

# Weather Wonders

A 5-day science adventure for kids



Explore, read, play, invent, build, and learn —  
all about climate and weather



Brought to you by Reading Rockets, with support from the Park Foundation



# Weather Wonders

A book-based adventure about climate and weather

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# Welcome to Weather Wonders

The best way to get kids learning is to build on their curiosity and interests. The Weather Wonders program is kid-centered, with an emphasis on inquiry and creativity.

We've designed the program to be user-friendly and adaptable. Use the materials each day for five days in a row, or once a week for five weeks (or any other way you like) to add hands-on learning to your summer programming.

**Day 1:** Weather, Seasons, and Climate

**Day 2:** Atmospheric Science

**Day 3:** Extreme Weather

**Day 4:** STEAM-y Weather

**Day 5:** Weather Brings Us Together

# Weather Wonders: Introduction

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## Getting yourself ready

- **Each day has an emphasis on one or more topics related to weather.** You'll find an introduction to the concepts covered and recommended books for each day, as well as a list of questions to guide explorations and activities.
- **Start by gathering books from your library** using the booklists here in the toolkit.
- **Choose both fiction and nonfiction books** from the lists provided.
- **Read them through before you read them to the kids**, so you know what happens and can spot any unfamiliar words or concepts you'll need to explain. Also, look for **places to ask questions** while you're reading to engage listeners.
- Think about which other parts of the program you'd like to do after reading the books. An activity is always a good idea, and you may also want to include writing, exploring related websites, videos and apps, and heading outside, too.
- **Get connected to NOAA guest speakers and field trips in your area:** <https://www.noaa.gov/education/noaa-in-your-backyard> or invite the National Weather Service to visit virtually with your program: <https://www.weather.gov/education/school-out-reach>. Check too with your local college or university to see if they have a meteorology department or what weather-related exhibits a local science or children's museum might have. Or reach out to your local TV news station about a field trip or other opportunities to meet a meteorologist or weather broadcaster.



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## Learning with the kids

- **Introduce the theme** for the day and ask kids what they know about it. (See “Activating background knowledge” on page 4.)
- **Read one or more of the books aloud and ask questions.** Listen carefully to the kids' answers. By reading to them and asking questions, you'll get them thinking about the topic, and what they want to learn. You'll also increase their understanding and excitement.



## Weather Wonders: Introduction

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- **Read another book and repeat.**
- **Choose a hands-on activity** to let kids explore the theme. By doing an activity, the kids get to use the concepts and new words they have learned.
- **Look for a local connection.** How can you connect the ideas in the books or the activities with the kids' personal experience? Think about walks in the rain, visiting a meteorologist, checking on the effects of weather on animal habitats or gardens.
- **Keep asking questions** and listening carefully to the children's answers.
- **Encourage kids to write** about what they are learning or curious about by using one of the writing prompts in this toolkit, and by keeping a **Weather Journal** for observations, drawings, questions, and creative writing activities.
- **Provide access to books about the topic** for kids to look at on their own.
- **Share digital media with kids** (websites, apps, videos, and podcasts) that they can use to learn more about the topic and give kids time to try them out.
- **Take a field trip** to one of the recommended locations to further explore your topic for the day or theme for the week. Activities for each day will include a **Weather Walk** with special attention to observing and predicting weather and understanding climate.

You can choose any of the activities in this toolkit, all of them, or just one or two, but we recommend that you **always Start With a Book.**



# Weather Wonders: Introduction

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## Review and teach new words

When you are pre-reading your books or looking at activities, websites, apps, or field trips, look out for words kids might not know. Take time to talk about those words and tell kids what they mean. You can provide images, video, and real objects to help them build an understanding of unfamiliar words. You can even act words out! You can do this before you read, before you do an activity, or while you are reading or trying a hands-on activity.

If words or concepts are being repeated, ask kids if they remember what they mean and how they might be used the same way or differently in this new context.

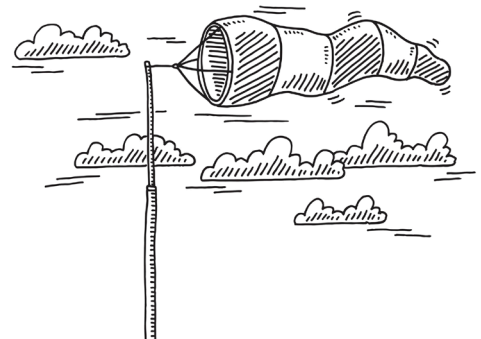
The glossary of **Weather Words** on pages 146-151 can help you define terms that kids might not be familiar with.

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## Activating background knowledge

Ask kids what they know about weather as you begin this program:

- What is the difference between weather and climate?
- How and why does weather change?
- Why is knowing about weather important to us in our everyday lives?
- How does weather impact our world and how people live?
- What do you wonder about weather?



## Connecting the days and concepts

Children will learn more readily and remember more if you review all five days of materials in advance and decide which books and activities you want to use. Connecting the ideas and activities day to day will help them create a big picture.

At the beginning of the day, ask them, “*What did we talk about yesterday?*” Then tie their answers to the focus for the day.



## Weather Wonders: Introduction

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You may choose to use all the days or you may select specific days for your program. You may select different activities; however, the **daily Weather Walk** is critical in helping children connect ideas with their everyday environment.

Setting up an **Weather Station** — providing kids with or having them build their own weather instruments — will provide opportunities for observation and reflection as well as help develop their interest in science, math, and engineering.

Use the **Weather Movement** activity to get kids' blood and oxygen flowing and ready to listen and learn. Sitting still and silent is not a developmentally appropriate expectation for most young children. Weather Movement can help you transition between activities, or work as an energizer to reduce restlessness while reinforcing content.

Ultimately, children will develop a deeper understanding if they connect the different ideas from each day.

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### Climate check!

Each day includes an activity focused on climate and how it is changing. It explores concepts around climate, climate change, and action. Kids explore climate and weather, what is happening with climate at home and around the world, the role of technology in combating climate change, and how to take action in their own community. These are the climate check topics:



**Day 1: Climate vs. weather**

**Day 2: The greenhouse effect**

**Day 3: Preparing for the effects of climate change**

**Day 4: Climate and technology**

**Day 5: Weather energy**

### Planning the daily Weather Walk

We experience weather every day, but how often do we truly observe it? A quick glance at a weather app, the newspaper, or a look out the window is often all the attention the weather usually gets as we get dressed and plan to head out for our day. Only when big weather events are happening do we really pay attention. Snow day? Heat wave? Hurricane or high winds? NOW, the weather has your attention. Especially if you are planning an outside activity like a soccer game, picnic, or field trip.



Making weather watching a daily experience provides opportunities to practice observation and data recording skills, facilitates real-world interaction with the environment and STEM, and supports kids' connection to their own communities and the larger world. Weather watching also demonstrates, in a very concrete way, how nature, science, technology, and curiosity/exploration are part of our everyday lives.

Though a Weather Walk is recommended daily, if you have the opportunity, take kids outside more than once during the day to observe how the weather changes!

### What you'll need for the daily Weather Walk:

- A place to walk and observe the weather
- Weather Journals or notebooks and colored pencils for each child
- Gear appropriate for the weather — sunscreen, hats, umbrellas, etc. (optional)
- Weather instruments and resources like weather apps, websites, or news channels

Including a daily Weather Walk in your Weather Wonders program is a way to anchor the topic and key concepts in daily activities and provide a framework for further exploration and discussion. Watching the weather at home makes it personal. Following the weather from a location someplace else in the world provides contrast and context. Choose a place with a different climate or hemisphere, or pick someplace rural if you live in an urban environment, and vice versa. Do kids have family in other parts of the world? Are they interested in a place in the current events spotlight?

To help keep your weather data consistent, plan for Weather Walk observations to take place every day, at the same time, and in the same location. While suggestions for Weather Walk activities will vary, count on always incorporating these components in each Weather Walk:



# Weather Wonders: Introduction

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## Daily Data Collection

- Start with the senses. Have kids write in their Weather Journal what they see, feel, hear, touch, and even taste (rain drops or snow flakes).
- Check a thermometer and record the temperature. If you like, measure the temperature in the sunshine and the shade. If you have made other weather instruments, like a weather vane, barometer, anemometer, hygrometer, and rain gauge, check those, too. Have kids record all data, along with the date and time, in their Weather Journal.

## Sky Sketch

- When you are out on your Weather Walk, give kids time to look up at the sky (but not directly at the sun)! Have them especially look carefully at clouds, sketch them, and describe them in their own words in their Weather Journals. As kids sketch, help them understand that they don't ever have to draw beautiful "perfect" pictures — the Sky Sketch is to document their observations and draw what they think is important to remember.
- Based on their observation and sketch, have them write predictions about what the sky will look like the next day.
- Encourage them to look for changes in their Sky Sketches and recurring patterns, and note those in their Weather Journals.



# Weather Wonders: Introduction

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## World Weather Wise

- Check local weather using a favorite weather app or online site, the newspaper, or a local TV or radio station. Invite kids to make note in their Weather Journal of what these resources report and compare it with their Daily Data Collection.
- Together, use a map to choose a location somewhere else in the world. Talk together about what they know about this place and have them predict how the weather there compared with their own. Ask them to note these things in their Weather Journal:

If they think the temperature in this location will be warmer or colder than where they are? Why?

What type of precipitation is expected there? Why?

If wind speeds are higher or lower and why.

- Check the current weather conditions of this online. Have kids record that, too, in their Weather Journal and check their predictions.

## Get outside — in all weather

We often avoid going outside when the weather isn't what we'd like it to be. Maybe it's raining, snowing, hot, or windy. Except for extreme situations, like heat advisories, lightning storms, or severe wind chill, most weather conditions, while maybe wet or messy, are safe. Make an effort to get kids outside in all kinds of weather. Experiencing the elements in person is a powerful experience, and can dispel misconceptions about the great outdoors.

The right clothing and gear make a big difference, so check to make sure kids have shoes and coats appropriate for the conditions before taking the group out. Gloves and hats are important to protect extremities or protect from the sun. If possible, encourage them to bring a spare, dry set of clothes (especially socks!) and have towels available for wet days. Warm or cool drinks enjoyed after your outdoor adventure provide the perfect opportunity to share their observations.

Beyond going outside to check the weather, create other opportunities to get outside. Take a walk in the rain and splash in some puddles. Chase leaves or fly a kite on a windy day. Go sledding or make snow angels. Go for a hike or a swim. Have a picnic. Go birdwatching. Look at the clouds. Rake leaves, grow a veggie or flower garden, or shovel snow. Nothing beats real-world experiences!



## Weather Wonders: Introduction

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### Weather journal

Journaling gives kids the opportunity to use drawing and writing together to show their observations, document their discoveries, pose questions, note their ideas, and learn to see and hear more. Keeping a Weather Journal is a great way to get your Weather Wonders' participants outdoors to explore and record their responses to and reflections about science and the natural world — and keep track of what they're learning. Get kids started on their journals with information that will help them keep track of what they wonder, identify weather phenomena, and provide them with some of the words they'll need to record their observations.

### Supplies

- Blank spiral notebook or sketchbook (or fold 10 sheets of paper in half and staple along the fold to create a booklet)
- Weather Wonders journal cover (optional, see Appendix)
- Weather Wonders weather log (optional, see Appendix)
- Writing tools
- Drawing materials

Let kids know that their journals can look however they want them to look! Kids can freely draw, write, or add photographs. It can be a place to brainstorm, keep notes and vocabulary words, make lists, sketch, or write poems. Tell them it is their place to write and draw their observations, thoughts, questions, and ideas, and as Weather Wonder, they will have a chance to make all kinds of observations and explore things that grab their curiosity.



## Weather Wonders: Introduction

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Talk with kids about how scientists keep notes and journals of their observations, data, and experiments. Writers keep journals of their observations and feelings about people and places. As Weather Wonders, ask them how they think they could use a journal.

Since part of the Weather Wonders experience is collecting weather data, help kids keep it organized with a consistent, standardized way of recording their observations. Provide the Weather Log template (in the Appendix) or point out what they need to note, which should always include the date, time, and location, and could also include:

Temperature: \_\_\_\_\_

Sky (description): \_\_\_\_\_

Wind (description): \_\_\_\_\_

Wind direction: \_\_\_\_\_

Wind speed: \_\_\_\_\_

Atmospheric pressure: \_\_\_\_\_

Humidity: \_\_\_\_\_

Precipitation type: (at data collection time): \_\_\_\_\_

Precipitation amount (in last 24 hours): \_\_\_\_\_

### Get kids thinking more about how to use their Weather Journals

Keeping a prompt or series of journal prompts can help kids who are feeling stuck. Share these sentence starters:

- I see ...
- I hear ...
- I wonder ...
- I was surprised by ...
- I feel ...
- Today's weather was...
- Today's weather made me feel ...
- This drawing shows today's weather ...

## Weather Wonders: Introduction

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The development of the Weather Wonders toolkit was made possible by a generous grant from the Park Foundation.

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### Weather Wonders toolkit creators

#### **Rachael Walker (co-author)**

Rachael has more than 30 years of experience developing partnerships with nonprofit organizations, corporations, and public agencies to benefit children and families. She launches national campaigns, coordinates special events, and develops original content for the National Education Association, Random House Children's Books, PBS, and WETA's Learning Media initiatives (Reading Rockets, Colorín Colorado, and AdLit.org). Visit Rachael at Belle of the Book: <https://www.belleofthebook.com/>

#### **Eileen Hanning (co-author)**

Eileen has more than 20 years of experience designing reading curriculum for underserved kids and training for their parents and social service providers about reading and child development. Her passion for children's books and hands-on learning has lead her to review children's books, learn, research and write about education, child development and toxic stress, and to create her own consulting company, ReadLearnReach (<https://readlearnreach.com/>), where she serves a variety of clients with their curriculum, training, children's book, and writing needs. She has developed curriculum for Random House, WETA, Reading Is Fundamental, the Girl Scouts of America, and Red Comet Press, and researched and written white papers for Tales2Go and Girls on the Run of Northern Virginia.

