cups/pieces are facing in the same direction! Your pencil will also need to spin freely, so it is best to simply hold it between your fingers, however, you can also try weighting a bottle with sand or rocks and placing your pencil inside to create a stand.

Calibrate & Observe:

Hold the pencil between your fingers in a windy place (you can also use a fan indoors). **What happens? Why does the anemometer spin? Why does it spin only one direction? What will happen if you set the fan to a higher speed or the wind blows stronger?**

Want to **calibrate** your anemometer so you can know the wind speed? Good for you! You're going to need the help of an adult to get your anemometer calibrated. On a calm day, with an adult driving the car, hold your anemometer out the window (stay buckled up!). Have the adult drive 5mph and count how many times your anemometer turns (rotates) in 10 seconds (HINT: it might be helpful to draw a mark on one cup and have someone time for you). Do the same at 10mph and 20mph—drive carefully! Plot down the number of rotations at each speed. With this information you can then best guess the wind speed at other times, by counting the rotations it makes in 10 seconds and comparing it to the data you collected when calibrating it! For example, if your anemometer turns 8 times going 5mph and 16 times going 10mph then later if it turns 12 times you can guess the wind speed is around 7-8mph! Of course, it won't be perfect, real anemometers use fancy computers to do the calculations and measuring for them!

Why does it work? An anemometer has four cups mounted on an axis that can spin. The cups are all aligned so they face the same direction around the circle. The open sides of the cups catch the wind more than the closed sides. When the wind blows it pushes on one side of the anemometer harder, causing it to spin! The rotation speed can then be used to determine the wind's speed.

Meteorologists use anemometers to measure wind speeds and know how fast approaching storms will get here among other things, but they aren't the only people who use anemometers! Anemometers at airports help pilots know when it's safe for planes to land and take off. Engineers use anemometers to find places with consistent high wind speeds, so they know where to build wind turbines to convert wind into energy. **How else do you think anemometers can be used?**

Keep Discovering!

Like this Discovery at Home? Keep your eye out for more "What's With Weather?" activities and check out these other Discovery at Home activities connected to weather and wind! And tag us with your creations and experiments @focomod we'd love to see them!

- What's With Weather?: Rain
- Investigating Clouds
- Harness the Wind!

- What's With Weather?: Forecast It!