#### **Ron Gird (reviewer)**

Ron is a retired Meteorologist and Outreach Program Manager with the National Weather Service. He has served as a consultant to Plan!TNOW, Time/Life Books, the American Meteorological Society, the National Geographic Society, and the Smithsonian National Air and Space Museum. Previous assignments included work with the NOAA Satellite Program, NWS Satellite and Spaceflight Programs, the NWS Storms Prediction Center, and The Analytical Sciences Corporation (TASC). He currently serves on the STEM Advisory Council for the Children's Science Center. Ron received his B.S. in meteorology from the Pennsylvania State University and he continues to support Penn State by serving on several advisory committees.

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#### **Tina Chovanec (design)**

Senior Director, Start with a Book and Reading Rockets

# Day 1

## Weather, Seasons, and Climate







# Day 1

## Weather, seasons, and climate

### Introduction

Weather changes from day to day. Some days are sunny; others are windy, cloudy, or snowy. Seasons change throughout the year, affecting the weather. People try to predict the weather so they'll know what to wear, how they should plan their day, or if it's safe to travel. People might choose to live in a place because of the [climate](#) — or the average weather patterns over the years.

Scientists describe [weather](#) as the state or condition of the atmosphere. The [atmosphere](#) is the “air” we breathe and a mix of gases held in place around the planet by gravity. So, weather is what is happening in our atmosphere. Climate is the average weather conditions over a long time, like 30 years.

Climates change more slowly than weather. [Climate change](#) is when the typical weather in a region changes over a long period of time. For example, the average temperature or rainfall could change. Scientists have noticed that the Earth is getting warmer. That means climates all over the Earth are changing.

[Seasons](#) are periods of the year distinguished by special climate conditions. Some places on Earth experience four seasons: winter, spring, summer, and fall. Near the equator, they experience two seasons: rainy and dry.

Activities for this day help kids to understand how we experience weather, climate, and the seasons all at once! Your weather may change every day. Your season changes two to four times a year, depending on where you live.

### Questions to guide explorations and experiments

- What is weather?
- What is precipitation?
- What are clouds? What kinds of clouds are there?
- What are seasons?
- What makes the seasons change/happen?
- Why is winter cold and summer hot?
- What is climate?
- What is climate change?
- How do mountains or oceans affect weather?

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### Books and activities

- **Books:** all about weather, climate, and seasons
- **Activities:** explore precipitation and seasons, take a Weather Walk

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### Water basics

If your kids need a refresher in water basics (the states of matter and the water cycle), [see pages 33-37](#). You'll find books, a simple activity, and a list of water words.



## Children's Books

### Fiction

- *A Busy Year* by Leo Leoni (Ages 3-6)
- *Busy Spring: Nature Wakes Up* by Sean Taylor and Alex Morss (Ages 5-8)
- *Días y días / Days and Days* by Ginger Foglesong Guy (Ages 3-8)
- *Frog and Toad All Year* by Arnold Lobel (Ages 3-8)
- *If Winter Comes, Tell It I'm Not Here* by Simona Ciraolo (Ages 4-8)
- *It Looked Like Spilt Milk* by George Shaw (Ages 4-8)
- *Leaf Man* by Lois Ehlert (Ages 4-8)
- *Little Cloud* by Eric Carle (Ages 3-6)
- *Lola Shapes the Sky* by Wendy Greenley (Ages 4-8)
- *The Longest Night* by Marion Dane Bauer (Ages 6-9)
- *Mouse Seasons* by Leon Leoni (Ages 3-7)
- *My Awesome Summer* by P. Mantis by Paul Meisel (Ages 4-8)
- *My Happy Year* by E. Bluebird by Paul Meisel (Ages 4-8)
- *Rain* by Manya Stojic (Ages 3-7)
- *Rain Play* by Cynthia Cotton (Ages 4-6)
- *Seasons* by Hannah Pang (Ages 3-8)
- *Summer Green to Autumn Gold: Uncovering Leaves' Hidden Colors* by Mia Posada (Ages 5-9)
- *This Beautiful Day* by Richard Jackson (Ages 3-6)
- *Wild Summer: Life in the Heat* by Sean Taylor and Alex Morss (Ages 5-8)
- *Winter Sleep: A Hibernation Story* by Sean Taylor and Alex Morss (Ages 5-8)
- *Wolf in the Snow* by Matthew Cordell (Ages 3-6)

### Poetry

- *Snow Birds* by Kirsten Hall (Ages 6-9)
- *Snowman – Cold = Puddle: Spring Equations* by Laura Purdie Salas (Ages 4-8)
- *Weather: Poems for All Seasons* by Lee Bennett Hopkins (Ages 3-6)
- *Watersong* by Tim McCanna (Ages 3-6)
- *Winter Friends* by Mary Quattlebaum (Ages 3-7)



## Children's Books

### Nonfiction

- *All the Water in the World* by George Ella Lyon (Ages 3-8)
- *The Cloud Book* by Tomie de Paola (Ages 4-8)
- *Clouds (National Geographic Explore My World)* by Marfe Delano (Ages 3-7)
- *Clouds* by Anne Rockwell (Ages 3-7)
- *Down Comes the Rain* by Frank Branley (Ages 5-9)
- *A Drop of Water* by Walter Wick (Ages 6-9)
- *Everything Weather (National Geographic Kids)* by Kathy Furgang (Ages 8-12)
- *It's Raining* by Gail Gibbons (Ages 3-8)
- *Look at the Weather* by Britta Teckentrup (Ages 6-9)
- *On the Same Day in March* by Marilyn Singer (Ages 5-7)
- *One Well: The Story of Water on Earth* by Rochelle Strauss (Ages 9-12)
- *The Reasons for the Seasons* by Gail Gibbons (Ages 4-8)
- *Red Leaf Yellow Leaf* by Lois Ehlert (Ages 4-8)
- *The Science of Weather: The Changing Truth About Earth's Climate* by Ian Graham (Ages 8-12)
- *See Inside Weather and Climate* by Katie Daynes (Ages 4-8)
- *Snow is Falling* by Frank Branley (Ages 3-8)
- *Water (National Geographic Readers)* by Melissa Stewart (Ages 7-9)
- *Water Is Water* by Miranda Paul (Ages 3-6)
- *Weather and Climate* by Joe Greek (Ages 6-10)
- *Weather* by Seymour Simon (Ages 6-10)
- *Weather Words and What They Mean* by Gail Gibbons (Ages 6-9)





# Activity 1: Cloud in a Jar

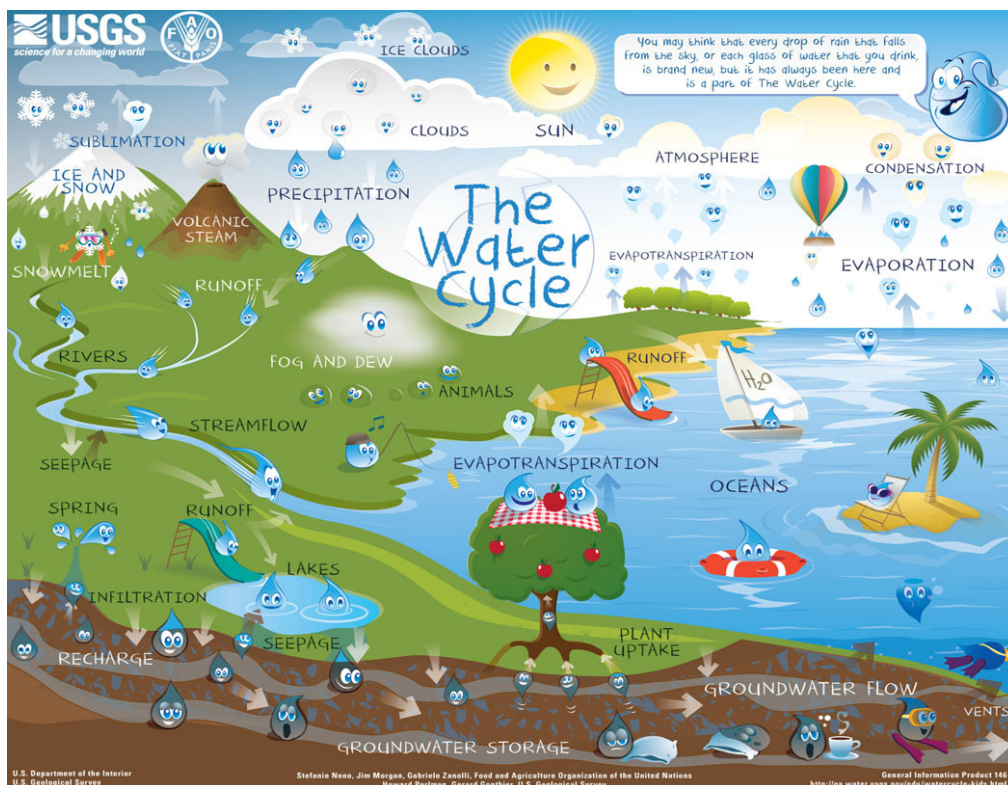
## Introduction

Weather is often about **precipitation** — liquid or solid water particles falling from **clouds**. It can be rain, snow, or hail, for example. It's all part of the **water cycle** — where water falls from clouds to the Earth, flows to rivers, streams, and oceans, and, at some point, **evaporates** and rises back up into the **atmosphere** and **condenses** into clouds.

**Explore the water cycle:** <https://youtu.be/z5G4NCwWUxY>

## The water cycle

The water cycle is the continuous, natural circulation of the Earth's water through evaporation, condensation, precipitation, and collection in lakes, streams, rivers, and oceans.



Interactive diagram from the U.S. Geological Survey. Try the interactive game: <https://www.usgs.gov/media/images/usgs-water-science-strategy-water-cycle>



## Activity 1: Cloud in a Jar

All the water available to drink on the Earth — about 121,000 cubic miles of it — circles around and around in the water cycle. And, all the water in the world now was once drunk by dinosaurs. That means that the water we have now is dinosaur pee!

**Explore more about the water cycle:** [https://youtu.be/o\\_bbQ0m3wuM](https://youtu.be/o_bbQ0m3wuM)

The water on the earth evaporates, or turns into gas or vapor, and rises up through the atmosphere. There, it cools and combines with dust to form as clouds. Clouds are a mass of tiny water droplets floating in the atmosphere that we can see from the ground.

**Try this easy condensation activity:** Give each child a metal spoon and have them breathe on it. The warm air from their body has water in it. It will cool quickly as it touches the metal spoon and condenses into fog on the spoon.

Different kinds of clouds exist at different altitudes or heights in the sky. *Cirro/us* means high and *alto* means middle. Stratus clouds are very low, touch the ground, and are gray. Fog is a stratus cloud. Cumulus clouds are also low and puffy, like cotton balls. Cirrus clouds are high and wispy. The clouds can also combine with nimbus clouds to create rain or snow. Depending on how cold it is, the precipitation coming out of the clouds could be snow, hail, sleet, or rain.

**See the cloud chart from Day 2 for examples.**

Review the water cycle and the states of matter of water: liquid, gas or vapor, and solid. See pages 33-37 for resources on water basics.

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### Supplies

- jar or clear plastic cup
- water
- foam shaving cream (not gel)
- food coloring drops
- pencil, paper, or journal for recording observations
- cloud identification sheet



## Activity 1: Cloud in a Jar

### Get kids thinking ...

Start by asking a couple of questions: Do you like it when it rains or snows? What is a cloud? What makes rain fall out of clouds?

Create a model of a cloud to see how rain falls out. Then identify clouds in the sky.

**Explore clouds:** <https://www.pbslearningmedia.org/resource/evscps.sci.life.clouds/clouds-and-weather/>

### Let's get started!

Think and talk about what your the cloud model will look like:

- The water in the jar is the atmosphere
- The shaving cream is a cloud
- The food coloring is water that is collecting in the cloud

### Then build your model:

**Step 1:** Fill the jar or cup almost to the top with water.

**Step 2:** Spray a "cloud" of shaving cream on the top of the water.

**Ask kids** to write a prediction about what will happen when you drip the food coloring into the cloud. Will it stay in the cloud? If it comes out, how long/how many drops will it take?

**Step 3:** Drop food coloring into the cloud until the color starts "raining" into the water below.



Photo: [Raising Veggie Lovers](#)

Explain that rain forms in clouds in the same way. When enough water collects in a cloud it gets heavy and leaks through, forming rain.



# Activity 1: Cloud in a Jar

Explain that depending on the temperature and atmospheric conditions between the cloud and the Earth, the water might freeze and turn into sleet, hail, or snow.

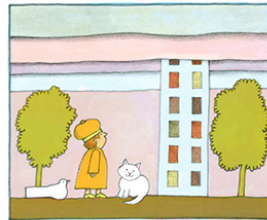
Invite kids to write down what happened and if their predictions were correct in their journals.

Next, head outside to have kids look at the sky and try to identify clouds. If there are no clouds, find pictures of clouds on the internet for kids to identify. This resource can help: [jpl.nasa.gov/edu/learn/project/the-types-of-clouds-and-what-they-mean/](http://jpl.nasa.gov/edu/learn/project/the-types-of-clouds-and-what-they-mean/)



Cumulus clouds are puffy and look like cauliflowers. They also have flat bottoms. They are always changing shape and are low down in the sky.

THIS IS A CLOUD. THIS IS A CAULIFLOWER.

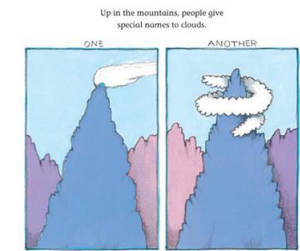


Stratus clouds are low, also. They look like wide blankets of gray and are sometimes called "high fogs." Drizzle or snow flurries may fall from them.

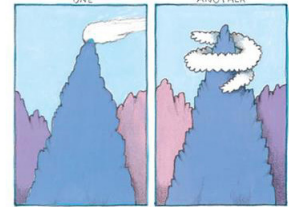
11



Fog is a cloud made of water droplets that form at ground level. It can come right into your front yard, especially if you live on a mountain.



Up in the mountains, people give special names to clouds.



One is called the "banner cloud." Another I like to call a "boa cloud."

THIS BOA IS NOT A CLOUD. IT IS A SNAKE!

Page spreads from: *The Cloud Book* by Tomie dePaola

## More precipitation activities

### Water in the atmosphere

<https://gpm.nasa.gov/education/lesson-plans/water-atmosphere>

### Make a mini water cycle

<https://thewaterproject.org/resources/lesson-plans/create-a-mini-water-cycle>

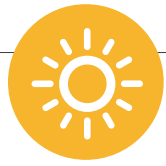
### Play the water cycle dice game

[https://www.arcticclimatemodeling.org/lessons/acmp/acmp\\_k4\\_WaterCycle\\_WaterCycleGame.pdf](https://www.arcticclimatemodeling.org/lessons/acmp/acmp_k4_WaterCycle_WaterCycleGame.pdf)

### Make it rain

<https://thewaterproject.org/resources/lesson-plans/rainmaker-experiment>





## Activity 2: Seasons in the Sun

### Introduction

**Seasons** happen because the earth moves around the Sun and the Earth is tilted on its axis. The Earth spins on an **axis** — like a pole running through the planet from the North Pole to the South Pole. It takes 24 hours for the Earth to spin on its axis — one day. When the Earth is facing the Sun, it's day time. When the Earth is in shadow, it's night.

The Earth also **orbits**, or moves in a circular path, around the Sun. That takes 365 days, or a year. Because the Earth is tilted on its axis, and not oriented vertically, part of the Earth is closer to the Sun for half of the orbit and part is farther away. This results in the Earth getting more or less sunlight throughout the year. That makes seasons.

Places that are neither near the poles nor near the equator are the mid-latitudes. If you live in the mid-latitudes, you have four seasons. If you live closer to the equator, you have two seasons — rainy and dry. That's because these places remain warm with the same amount of light and dark year-round.

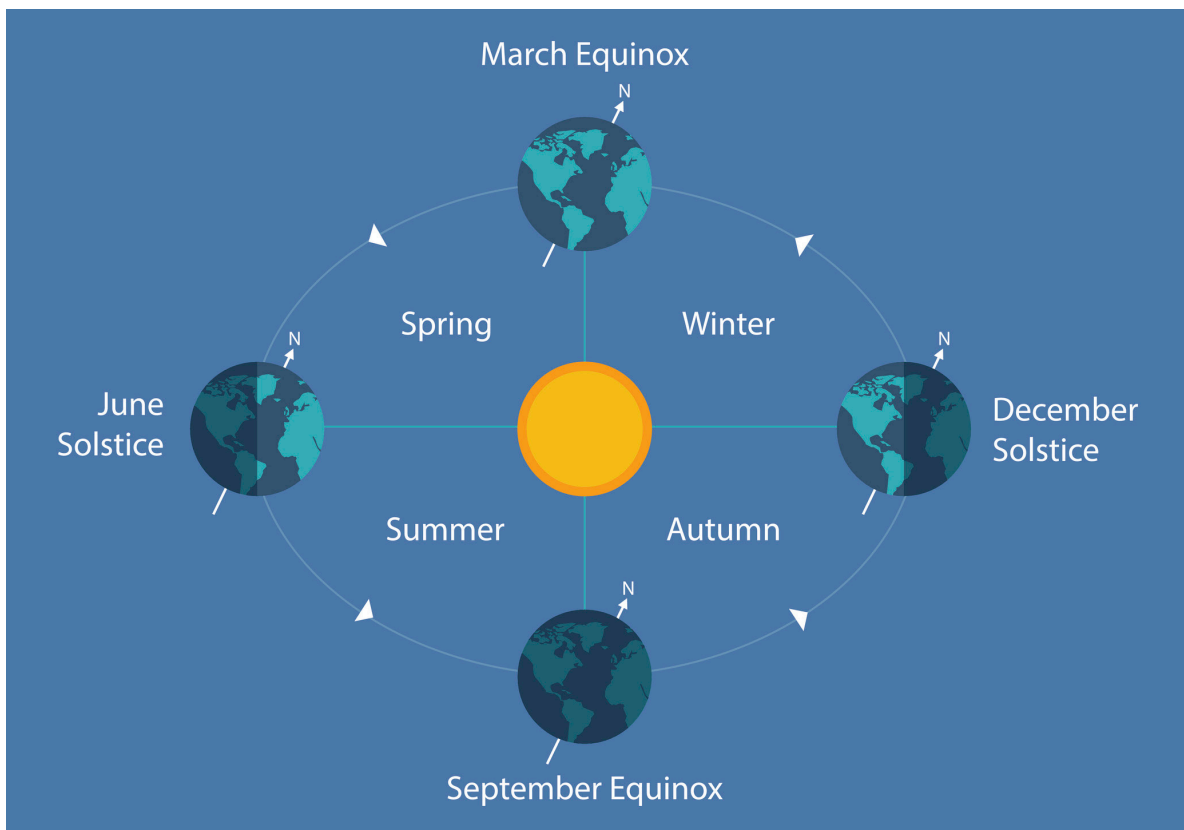
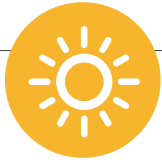


Illustration: iStock



## Activity 2: Seasons in the Sun

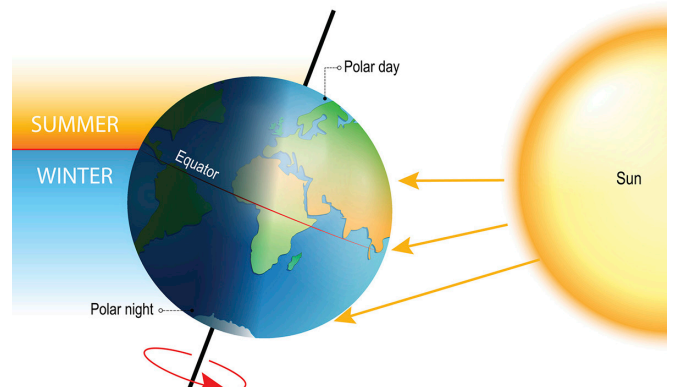
### Supplies

- globe or foam ball and straw or chopstick
- protractor
- push pin
- bright lamp without a shade
- big paper star and some tape
- one sign each for summer solstice, winter solstice, spring equinox, and fall equinox

### Get kids thinking ...

Start by asking some questions:

- What is an orbit?
- What movement of the Earth makes a day?
- What movement of the Earth makes a year?
- What is an axis?
- How far is the Earth tilted on its axis?
- How does the tilt affect how the Sun hits the Earth?
- What season is it here now?

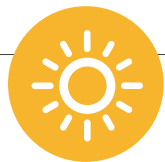


**Explore seasons:** <https://www.calacademy.org/educators/why-do-we-have-different-seasons>

### Let's get started!

**Think and talk about what your season model will look like:**

- The foam ball is the Earth
- The straw or chopstick is Earth's axis
- The push pin is you
- The lamp is the Sun



## Activity 2: Seasons in the Sun

### Get oriented:

- Have kids make a circle
- Place your lamp without shade in the center of the circle and turn it on

**Ask kids** to imagine they are the Earth and the light is the Sun. Then have them spin once in place and ask, “If you are the Earth, how much time does it take for you to turn around once?” Answer: a day.

Next, have them walk around the whole circle, returning to the spot where they started and ask, “You are still the Earth. How much time does it take for the Earth to orbit, or go all the way around the Sun?” Answer: a year.

Next, ask them to try to do both at once, slowly. Spin on their own axis while orbiting the Sun. Have them go about 1/4 of the way around the Sun.

Explain that’s what the Earth does: it rotates on its axis resulting in day and night, and at the same time, it circles the Sun. Because the Earth tilts, we get seasons.

- Tape the star on a wall someplace where all the kids can see it. Explain that this represents Polaris, or the **North Star**. The Earth’s northern hemisphere tilts 23.5 degrees toward it.
- Show kids 23 degrees on the protractor (or about 1/8th of a circle)
- Still standing in their circle around the lamp, have the kids tilt their bodies about 23 degrees toward the star.

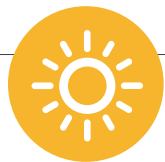


### Explore solstices and equinoxes

Ask them to notice which way their bodies are tilting in relation to the Sun.

- If they are leaning directly away or towards the Sun, their place on the circle is a solstice. Mark the spots on the circle with the winter and summer solstice signs.





## Activity 2: Seasons in the Sun

- If they are not leaning either toward or away from the Sun, their place on the circle is an equinox. Mark the spots on the circle with the fall and spring equinox signs.

Explain that a **solstice** is the point in the year when the Earth is tilted the most towards the Sun or away from it. The winter solstice is the shortest day of the year. The summer solstice is the day with the longest amount of sunlight in the year.



An **equinox** is the time of year when the Sun passes right over the equator. Day and night are the same length. Equinoxes happen in the spring and fall.

### Then build and use your season model:

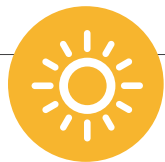
**Step 1:** If not using a globe, put the straw or chopstick through the center of the ball.

**Step 2:** Point out the axis of the globe or your model (the straw/chopstick).

**Step 3:** Show kids 23 degrees on the protractor again (or about 1/8th of a circle) and tip your model or point out how the axis on the globe is tipped, not vertical.

**Step 4:** Place a push pin on the ball or globe to represent a person on the Earth.

Walk around the circle with the model and ask the kids to observe how the light hits it. When



## Activity 2: Seasons in the Sun

you get to a solstice or equinox spot, spin your model or globe so the kids can see how long day or night is.

Invite them to imagine they are the push pin and ask them how much Sun, and which season it is as you make your way around the circle.

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### More activities about seasons

#### **Make a four season tree**

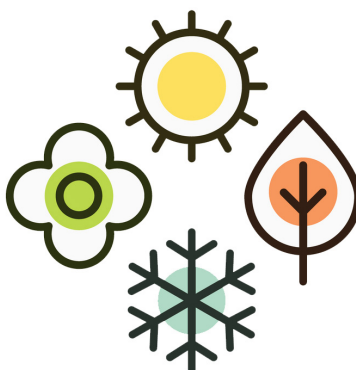
<https://www.generationgenius.com/activities/four-seasons-activity-for-kids/>

#### **Outdoor activities by season**

<https://runwildmychild.com/outdoor-activities-for-kids-by-season/>

#### **Kinesthetic Astronomy: Longer Days, Shorter Nights**

<https://www.calacademy.org/educators/lesson-plans/kinesthetic-astronomy-longer-days-shorter-nights>





# Activity 3: Climate Check! Climate vs. Weather

## Introduction

Weather in any one place can change from day to day. Climate is the average weather in a place over a long time, like 30 years. Climates can change, too, but they change very slowly. Understanding the difference between weather and climate is the first step in understanding how climates change, too. Explore climate vs. weather in these videos below:

**Weather vs. Climate (Crash Course):** <https://youtu.be/YbAWny7FV3w>

**Climate and Weather (NOAA):** <https://youtu.be/ID6KsSjoNOY>

---

## Supplies for each group

- cup filled with at least 30 colored beads of different colors
- blank calendar page with all the days of the month
- pencil

---

## Get kids thinking ...

Start by asking:

- What is climate? How is it different from weather?
- What climate do you live in?
- Is there a different climate where you'd like to live?



# Activity 3: Climate Check! Climate vs. Weather

## Let's get started!

Start reading a book about weather, like *The Snowy Day*, *The Wind Blew*, or *Rain* and ask kids if they remember a time when it was snowy, windy, or rainy. Then discuss the difference between weather, which changes a lot, and climate, which is the average weather in a place over time. For example, sometimes it rains in the desert, but that is rare. The climate in the desert is arid or dry.

**Ask kids:** Can you imagine a way to show how weather and climate are different but related? Here's an activity that lets kids see this idea.

Divide kids into at least four groups. Explain that the beads represent different kinds of weather. Show them the colors of the beads and ask them to assign a kind of weather to each color. For example, yellow could be sunny and dry, purple could be snow, green could be cool and windy, blue could be hot and humid, etc.

Then have each group take a bead out of the cup and write that kind of weather in the square for the first day of the month. Ask them to share the weather they drew for that day. Have them repeat the process until they have filled their calendar.



Ask each group to count up how many days each kind of weather occurred in their month and share their summary. Was there any pattern to the weather?

Then put the four calendars and summaries together. Explain that weather is what happens from day to day, but climate is the average weather conditions in a place over a long period of time. Invite kids to look at the four (or more) calendars together to see what the weather pattern was over the whole time.





# Activity 3: Climate Check! Climate vs. Weather

## Community connection

Now connect what kids have learned about weather, seasons, and climate to your own community. Have a weather and climate scavenger hunt. Look for different examples of how weather and climate affect your community. Invite kids to fill out the chart and decide whether what they see is evidence of recent weather or of long-term climate. Add more examples when you find them.

Example	Where did you find it?	Effect: what do you see here?	Why?	Is this weather or climate?
A sunny place				
A shady place				
A place with trees				
<i>Example: a windy place</i>	<i>The top of a hill</i>	<i>Trees bent away from wind, no leaves on the ground</i>	<i>The wind pushed them for a long time</i>	<i>Climate — it must be windy here a lot and for a long time</i>
A place with erosion (water or wind)				
A place with water like a pond, lake, creek, or river				
A dry place				



# WEATHER WALK

1

Take kids outside with their **Weather Journals** to observe the weather. After the **Daily Data Collection** and **Sky Sketch**, ask kids if they see clues or evidence of any precipitation or the water cycle.

Do they see any clues about the season? Invite them to share their observations, why they think what they see is an indication of precipitation or the season, and write their observations in their journals.

Follow up on your **World Weather Wise** activity and talk more about the weather and climate of this location. Discuss what season this location is experiencing and ask kids how they can tell, and what kind of climate it has.

If you have the opportunity, take the kids outside more than once during the day to observe how the weather changes.

**Repeat the Daily Weather Walk every day.**



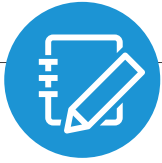
# Weather Movement

## Make a human thunderstorm

**Say:** “As a group, right in this room, we are going to create a rainstorm. We will make the rainstorm using our hands and feet. Watch my hands, then follow and do the same thing.”

- Rub hands together (wind)
- Snap fingers (sprinkling rain)
- Clap hands (heavier rain)
- Slap thighs (pouring rain)
- Stomp feet and continue slapping thighs (thunder and heavy rain)
- Slap thighs (thunder stopped)
- Clap hands (rain is slowing)
- Snap fingers (rain is down to a sprinkle)
- Rub hands (Sun is coming out and a fresh breeze is blowing)
- Hands on lap (silence after a storm)





# Writing About Weather

## Weather word cloud

Do a word association exercise with kids: have them draw the shape of a large cloud and then fill it in with all the words that pop into their heads when you say “weather.” You can also have them try associating with different words, such as rain, storm, or sunshine. Kids could also use an online word cloud generator to make their weather word cloud, or you could combine all words generated by kids into an online word cloud generator to make one big word cloud.

## Haiku

Haiku is a Japanese form of poetry, usually about nature or the seasons. It is made up of three unrhyming lines. The first and last line have five syllables. The middle line has seven syllables. The last line usually makes some kind of observation about the subject. Invite the kids to write a poem about the weather or the seasons.

## Sensing the season

Invite kids to choose a season and imagine what they’d see, hear, touch, smell, and taste. Fall might include leaves of many colors, falling leaves, cold winds blowing, sunlight changing, leaves crunching underfoot, campfire smoke, pumpkin pie, apples, etc. They can organize these observations into a poem, inviting the reader to guess what the subject is at the end.

## Seasonal music

Play Vivaldi's masterpiece, *The Four Seasons*, and get kids to reflect and write about the qualities of the weather from season to season as they listen. The idea behind this writing exercise is for students to generate their impressions or ideas — or characters, themes, or rhythms — that can be further developed later into a poem, paragraph, or story.

[https://freemusicarchive.org/music/John\\_Harrison\\_with\\_the\\_Wichita\\_State\\_University\\_Chamber\\_Players/The\\_Four\\_Seasons\\_Vivaldi](https://freemusicarchive.org/music/John_Harrison_with_the_Wichita_State_University_Chamber_Players/The_Four_Seasons_Vivaldi)





# Kid-Friendly Digital Media

## Apps

Kid Weather App \$

<https://www.kidweatherapp.com/>

NASA Citizen Science App

<https://observer.globe.gov/about/get-the-app>

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## Online games

Cloud Matching Game

<https://scied.ucar.edu/interactive/cloud-matching-game>

Clouds Memory Game

<https://scied.ucar.edu/interactive/clouds-memory-game>

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## Websites

National Geographic Seasons

<https://education.nationalgeographic.org/resource/season/>

Old Farmer's Almanac for Kids

<https://www.almanac.com/kids#weather>

SciJinks NOAA website for kids

<https://scijinks.gov/>

Brain Pop: Weather

<https://www.brainpop.com/science/weather/>



# Kid-Friendly Digital Media

## Climate Kids (NASA)

<https://climatekids.nasa.gov/>

## Gizmos: Weather, Climate and Seasons

<https://gz.explorelearning.com/index.cfm?method=cResource.dspResourceExplorer&browse=-Science/Grade%203-5/Earth%20and%20Space%20Science/Weather%2C%20Climate%2C%20and%20Seasons>

## National Oceanic and Atmospheric Administration — Education

<https://www.noaa.gov/education>

## NOAA: Discover Your World with NOAA

<https://oceanservice.noaa.gov/education/discoverclimate/>  
<https://oceanservice.noaa.gov/education/discoveryourworld.html>

## American Meteorological Society

<https://www.ametsoc.org/index.cfm/ams/education-careers/>

## Weather Channel

<https://weather.com/>

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## Video

### What Causes the Seasons?

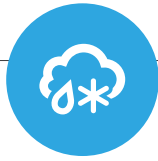
<https://youtu.be/u41ozQchuXk>

### How Clouds Form

<https://youtu.be/-YySltYzvtU>

### Size Matters: Measuring Raindrop Sizes from Space

<https://gpm.nasa.gov/education/videos/size-matters-measuring-raindrop-sizes-space>



# Water Basics

## Basic facts about water

- There is a finite amount of water on the Earth and it moves around through the water cycle.
- Water exists on Earth in three states: solid as ice; gas as vapor, fog, or mist; and liquid as water.
- The way water behaves changes with the seasons (rain, snow, hail, flooding, drought).
- People, plants, and animals need water to live.

## Water words

### Absorption

The process of being soaked up.

### Clouds

A mass of water vapor that floats in the sky. Different cloud types form at different altitudes and temperatures. 3 common cloud types: **Cirrus**: thin, wispy and feathery cloud. **Cumulus**: fluffy white cloud with a flat bottom. **Stratus**: wide, thick low-lying gray cloud.

### Condensation

When gas cools and changes to a liquid, for example, when warm steam touches a cold window.

### Drought

A long period with little or no rain.

### Evaporation

When a liquid heats up and changes to gas.

### Flood

An overflow of water onto land that is normally dry.

### Fog

A thick mass, like a cloud, made up of tiny water drops floating in the air and touching the ground.

### Hail

Frozen rain, or small balls of ice that fall from the sky.

### Ice

Water in a frozen, solid state.

### Precipitation

Water falling in the form of rain, snow, or hail.

### Rain

Drops of water that form in the clouds and fall from the sky.

### Snow

Soft, white flakes of ice that fall from the sky. Snow is formed when water in the upper air freezes into crystals.

### Sublimation

When ice changes to gas, skipping the liquid state.

### Surface tension

The "sticking together" of water molecules on the top surface. It explains why insects can walk on water!

### Transpiration

When plants give off moisture into the air.

### Vapor

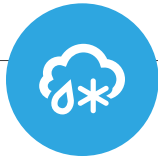
Tiny drops of water in the air; the gas form of water. Clouds are made of water vapor.

### Water

A clear thin liquid that has no color or taste when it is pure. It falls from clouds as rain or snow and enters rivers, lakes, and oceans. All animals and people need water in order to live.

### Water cycle

The continuous, natural circulation of the earth's water through evaporation, condensation, precipitation, and collection in lakes, streams, rivers, and oceans.



# The water cycle

The water cycle is the continuous, natural circulation of the Earth's water through evaporation, condensation, precipitation, and collection in lakes, streams, rivers, and oceans.



Interactive diagram from the U.S. Geological Survey. Try the interactive game:  
<https://www.usgs.gov/media/images/usgs-water-science-strategy-water-cycle>





# Children's Books about Water

## Fiction

- *Bringing the Rain to Kapiti Plain* by Verna Aardema (Gr 2-3)
- *Come on Rain!* by Karen Hesse (Gr K-2)
- *Hurricane* by David Wiesner (Gr 1-3)
- *Hurricane!* by Jonathan London (Gr 1-3)
- *It Looked Like Spilt Milk* by Charles G. Shaw (Gr 1-5)
- *Rain* by Manya Stojic (Gr 1-2)
- *Rain Rain Rivers* by Uri Shulevitz (Gr K-2)
- *The Snowy Day* by Ezra Jack Keats (Gr 1-2)
- *Waiting Out the Storm* by Joann Early Macken (Gr 1-2)
- *Walter Was Worried* by Laura Vaccaro Seeger (Gr 1-5)
- *Water Boy* by David McPhail (Gr 1-3)

## Poetry

- *All the Water in the World* by George Ella Lyon and Katherine Tillotson (Gr K-3)
- *I Know the River Loves Me / Yo se que el rio me ama* by Maya Christina Gonzalez (Gr 1-3)
- *Water Dance* by Thomas Locker (Gr K-2)
- *Watersong* by Tim McCanna (Gr K-1)
- *Weather Poems for All Seasons* by Lee Bennet Hopkins (Gr K-2)

## Nonfiction

- *Clouds* by Anne Rockwell (Gr K-3)
- *DK Eyewitness: Water* by John Woodward (Gr 3-5)
- *A Drop of Water* by Walter Wick (Gr 3-5)
- *Hurricanes* by Gail Gibbons (Gr 1-3)
- *I Get Wet* by Vicki Cobb (Gr K-2)
- *The Magic School Bus Inside A Hurricane* by Joanna Cole (Gr 1-3)
- *National Geographic Kids: Water* by Melissa Stewart (Gr 1-5)
- *One Well: The Story of Water on Earth* by Rochelle Strauss (Gr 3-5)
- *Rivers of Sunlight* by Molly Bang and Penny Chisholm (Gr 2-5)
- *Water Is Water: A Book About the Water Cycle* by Miranda Paul (Gr 1-5)



# Activity: Water, Ice, and Steam

## Introduction

Introduce kids to the three states that water can be in: liquid, solid (ice), and gas (steam or vapor).

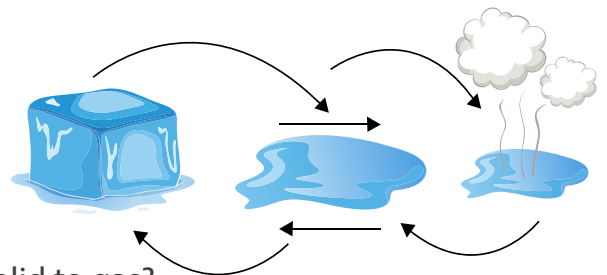
## Supplies

- Electric skillet with lid
- Ice cubes
- Water

## Get kids thinking ...

### Start by asking a couple of questions:

- What does ice or snow feel like?
- What does water feel like?
- What does steam or vapor feel like?
- What makes water change its state, from liquid to solid to gas?
- What happens to ice when you take it out of the freezer?



## Let's get started!

Show the kids the ice cubes. Let them touch the ice. Ask them to describe how the ice feels and what it looks like. Put the ice in electric skillet. If you have time, let the ice melt on its own. If not, turn on the skillet to low and let the ice melt.

Once the ice has melted, ask the kids what they have observed. How has the ice changed? What state is the ice in now? (liquid) What shape is it? Ask the kids to predict what would happen if you put the water in the freezer. What would happen if you turned up the heat?

Turn up the heat on the skillet and bring the water to a simmer, so that the kids can see the water turning into steam. Be careful to kids away from the hot skillet and steam.



# Activity: Water, Ice, and Steam

Ask the kids what they have observed about the water. How has it changed? What state is it in now? What shape is it?

Ask the kids to predict what would happen if you turned off the heat. Ask the kids to predict what would happen if the steam met with very cold air.

If you have a lid, put it on the skillet and let the steam collect and condense on the inside. After a few minutes, lift up the lid and show the kids what the steam is doing.

Ask them what they think is happening. What do they observe? How has the steam changed? What state is the steam in now? (liquid) What shape is it? What are the drops of water doing?

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## Introduce water words

Talk about these words and what they mean: evaporation, condensation, precipitation, and for extra fun: sublimation (ice to gas state, skipping the water stage) and transpiration (water vapor produced by plants through photosynthesis).





# Day 2

## Atmospheric Science

### Introduction

The word **weather** describes what's happening in the **atmosphere** at a given point in time and geographic location. This day focuses on observations of atmospheric conditions, what tools or instruments can help people make those observations, and how those observations are used to predict future weather.

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### Questions to guide explorations and experiments

- How and where does weather happen?
  - Why and how do people study weather?
  - How does air pressure affect the weather?
  - How are weather predictions made?
  - What tools do meteorologists use to make weather predictions and track weather?
  - How does the atmosphere affect weather and climate?
- 

### Books and activities

- **Books:** about predicting and forecasting weather, weather science, and weather scientists
- **Activities:** explore the atmosphere, build weather instruments and a weather station, create a terrarium, and learn about greenhouse gases, take a Weather Walk, and observe clouds





## Fiction

- *Cloulette* by Tom Lichtenheld (Ages 4-8)
- *Cloudy With a Chance of Meatballs* by Judi Barrett (Ages 3-9)
- *Freddy the Frogcaster series* by Janice Dean (Ages 3-6)
- *Groundhog Weather School* by Joan Holub (Ages 6-9)
- *Miss Newman Isn't Human!* by Dan Gutman (Ages 6-9)
- *Misty the Cloud: Fun Is in the Air* by Dylan Dreyer (Ages 4-6)
- *Nighttime Symphony* by Timbaland and Christopher Meyers (Ages 3-9)
- *The Weather Girls* by Aki (Ages 3-6)
- *When Cloud Became a Cloud* by Rob Hodgson (Ages 4-8)
- *The Wind Blew* by Pat Hutchins (Ages 4-8)
- *Windy Days* by Deborah Kerbel (ages 3-6)

## Poetry

- *A Boy Asked the Wind* by Barbara Nickel (Ages 4-8)
- *Hear the Wind Blow* by Doe Boyle (Ages 4-8)
- *Make Things Fly: Poems About Wind* by Dorothy Kennedy (Ages 9-12)

## Nonfiction

- *Boy, Were We Wrong About Weather!* by Kathleen V. Kudlinski (Ages 6-9)
- *Breaking Through the Clouds: The Sometimes Turbulent Life of Meteorologist Joanne Simpson* by Sandra Nickel (Ages 6-9)
- *I Face the Wind* by Vicki Cobb (Ages 6-9)
- *Inside Weather* by Mary Kay Carson (Ages 6-9)
- *The Kids' Book of Weather Forecasting* by Meteorologist Mark Breen and Kathleen Friestad (Ages 6-9)
- *The Layers of Earth's Atmosphere* by Elizabeth Borngraber (Ages 9-12)
- *Like a Windy Day* by Frank and Devin Asch (Ages 4-7)



- *Meteorology: Cool Women Who Weather Storms* by Karen Bush Gibson (Ages 9-12)
- *Meteorology: The Study of Weather* by Christine Taylor-Butler (Ages 9-12)
- *National Geographic Kids Everything Weather: Facts, Photos, and Fun that Will Blow You Away* by Kathy Furgang (Ages 7-12)
- *National Geographic Little Kids First Big Book of Weather* by Karen de Seve (Ages 3-6)
- *Pika Country: Climate Change at the Top of the World* by Dorothy Hinshaw Patent and Marlo Garnsworthy (Ages 6-9)
- *Stickmen's Guide to Earth's Atmosphere in Layers* by Catherine Chambers (Ages 9-12)
- *Weather* by John Farndon, Sean Callery, and Miranda Smith (Ages 9-12)
- *Weather Forecasting* by Gail Gibbons (Ages 6-9)
- *What Is the Atmosphere?* by Joe Greek (Ages 6-9)
- *What Is Weather* by Robin Johnson (Ages 6-9)
- *What's the Weather?* by Fraser and Judith Ralston (Ages 6-9)



# Activity 1: Under Pressure

## Introduction

Earth is surrounded by the **atmosphere**, a mix of gases held in place around the planet by gravity. Weather is the state or condition of the atmosphere and is caused by heat from the Sun and movement of the air. Moisture in the air, precipitation, cloudiness, and wind are all different components of our weather.

The weight of the atmosphere, or the **air** or **atmospheric pressure**, affects what kind of weather and how intense our weather is. Weather changes are caused by pressure changes!

A **barometer** is an instrument used for measuring the change in atmospheric pressure. With this activity, kids can get to know the atmosphere, learn more about atmospheric pressure, and make their own barometers.



## Supplies

- clean, empty glass jar or tin can
- balloon (round and new — never blown up)
- thick rubber band
- plastic drinking straws or similar lightweight item, like coffee stirrers or wooden skewers
- markers and pencil
- paper
- tape or glue
- scissors and ruler
- Weather Journals (see Appendix)





# Activity 1: Under Pressure

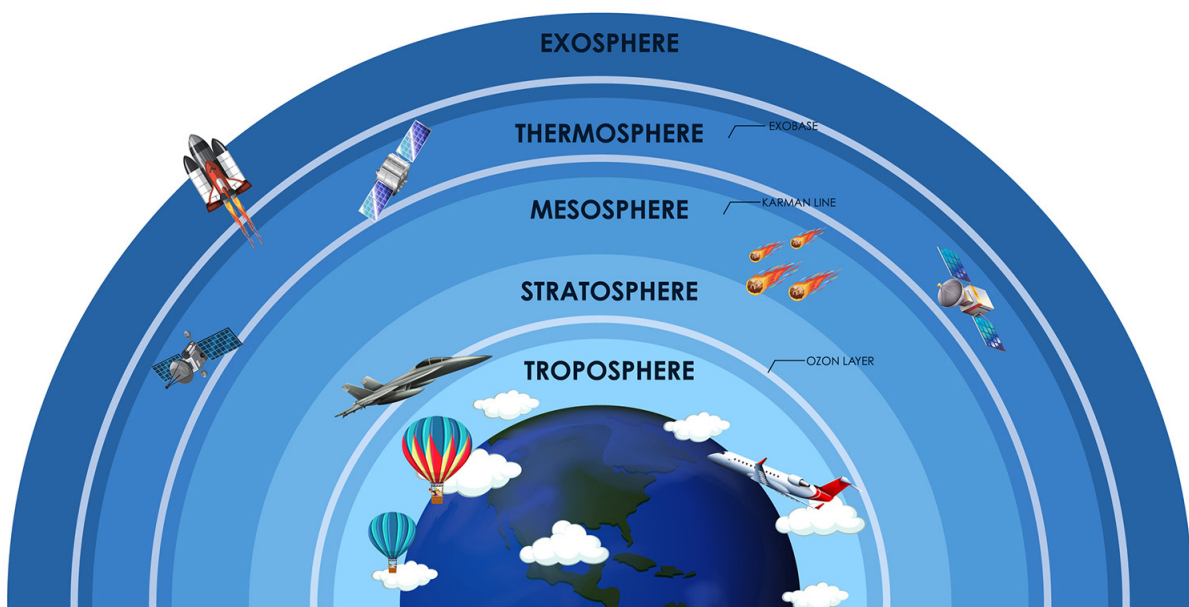
## Get kids thinking ...

**Ask kids** about their experiences with atmospheric pressure. Have they ever been in a car going up a steep hill or taken off in an airplane and had their ears “pop”? What do they think causes that to happen? Talk about how the air pressure outside of their bodies changes as altitude changes. Ears “pop” when the pressure of the air inside their ears tries to match decreasing or increasing atmospheric pressure outside as they go up or down. **Ask kids** what they think air pressure has to do with the weather?

## Let’s get started!

Kids may have heard our atmosphere talked about as a jacket or blanket of air that surrounds the Earth, keeping us warm and providing oxygen to breathe. That air also has weight. As gravity pulls the blanket of air to Earth, it presses on everything.

Start with a book such as *Stickmen’s Guide to Earth’s Atmosphere in Layers* that offers details about our atmosphere and shows kids how weather and the atmosphere are connected. Talk with kids about how changes in the atmosphere, including changes in air pressure, affect the weather.





# Activity 1: Under Pressure

Atmospheric pressure changes with temperature and also lessens with altitude, so there are areas of high pressure and low pressure all around the Earth. How much air pressure there is also depends on the density of the air. Density is how closely the molecules of air are packed together.

High pressure causes air to sink down slowly and generally leads to clear skies because sinking air stops clouds from forming. Low-pressure air is warmer and cools as it slowly rises, making clouds form from any moisture in the air and precipitation likely. Wind is also caused by differences in air pressure within the atmosphere. When air moves from high-pressure areas to low pressure-areas and the greater difference in pressure, the faster the wind blows.

Ask kids if they have ever heard a weathercaster on the news talking about low and high pressure. Take a look at the National Weather Service's Daily Weather Map and ask kids what they notice. Do they see the letter "H" and the letter "L"? What does that mean for today's weather?

The letters "H" and "L" for "high pressure" and "low pressure" got on the weather map because meteorologists use barometers to measure atmospheric pressure and predict changes in weather. Discuss the importance of knowing the air pressure and how a barometer can be used to help predict the weather as kids build their own barometers. **Note:** a simple (but unofficial) way to know the difference between highs and lows is "H = Happy" and "L= Lousy"!

**National Weather Service:** <https://www.weather.gov/>

**Explore high and low pressure:** <https://scijinks.gov/high-and-low-pressure-systems/>

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## Build a barometer

There are several different types of barometers, the scientific instrument used to measure atmospheric pressure. The barometer kids will be building is a dry barometer, which is similar to the aneroid (air) barometer. Before kids start building their own, show them examples of different types.

**Types of Barometers:** <https://education.nationalgeographic.org/resource/barometer/>

**Weather Works: What is a barometer and how does it work?** <https://youtu.be/gbIJW>





# Activity 1: Under Pressure

Figure out the best place for the barometer. Placing the barometer against an indoor wall keeps it from getting moved around and makes it easy to note changes in pressure on the paper gauge. Get kids to help find a spot that keeps the barometer away from any extreme sources or heat or cold. **Ask kids** why that might be important to their pressure measurements, and talk about the effects of temperature on air pressure.

Before kids get started building, demonstrate these steps:

**Step 1:** Cut off the stem of the balloon.

**Step 2:** Stretch the balloon head over the opening of the jar. Smooth until you have a flat surface.

**Step 3:** Use a thick rubber band to secure the balloon to the jar. Make sure the jar is sealed tightly with no way for air to come in or leak out.

**Step 4:** Next, make a pointer for the barometer. Longer pointers make for more accurate readings of atmospheric pressure. Get a good length by squeezing the end of one straw into another or gluing coffee stirrers together. If you are using a straw or stirrers, cut one end of the pointer at an angle to create a fine tip.

The pointer will show how much the balloon moves up and down when pressure changes, so it needs to be very straight.

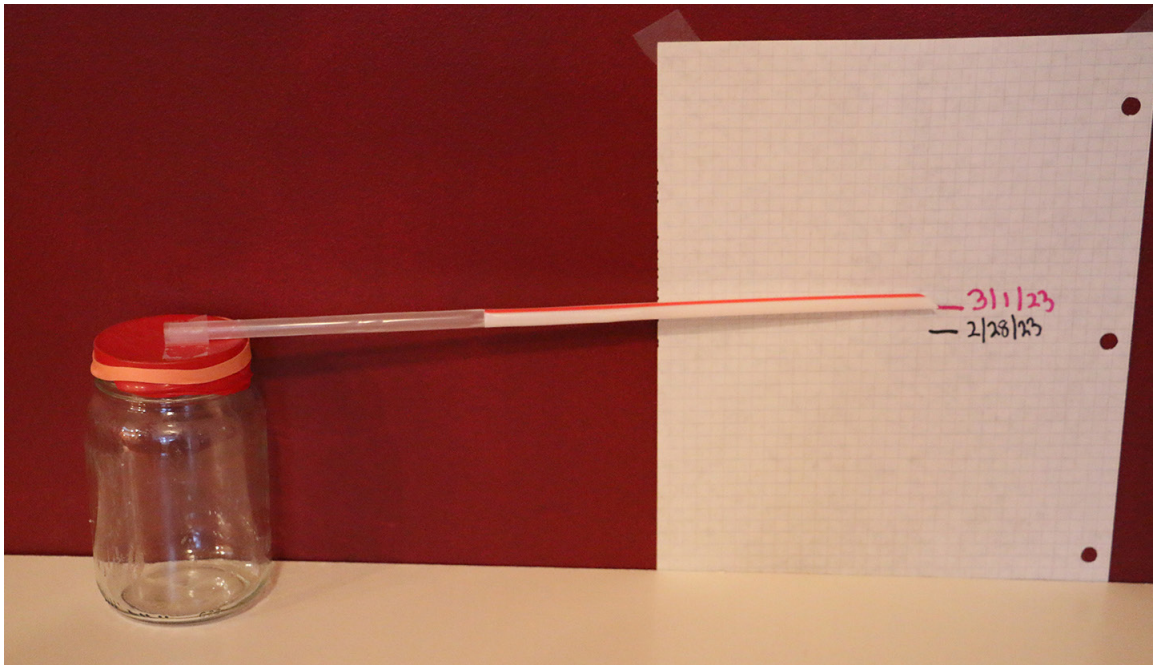
**Step 5:** Glue or tape the non-pointy end of your pointer on top of the balloon, right in the center. If you use glue, wait for it to dry completely.





## Activity 1: Under Pressure

**Step 6:** To track the movement of the pointer, you need to create a gauge. Get a piece of lined paper or draw your own lines using a ruler. Tape the paper to the wall and place the barometer along the wall, so that the pointer is in front of the paper. Make a mark on the paper that shows where the pointer is. Put the date next to the line you make and draw a symbol that shows what the weather is like on this day.



As kids build their barometer, talk about how it will work. The pointer rises and falls because of air pressure. When there is higher atmospheric pressure, air presses down on the balloon and the pointer will rise. When the air pressure decreases on the balloon, the pointer will drop. Discuss the importance of knowing the air pressure through the use of a barometer. **Ask:** How can understanding the change in atmospheric pressure help forecast the weather? What kind of weather happens when atmospheric pressure is high? Or low?

Kids should observe the barometer over time. Have kids check their barometers daily, mark the gauge, and record the results in their Weather Journals, noting the date, the direction of the pointer and if it is indicating higher or lower pressure, current weather conditions, and their weather predictions. Kids can compare their results with atmospheric pressure readings and the weather forecast from a news source.



# Activity 1: Under Pressure

## More air pressure activities

### Interactive activities:

**Scroll up, up, up into the different layers of Earth's atmosphere**

<https://climatekids.nasa.gov/whats-in-the-atmosphere/>

**Virtual ballooning to explore the atmosphere**

<https://scied.ucar.edu/interactive/virtual-ballooning>

### Get hands on:

**Experiment with temperature and air pressure**

<https://www.sciencebuddies.org/stem-activities/balloon-barometer>

**5 Ways to Demonstrate Air Pressure**

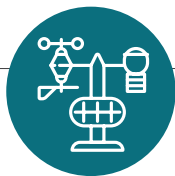
<https://www.asme.org/topics-resources/content/5-ways-to-demonstrate-air-pressure-to-children>

**Atmospheric Pressure Experiment. Get ready to crush some cans!**

<https://youtu.be/-53nNVX5RDU>

**Build a water barometer**

<https://youtu.be/k4lQ9zvAE4U>



## Activity 2: Weather Station

### Introduction

**Meteorology** is the scientific study of Earth's atmosphere, especially how the atmosphere affects the weather. Scientists who study and work to understand the processes in Earth's atmosphere that determine weather and climate are called **meteorologists** and **climatologists**.

To **predict** weather, meteorologists use instruments to measure atmospheric conditions. A weather station is a collection of those instruments, which may include a **weather vane**, **anemometer**, **hygrometer**, **thermometer**, **barometer**, and **rain gauge**. Using these instruments and other tools such as **radar systems**, **satellites**, and **weather balloons**, meteorologists study the past and present **atmospheric patterns**. With the data they gather, they are able to predict the future weather and make a **weather forecast**.

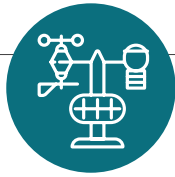
While you can buy basic weather station instruments, it is a fun learning experience to have kids create their own tools for gathering weather data. Making their own instruments will help kids build their understanding of how the instruments work, learn more about the tools meteorologists use, and take their own first steps into weather forecasting by observing, measuring, and collecting weather data.

When choosing which weather instruments kids will make, determine what best fits into your day and suits kids' interests and abilities. You can have each child create all the weather station instruments (other than a thermometer) or have kids work in pairs or small groups to make one set of the instruments and set up a community weather station to observe the weather over the week or a period of weeks. If your schedule doesn't allow for a longer term collection of weather data, focus on having kids make one or two of these instruments and put an emphasis on testing them out and understanding how they work.

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### Get kids thinking ...

The first step in studying weather is to observe it! **Ask kids** to think about what it means to observe something. How can they observe weather? What tools might they use to help them make and record observations about different components of weather?



## Activity 2: Weather Station

### Let's get started!

Start with reading aloud a fiction book about the weather such as *Cloudy with a Chance of Meatballs* by Judi Barrett. Talk about what kind of weather the characters in the book experienced. How did they know what kind of weather to expect? How do we know what kind of weather we are going to have for the day or week? Read from a nonfiction book such as *Inside Weather* by Mary Kay Carson and discuss what information and words related to weather they already know or want to learn more about.

**Ask kids:** What ideas did both these books give them about how to find out what the weather will be like? Where do they get their information about the weather forecast?

Meteorologists study the weather by recording and analyzing data. They make their weather predictions based on information about past weather. **Ask kids** what kinds of weather information they think these scientists collect and record. Talk about why tracking changes in temperature, pressure, humidity, wind, and precipitation would be important in predicting the weather.

**Explore weather forecasting:** <https://scijinks.gov/menu/weather-forecasting/>

Talk with kids about weather information they can collect themselves by building their own weather station instruments and keeping a record of their measurements. Help them understand that the instruments they can build will not provide exact readings. For example, a homemade anemometer can help them calculate an approximate wind speed, but it will not provide an exact reading. But the data they collect can still help them predict the weather!

Deciding on what data to collect will help kids determine what instruments they will need or want to have in their weather station. Most weather stations include the following instruments:

- **Weather vane:** shows the direction of the wind
- **Thermometer:** measures air temperature
- **Anemometer:** measures wind speed
- **Hygrometer:** measures humidity, or moisture in the air
- **Rain gauge:** measures the amount of rain or snow that falls
- **Barometer:** measures atmospheric pressure (see Activity 1)





## Explore weather instruments

- **Weather Tools and Instruments:** [https://videoguru.com/video/third\\_grade\\_earth\\_science\\_a07/](https://videoguru.com/video/third_grade_earth_science_a07/)
- **Weather Instruments:** <https://youtu.be/zNmtns2Z3Xc>
- **Weather Instruments Woo Woo Rap:** <https://youtu.be/p9rQpme2Vlw>

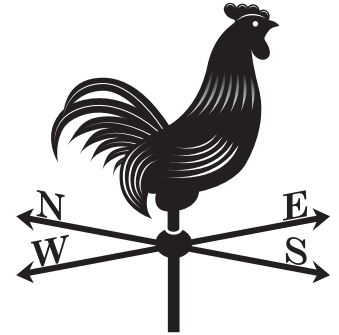
Use the activities on the following pages to create instruments for a weather station. Kids can work alone, in pairs, or small groups.



## Activity 2: Weather Station

### Station 1: Make a weather vane

A weather vane is an instrument that shows where the wind is blowing from, or wind direction. Knowing the direction of the wind is important in predicting weather because wind usually blows from high-pressure areas to low-pressure areas and this affects our expected weather. To use a weather vane and understand wind direction, kids need to know where north, south, east, and west are. Provide kids with supplies and these instructions to have them build their own weather vane.



**Make a Wind Vane to Measure Wind Direction:** <https://www.amnh.org/explore/ology/earth/make-your-own-weather-station/make-a-wind-vane>

**Explore wind:** <https://scijinks.gov/wind/>

### Supplies and steps

- cardstock or a file folder
- piece of cardboard (something from the recycling bin)
- arrow template and a plate or circle to trace
- sharpened pencil with new eraser
- plastic-headed straight pin
- piece of modeling clay
- nonflexible plastic drinking straw
- scissors and ruler
- pencils and markers
- compass or compass app (current iPhones and most other smart phones have built-in compasses)



**Step 1:** Find a piece of cardboard in the recycling bin. Use a plate or another circular item and trace a circle approximately 10 to 12 inches onto the cardboard. Cut out the circle.

**Step 2:** Use a marker and a ruler to draw a line down the center of your circle. Label the top of the line “North” and the bottom of the line “South.” Then draw another line across the center of the circle. Label the line to the left “West” and the line to the right “East.”



## Activity 2: Weather Station

**Step 3:** Use the template (see page 75) to cut out an arrow point and an arrow tail from a piece of cardstock.

**Step 4:** Use scissors to make two 1/2-inch slits, directly across from each other, into one end of the straw. Slip the flat edge of the arrow point into the slits in the straw.

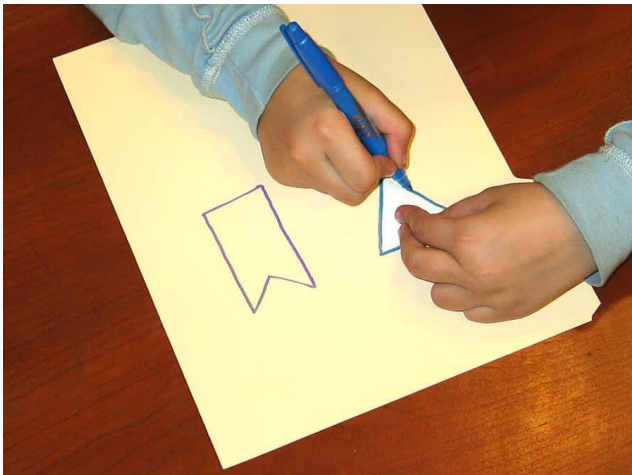
**Step 5:** Cut two 1/2-inch slits on the other end of the straw, making sure the new slits match up with the ones that hold the arrow point. The arrow point and arrow tail need to be at the same angle. Slip the arrow tail into the slits.

**Step 6:** Use a tiny amount of glue or small pieces of tape to secure the arrow point and tail in place.

**Step 7:** Push the straight pin through the middle of the straw and then into the pencil eraser.

**Step 8:** Push the sharp end of the pencil into a lump of modeling clay. Place the clay in the center of the cardboard circle. Press and mold it to the pencil and the cardboard so that the pencil is straight and secure.

**Step 9:** Blow on the arrow tail gently to make sure it can spin freely. Make any adjustments.



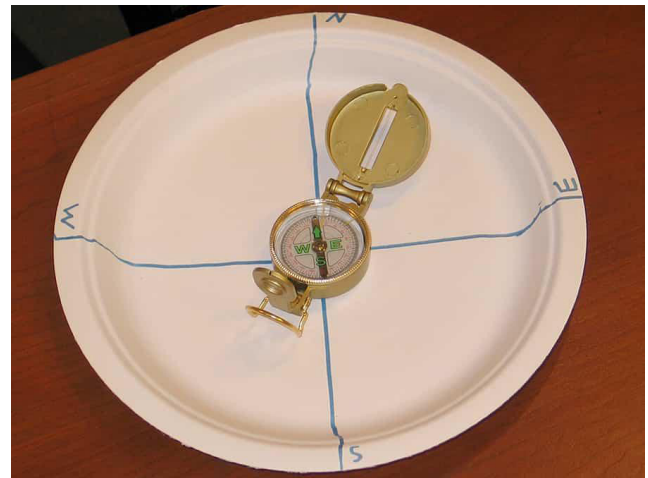
Photos: American Museum of Natural History



## Activity 2: Weather Station

**Step 10:** Head outside to find a spot for the weather vane where nothing will obstruct the wind direction. Use a compass to find which direction is “North.” Set up the weathervane so that “North” on the cardboard circle faces the correct direction.

Observe what happens when the wind begins to blow! (If it is very breezy, weigh down the weathervane with rocks or other heavy objects to keep it from blowing over.)



Photos: American Museum of Natural History

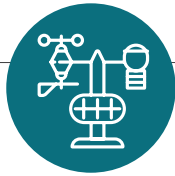
If the air is moving, the arrow on the weathervane will point to the direction the wind is blowing from. Consider adding more directional information to the circle on the weather vane: Northeast, Northwest, Southeast, and Southwest.

Have kids note the wind direction in their Weather Journals.

### Test this instrument!

Use a compass to position a box fan in various directions and have kids use their weather vanes to determine wind direction. Kids can also place obstacles in front of the “wind” to learn more about how the instrument works.

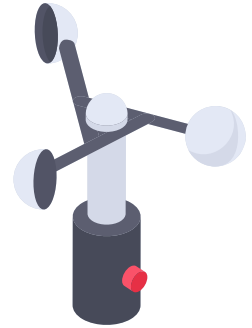




## Activity 2: Weather Station

### Station 2: Make an anemometer

The anemometer is an instrument that measures wind speed. It rotates at the same speed as the wind. This anemometer has four cups which catch the wind and make the anemometer spin. The more spins per minute, the greater the wind velocity!



Provide kids with the supplies and these instructions for making their own anemometer.

**Explore estimating wind speed:** <https://www.weather.gov/pqr/wind>

### Supplies and steps

- 4 small paper cups
- 2 nonflexible plastic drinking straws
- plastic-headed straight pin (long enough to go through the 2 straws and securely into the pencil eraser)
- pencil with a new eraser
- tape (electrical tape works well)
- scissors
- stapler
- marker
- stopwatch or timer

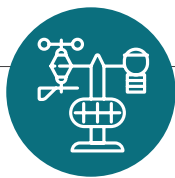


**Step 1:** Use the two straws to make a cross shape. Use tape to secure the straws together in that shape.

**Step 2:** Push a straight pin through the center of the cross and into the eraser of the pencil. Spin the straws several times in both directions to make sure the straws rotate well.







## Activity 2: Weather Station

**Step 3:** On the underside of each straw “arm,” staple a paper cup to the end of each straw. All the open ends of the cups should face the same direction.

**Step 4:** On one of the cups, use a marker to make one of the cups look different from the others. The marked cup will be the one to use for counting the spins of the anemometer.

**Step 5:** Have kids mount or hold the anemometer in a place outside where they can feel the wind from all directions. Try to place it high above the ground and away from anything that can obstruct the flow of air. When the cups catch the wind, the anemometer should spin. To measure the wind speed, have kids watch and count how many times the marked cup completely spins around. About 10 complete spins per minute equals a wind speed of about one mile per hour.



Have kids record their counts in their weather journal and calculate the wind speed.

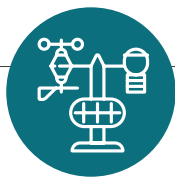
### Test this instrument!

Kids can also explore how their anemometer works with a box fan. Have kids hold their anemometer in front of a fan, testing different fan speeds and collecting data on spin counts to build understanding.

### Related resource

#### Build an Anemometer

[https://www.nasa.gov/sites/default/files/atoms/files/build\\_an\\_anemometer.pdf](https://www.nasa.gov/sites/default/files/atoms/files/build_an_anemometer.pdf)



## Activity 2: Weather Station

### Station 3: Make a hygrometer

A **hygrometer** is an instrument that measures the amount of humidity or water vapor in the air. Water vapor is an important weather-making part of air. It is the source of all forms of condensation and precipitation!



**Explore humidity:** <https://scijinks.gov/what-is-humidity/>

There can be a lot or very little water vapor in the air. Water evaporates when it gets heated by the sun. Water vapor gets into the atmosphere by evaporation. Winds move the water vapor in the atmosphere from one place to another.

Talk with kids about what the weather feels like to them when there is a lot of water vapor in the air and humidity is high. In nature, pinecones will respond to changes in humidity. To stop its seeds from being released in cold, wet weather, a pinecone will close its scales to protect its seeds. When the weather is dry and warm, the cone will open up so the seeds can fall out and be spread to spaces where there is enough room for a new tree to grow.

Even once it has released all of its seeds, the pinecone will continue to open and close as humidity changes, making it a natural hygrometer. Provide kids with supplies and these instructions for adding a pinecone hygrometer to their weather instruments.

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### Supplies and steps

- pinecone
- plastic-headed straight pin
- small cardboard box or other small container from the recycling bin
- glue and tape
- scissors and markers, black and red

**Step 1:** Choose a scale in the top third of the pinecone, but not at the very top. Kids should have adult help to carefully stick the straight pin into the end of the scale. This is the pointer for the instrument.



## Activity 2: Weather Station

**Step 2:** Find a small cardboard box that is just a little bigger than the pinecone. Cut the box so that it has a bottom and three sides.

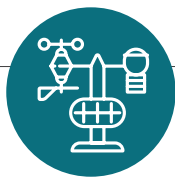
**Step 3:** Glue the bottom of the pinecone to the bottom of the box, positioning the pinecone so that the pointer is near the back side of the box. Let the glue dry.

**Step 4:** Use the red marker to make a small line on the box wall where the pin head is pointing. This mark is for reference as a starting point.

**Step 5:** Try the instrument! Place the pinecone hygrometer outside in a shady location where it won't be disturbed overnight.



Before you have kids check the instrument the next day, have them check your local weather and make note of the current humidity in their weather journal. When they check the hygrometer, if the head of the pin has moved, kids should mark the new position with a black marker and label it with the date and the humidity reading from the local weather report. Have them do this for several days or until they have enough data points to use the pinecone hygrometer to estimate humidity without checking the local weather.



## Activity 2: Weather Station

### Test this instrument!

Kids can explore how their hygrometer works by using a spray bottle to mist the pinecone with water. Have them observe what happens when the pinecone is exposed to wet conditions. Ask kids to think about other ways they could simulate wet, humid, or dry conditions to further test the hygrometer.

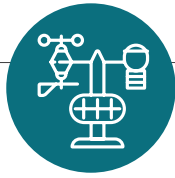
### Related resource

#### **Pine Cone Weather**

<https://thehappyscientist.com/content/pine-cone-weather>



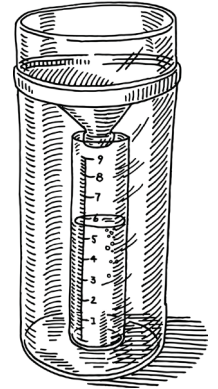




## Activity 2: Weather Station

### Station 4: Make a rain gauge

A rain gauge works by collecting and capturing rainwater in one location. Data from rain gauges in other locations can show what areas had the heaviest rain and can help predict if other locations will get heavy rain or if flooding is possible. Rain gauges are also important in monitoring droughts and in predicting weather patterns based on historical rainfall records.



**Explore rain and precipitation:** <https://www.usgs.gov/special-topics/water-science-school/science/rain-and-precipitation>

### Supplies and steps

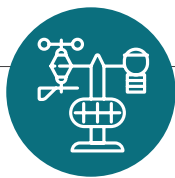
- straight, thin cylinder-shaped clear jar from the recycling bin with label removed
- ruler
- rubber band (optional)
- funnel (optional). If the diameter of the opening of the jar is exactly the same size as the diameter of the bottom of the jar, you don't need a funnel. If the bottom of the jar is bigger than the opening, use a funnel with the same diameter as the bottom of the jar.)
- fine-tip permanent marker
- clear packing tape



**Step 1:** Prepare a straight, thin cylinder-shaped clear jar from the recycling bin by removing any labels and making it clean and dry.

**Step 2:** Cut a piece of clear packing tape that is the same height as the jar. Affix the tape vertically to the jar.





## Activity 2: Weather Station

**Step 3:** Stand up a ruler so that the zero mark is even with the bottom of the jar and the numbered marks are next to the strip of tape. Have someone hold the ruler in place or secure it to the jar with a rubber band.

**Step 4:** Use a permanent marker to mark the inches on the tape. Add the lines between each inch to note 1/2 and 1/4-inch measurements.

**Step 5:** Put the ruler aside and cover the markings with a second piece of clear packing tape to protect from water.

**Step 6:** If a funnel is needed, put it in the jar and secure it in place with more tape.

**Step 7:** Try your instrument! Have kids find a spot not too near buildings or under trees where they can leave the rain gauge outside. (If the rain gauge can't be safely kept outdoors for an extended period, have kids put it out when they anticipate rain.)

When the rain gauge collects rainwater, kids should record their measurements in their Weather Journal. The rain gauge should be emptied after each rain.

### Test this instrument!

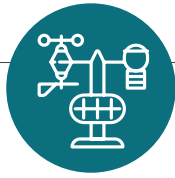
Situate the rain gauge under a sprinkler and kids can try out their rain gauge, and practice taking and recording measurements.



### Related resource

#### Make a Rain Gauge to Measure Rainfall

<https://www.amnh.org/explore/ology/earth/make-your-own-weather-station/make-a-rain-gauge>



## Activity 2: Weather Station

### Setting up the weather station

Some of the instruments — the rain gauge, anemometer, and wind vane — need to be placed outside. If you can't leave them outside, bring them out to the same location each day for taking readings. The barometer can be kept and monitored inside. For taking the outdoor temperature, the thermometer should be outside but protected from precipitation and direct sunlight. (Be sure to talk about how the type of thermometer you have works and discuss with kids why the temperature of the air is always changing.)

Once the weather station is set up, talk about how the data they will collect can help them make weather predictions. **Ask kids** how long they think they will need to collect data in order to find weather patterns that help them to forecast the weather.

As kids observe, collect, and record weather data, have them make weather predictions in their Weather Journals and then note the weather forecast from a trusted source. In the following days, have them compare the actual weather to the predictions.

When making their predictions, have them reference the data they've collected. These questions can help them think about what both they and meteorologists look for in their data:

- What have you observed in the sky?
- Has the barometer been rising or falling?
- Has humidity been rising or falling?
- Has the wind been blowing from the same direction?
- Has the daily temperature been rising or falling?
- Has there been any precipitation?



# Activity 2: Weather Station

## More weather instrument activities

### Wind Detectors (The Franklin Institute)

<https://www.fi.edu/en/science-recipes/wind-detectors>

### Hair Hygrometer (Exploratorium)

<https://nylearns.org/module/content/search/item/4211/viewdetail.ashx#sthash.R8DTH77L.dpbs>

### Make a Hygrometer to Measure Humidity

<https://www.sciencebuddies.org/stem-activities/humidity-meter-hygrometer>

### Weather Activities Pack

[https://www.weather.gov/media/hun/outreach/kids/Weather\\_Activity\\_Pack\\_singles.pdf](https://www.weather.gov/media/hun/outreach/kids/Weather_Activity_Pack_singles.pdf)

### Build Your Own Weather Station

[https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/education/activity-book/pdf/NOAA\\_DYW\\_2017\\_16\\_Weather\\_Station.pdf](https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/education/activity-book/pdf/NOAA_DYW_2017_16_Weather_Station.pdf)



Page spread from *The Weather Girls* by Aki



# Activity 3: Climate Check! Greenhouse Effect

## Introduction

The mix of gases in Earth's **atmosphere** is what helps protect the planet from cold, like a warm blanket. Sunlight coming through the atmosphere warms the Earth's surface. The atmosphere holds in or traps some of that warmth.

Gases in the atmosphere that trap heat are called **greenhouse gases**. The primary greenhouse gases on Earth are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. When these gases trap heat from the sun, it is called the **greenhouse effect**.

These gases, which come from both natural and human-made sources, are increasing in the atmosphere. This results in the atmosphere holding in more warmth and the Earth's temperature increases. An increasingly warmer atmosphere affects our weather — and our repeated weather patterns, or **climate**.

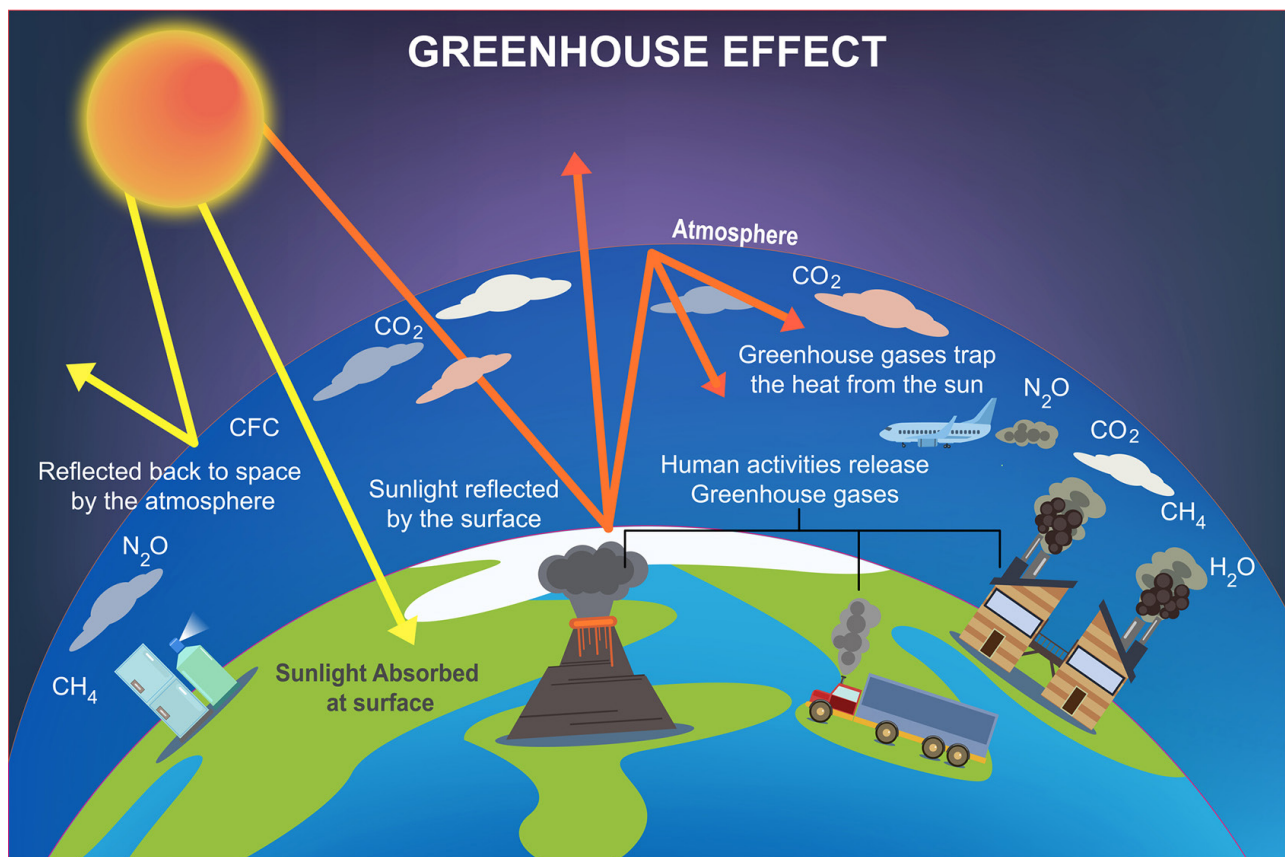


Illustration: iStock



## Activity 3: Climate Check! Greenhouse Effect

When kids create their own terrarium, they can learn more about and make connections between trapped sunlight, greenhouse gases, the temperature of an environment, and climate's influence on ecosystems.

### Supplies

- clear glass container from the recycling bin, such as a pickle jar; or repurpose a vase or canning jar. (Make sure the opening is big enough for kids' hands)
- marble-sized rocks
- activated charcoal (NOT charcoal for BBQ)
- potting soil (sterilized)
- small plants (plants that are slow-growing and like moisture) or seeds
- tablespoon or other tool for filling the jar
- water



**Ask kids** what they know about how a greenhouse works. Talk about how sunlight enters the glass enclosure of a greenhouse and warms the air, soil, and surfaces inside. A greenhouse stays warm inside because the glass roof and walls trap the Sun's heat.

The greenhouse effect works in a similar way. Greenhouse gases in the atmosphere, such as carbon dioxide and methane, trap heat like the roof and walls of a greenhouse. These heat-trapping atmospheric gases aren't solid like glass, but making a miniature greenhouse or terrarium is a good way to get an idea of how the greenhouse effect works and learn more about its impact on climate.

### Explore the greenhouse effect

**The Greenhouse Effect (EPA):** <https://youtu.be/VYMjSule0Bw>

**The Greenhouse Effect (University of Illinois Extension):** <https://www.youtube.com/watch?v=7bgk2cFc4Fc>





## Activity 3: Climate Check! Greenhouse Effect

### Let's get started!

**Step 1:** Kids should first make sure their containers are clean and dry.

Talk about the thickness of their containers. **Ask:** What effect will the thickness of the container have on what will grow inside? What effect will having an open or closed container have?

**Step 2:** Have kids add a layer of rocks one-inch thick in the bottom of their container.

As kids add layers to their containers, ask them questions about what they think the layers are for and talk about the needs of plants and other living things.

**Step 3:** On top of the rocks, have kids spoon on a 1/2-inch-thick layer of activated charcoal.

**Step 4:** Have kids use a cup to add potting soil to the container until the container is half-full.

**Ask kids:** What do you think will happen when plants are completely enclosed in the glass container (or one with a small opening)? How do they think the Sun's energy will affect the terrarium? Have them make predictions about what could increase or decrease the amount of trapped heat in their terrarium.

**Step 5:** Help kids get the plant ready to add to the terrarium. Have them gently shake old soil from the roots before putting the plant in the container into an appropriately sized hole in the potting soil. They should press the plant firmly in place and add some additional soil to fill the hole and cover the roots. Depending on the size of the container and availability of plants, kids may have more than one plant in their terrarium. Have them water the plants before closing the container.

**Explore the water cycle in a terrarium:** <https://youtu.be/0vu4wdHNo4Q>

**Step 6:** Kids should find spots for their terrariums in indirect sunlight. Have them monitor their terrarium, checking for temperature and excess moisture and making observation notes. It may be that they will need to try several different locations to find the spot with the most favorable conditions for plant health.

Talk with kids about why the greenhouse effect is important. **Ask:** What do greenhouse gases in the atmosphere do for Earth's climate? What would happen to life on Earth without the greenhouse effect?



## Activity 3: Climate Check! Greenhouse Effect



### Community connection

Kids have explored the benefits of the greenhouse effect in keeping Earth a comfortable place to live. But human activities are increasing the amount of greenhouse gases in our atmosphere, making it hotter than it should be. Carbon dioxide is the most common greenhouse gas created by human activities.

Let kids brainstorm ways they can help reduce carbon dioxide emissions, such as reducing use of electricity and adjusting thermostats, biking, walking, or using public transportation instead of driving, or planting trees. Talk about ways they could share their messages and get others to take responsibility and take action.

Try turning a community space into a canvas for creative collaboration! The visual elements of a mural are a great way to beautify a space — inside or outdoors. As a work of public art, a mural often has a message or theme. A mural creates an enjoyable space but is also a call to action. And as a collaborative work of art, a mural can bring communities closer together.



## Activity 3: Climate Check! Greenhouse Effect

Before starting a mural, you need to know where it will be placed. While murals can be painted directly on walls, painting them on plywood or canvas panels may be safer and easier for kids to work on (without ladders) and offer more flexibility for placement and maintenance. You may want to engage support from an artist in your community to have them talk with kids about their ideas for placement as well as what images and colors they think will be most effective in a mural that urges others to take care of the environment.



### Related resource

**Make a Terrarium Mini-Garden**

<https://climatekids.nasa.gov/mini-garden/>

### More greenhouse effect activities

**DOT Mural**

<https://ourclimateourfuture.org/activity/dot-mural/>








# WEATHER WALK

# 2

Take kids outside to observe the weather. After the **Daily Data Collection** and **Sky Sketch**, ask kids if they found any clues or evidence of any precipitation or significant weather changes.

Do they see any clues that could help them predict the weather? When clouds are in the sky, kids can observe their shape, color, and placement to predict what the weather will do. Being able to identify different types of clouds helps meteorologists understand current weather and make predictions. Kids can do the same!

Like long rows or strings of popcorn		Altostratus cloud	<b>Cold front</b> coming. When it is warm and sometimes humid, may turn into thunderstorms when a cold front approaches.
Low, blurry, and gray, covering the sky		Nimbostratus cloud	<b>Rain</b> , but not too heavy.
Big, tall, thick, and maybe dark on the bottom		Cumulonimbus cloud	<b>Thunderstorm.</b> These clouds produce heavy rain, thunder, lighting, and possibly hail and tornadoes.



# WEATHER WALK

# 2

Invite the kids to share their observations, why they think what they see is an indication of precipitation or changing weather, and write them in their journals.

**Find additional cloud observation and identification resources:**

**Cloud Identification Chart**

<https://www.globe.gov/documents/348614/24331082/GLOBE+Cloud+Chart>

**National Weather Service Cloud Chart**

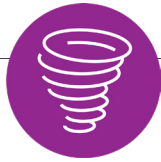
<https://www.weather.gov/jetstream/cloudchart>

Follow up on your **World Weather Wise** activity and talk more about the weather and climate of this location. Discuss what weather this location is currently experiencing and ask kids to imagine what the sky looks like in this location and sketch it in their Weather Journal.

If you have the opportunity, take the kids outside more than once during the day to observe how the weather changes.

**Repeat the Weather Walk every day.**





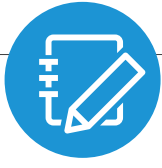
## Simon (the Weatherman) Says

When you play Simon (the Weatherman) Says, give players a chance to act out several of these silly interpretations of weather before giving an order without saying “Simon the Weatherman Says.”

- Fall down like heavy rain
- Stomp your feet like loud thunder
- Spin like a tornado
- Clap your hands like lightning
- Drift your hands down like quiet snow falling
- Blow like a hurricane
- Float around like a cloud

Let someone else have a turn as Simon the Weatherman and see what other weather moves in!





## Writing About Weather

### Weather report

Find a recent news broadcast online and let kids watch the meteorologist's segment. Then have them imagine they have to give the next weather report on the local news! Ask them to use the weather data they have collected to write their script, which could include:

- Their observations on today's weather
- Current, high, and low temperatures
- Their forecast for tomorrow and the next few days
- Something they find interesting about the current weather

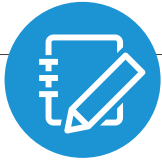
Kids can read their scripts aloud or create their own weather forecast video to share.

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### Memorable weather

Most people have strong feelings about weather. Some love hot, sunny days; others enjoy gentle spring rain. Some people complain about snow and cold; others dislike thunderstorms. Talk with kids about their feelings about different types of weather. Heading outside and looking at nonfiction books about weather may stimulate thinking. Encourage them to offer descriptions of how different types of weather look, smell, feel, and sound, then write down their ideas. Then encourage them to brainstorm to create an alliterative poem about their most memorable weather experience.

Alliteration is the repetition of initial consonant sound in two or more neighboring words or syllables, such as "the wintry wind whistles." Talk with kids about other examples of alliteration that have likely encountered in brand names and advertising — like Best Buy, Red Robin, Krispy Kreme — and why the alliteration helps make words and phrases memorable. Alliterative words twist the tongue and are fun to read and say! A poem full of alliteration is like a tiny tornado in your mouth.



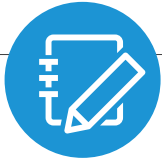
# Writing About Weather

## “Beaufort wind force scale” poetry

The Beaufort wind force scale is a table that describes the force of the wind and can be helpful in estimating wind strength without the use of instruments. The scale, from 0 - 12, shows the strength of the wind from calm to hurricane.

Read together, the Beaufort scale descriptions and observations sound like poetry. Read the scale aloud as a poem and share “Hear the Wind Blow” by Doe Boyle, an illustrated poem where each stanza represents, in order, one of the 13 categories of the Beaufort wind-force scale. Talk about how words can be used to describe something that you cannot see. Have the kids incorporate Beaufort’s descriptions and observations when they create their own “found poem” that defines the wind or conveys a theme of their own choosing. A “found poem” is created by using words or phrases that have been selected and rearranged from another text.

Beaufort Force	Description	Observations	Wind (mph)
0	Calm	Smoke goes straight up	Less than 1
1	Light air	Wind direction is shown by smoke drift but not by wind vane	1-3
2	Light breeze	Wind is felt on the face; leaves rustle; wind vanes move	4-7
3	Gentle breeze	Leaves and small twigs move steadily; wind extends small flags straight out	8-12
4	Moderate breeze	Wind raises dust and loose paper; small branches move	13-18
5	Fresh breeze	Small trees sway; waves form on lakes	19-24



# Writing About Weather

<b>Beaufort Force</b>	<b>Description</b>	<b>Observations</b>	<b>Wind (mph)</b>
6	Strong breeze	Large branches move; wires whistle; umbrellas are difficult to use	25-31
7	Near gale	Whole trees are in motion; walking against the wind is difficult	32-38
8	Gale	Twigs break from trees; walking against the wind is very difficult	39-46
9	Strong gale	Buildings suffer minimal damage; roof shingles are removed	47-54
10	Whole gale (storm)	Trees are uprooted	55-63
11	Violent storm	Widespread damage	64-72
12	Hurricane	Widespread destruction	73+



# Kid-friendly Digital Media

## Apps

### **Weather Bug**

<https://www.weatherbug.com/>

### **GLOBE Observer Clouds**

<https://observer.globe.gov/about/get-the-app>

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## Online games

### **Pressure and Flow: Using Water Tanks to Explain Why the Wind Blows**

<https://scied.ucar.edu/interactive/pressure-flow-water-tanks-virtual-lab>

### **Climate Time Machine (NASA)**

<https://climatekids.nasa.gov/time-machine/>

### **HotSeat: You Be the Forecaster**

<https://www.nssl.noaa.gov/education/hotseat/>

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## Websites

### **What's in the atmosphere**

<https://climatekids.nasa.gov/whats-in-the-atmosphere/>

### **Old Farmer's Almanac for Kids**

<https://www.almanac.com/kids#weather>

### **Predict the weather**

<https://kids.nationalgeographic.com/nature/article/predict-the-weather>

### **Weather Wiz Kids**

<https://www.weatherwizkids.com/>





## Online books

### **The Air We Breathe**

[https://www.nasa.gov/pdf/62452main\\_The\\_Air\\_We\\_Breathe.pdf](https://www.nasa.gov/pdf/62452main_The_Air_We_Breathe.pdf)

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## Video

### **TED Ed: The History of the Barometer (and How It Works)**

<https://youtu.be/EkDhlzA-lwl>

### **NASA's Earth Minute: Gas Problem**

<https://youtu.be/K9kga9c0u2l>

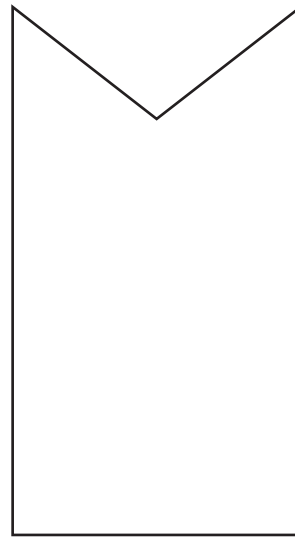
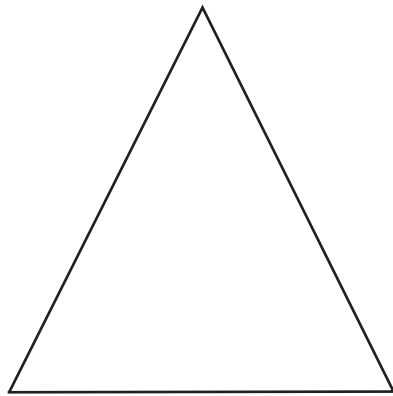
### **Crash Course Kids: Weather Channels**

<https://youtu.be/RD-2dvaG4UY>

### **How to Read a Weather Map**

<https://youtu.be/GkE3F5AuWBQ>

## Activity 2 (Station 1): Weather vane template



# Day 3

## Extreme Weather





# Day 3

## Extreme Weather

### Introduction

Severe weather or climate conditions can damage or devastate communities and natural environments. Extreme weather events can include heat waves, hurricanes, tornadoes, tropical cyclones, and floods and are often short-lived. Other climate-related extreme events last longer than weather events or come out of weather or climate events that go on over a longer period of time, such as [drought](#).

Severe and extreme weather events can bring uncertainty and anxiety into our lives. But kids who are aware of and prepare for extreme weather will understand and appreciate that there are caring adults around who want them to stay safe. And that there are things that they can do themselves!

This day focuses on understanding how extreme weather forms, particularly thunderstorms and tornadoes, and what kids can do to prepare themselves and their communities to stay safe in extreme weather.

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### Questions to guide explorations and experiments

- What is extreme weather?
- How is extreme weather different from other types of weather?
- How does extreme weather affect the lives of people and other living creatures?
- What kinds of extreme weather happen where we live?
- What can we do to stay safe in extreme weather conditions and help others?

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### Books and activities

- **Books:** about all kinds of extreme weather, climate change, thunderstorms, and tornadoes
- **Activities:** understanding how thunderstorms, lightning, and tornadoes form and the impact they have; projects to improve preparedness and safety in extreme weather



## Fiction

- *Beak & Ally: The Big Storm* by Norman Feuti (Ages 6-10)
- *Blizzard* by John Rocco (Ages: 3-7)
- *Booma Booma Boom* by Gail Silver (Ages 4-8)
- *Bruce's Big Storm* by Ryan T. Higgins (Ages 4-8)
- *Clifford Keeps Cool* by Norman Bridwell (Ages 3-6)
- *The Coquíes Still Sing: A Story of Home, Hope, and Rebuilding* by Karina Nicole González (Ages 6-9)
- *Come On Rain* by Karen Hesse (Ages 3-6)
- *Eye of the Storm* by Kate Messner (Ages 9-12)
- *The Fog* by Kyo Maclear (Ages 6-9)
- *Heatwave* by Eileen Spinelli (Ages 6-9)
- *Hurricane* by John Rocco (Ages 3-7)
- *Hurricane Rescue* by Jennifer Li Shotz (Ages 8-12)
- *I Am a Tornado* by Drew Beckmeyer (Ages 4-8)
- *I Am the Storm* by Jane Yolen and Heidi E. Y. Stemple (Ages 3-7)
- *I Feel Safe* by David McPhail (Ages 3-6)
- *Katy and the Big Snow* by Virginia Lee Burton (Ages 4-8)
- *The Legend of Lightning and Thunder* by Paula Ikuutag Rumbolt (Ages 6-9)
- *Mardi Gras Almost Didn't Come this Year* by Kathy Price (Ages 4-8)
- *Otis and the Tornado* by Loren Long (Ages 3-8)
- *Pattan's Pumpkin: A Traditional Flood Story from Southern India* by Chitra Soundar (Ages 4-8)
- *Science Comics: Wild Weather: Storms, Meteorology, and Climate* by M.K. Reed (Ages 9-12)
- *The Storm in the Barn* by Matt Phelan (Ages 10 and up)
- *Thunder Cake* by Patricia Polacco (Ages 3-8)
- *Thunderstorm* by Arthur Geisert (Ages 4-8)
- *To Change a Planet* by Christina Soontornvat (Ages 4-8)
- *Waiting Out the Storm* by JoAnn Early Macken (Ages 3-7)
- *When the Wind Came* by Jan Andrews (Ages 4-8)





## Poetry

- *Tornado! Poems* by Arnold Adoff (Ages 8 and up)
- *Viento, Vientito / Wind, Little Wind* by Jorge Tetl Argueta (Ages 4-7)
- *Zap! Clap! Boom! The Story of a Thunderstorm* by Laura Purdie Salas (Ages 3-7)

## Nonfiction

- *Al Roker's Extreme Weather* by Al Roker (Ages 9-12)
- *All the Feelings Under the Sun: How to Deal With Climate Change* by Leslie Davenport (Ages 10 and up)
- *The Big Storm* by Bruce Hiscock (Ages 6-10)
- *Climate Action: What Happened and What We Can Do* by Seymour Simon (Ages 6-10)
- *Extreme Weather: Surviving Tornadoes, Sandstorms, Hailstorms, Blizzards, Hurricanes, and More! (National Geographic Kids)* by Thomas Kostigen (Ages 8-12)
- *Flash, Crash, Rumble, and Roll* by Frank Branley (Ages 3-8)
- *How Ben Franklin Stole the Lightning* by Rosalyn Schanzer (Ages 6-9)
- *Hurricane & Tornado* by Jack Challoner (Ages 8-12)
- *Kids Fight Climate Change* by Martin Dorey (Ages 7-10)
- *Old Enough to Save the Planet* by Loll Kirby (Ages 7-12)
- *Our House Is on Fire: Greta Thunberg's Call to Save the Planet* by Jeanette Winter (9 -12)
- *Something Happened to Our Planet: Kids Tackle the Climate Crisis* by Marianne Celano and Marietta Collins (Ages 6-9)
- *Storm on the Desert* by Carolyn Lesser (Ages 4-8)
- *The Story of Lightning & Thunder* by Ashley Bryan (Ages 5-8)
- *Thunderstorms* by Chana Stiefel (Ages 8-10)
- *Tornado! The Story Behind These Twisting, Turning, Spinning, and Spiraling Storms (National Geographic Kids)* by Judy Fradin (Ages 4-8)
- *The Tornado Scientist: Seeing Inside Severe Storms* by Mary Kay Carson (Ages 9-12)
- *Tornadoes!* by Gail Gibbons (Ages 4-7)
- *When the Sky Breaks: Hurricanes, Tornadoes, and the Worst Weather in the World* by Simon Winchester (Ages 9-12)



# Activity 1: Thunderstorms

## Introduction

Thunderstorms are dangerous storms that happen a lot. There can be 40,000 to 50,000 thunderstorms each day around the world! They can occur any time of year and at any hour.

All thunderstorms have lightning. Hundreds of people in the U.S. get struck by lightning each year and some of them die. Lightning strikes can also start fires. In addition, thunderstorms can bring strong, destructive winds that knock down trees and power lines. Heavy, intense rainfall from thunderstorms can cause flash floods. And thunderstorms can bring tornadoes as well as damaging hail.

Given the danger and noise they bring, thunderstorms can be loud and scary for some kids.

With these activities, kids can work in small groups to create their own thunderstorm and lightning to better understand what they are and how they form.

## Supplies for thunderstorms

- blue and red food coloring
- water
- ice cube tray(s) for making ice cubes using blue food coloring (make the ice cubes before you start the activity)
- clear plastic container about the size of a shoe box





## Activity 1: Thunderstorms

### Get kids thinking ...

Find out what they know about storms and how storms form. **Ask kids:** How and why do thunderstorms happen where we live? How do you feel about thunderstorms? What differences have you noticed between a warm, sunny day and a warm, stormy day? Talk about which weather conditions they have noticed that often result in thunderstorms. Get kids talking about their feelings about thunderstorms after sharing *Thunder Cake* by Patricia Polacco.

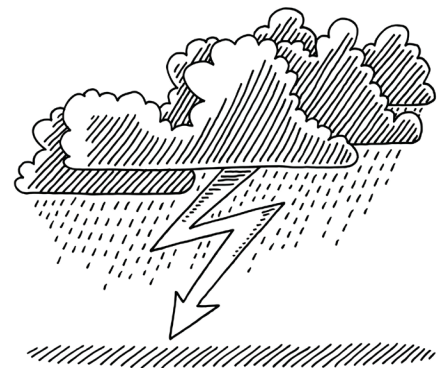
### Explore clouds

#### What Causes a Thunderstorm?

<https://youtu.be/pcZn3dGWQ-U>

#### What Causes Lightning?

[https://youtu.be/VqXnN\\_FQfrc](https://youtu.be/VqXnN_FQfrc)



### Let's get started!

**In advance:** Fill the ice cube tray with water and add several drops of blue food coloring to each cube. Freeze until solid.

**Step 1:** Have kids fill the clear plastic container almost to the top with lukewarm water. They should make sure the water is lukewarm and not hot.

**Step 2:** Provide each group with 4 or 5 blue ice cubes to add to the water near the left side of the container.

**Step 3:** Right after they add the ice, each group should squeeze 8 or more drops of red coloring into the water on the right side of their container.

**Step 4:** Watch what happens as the two different colors — and temperature — interact with each other.

As kids make their observations, **ask:** Why does the blue ice water sink while the warmer red water rises, or stays higher than the blue? Talk with them about what the blue and the red

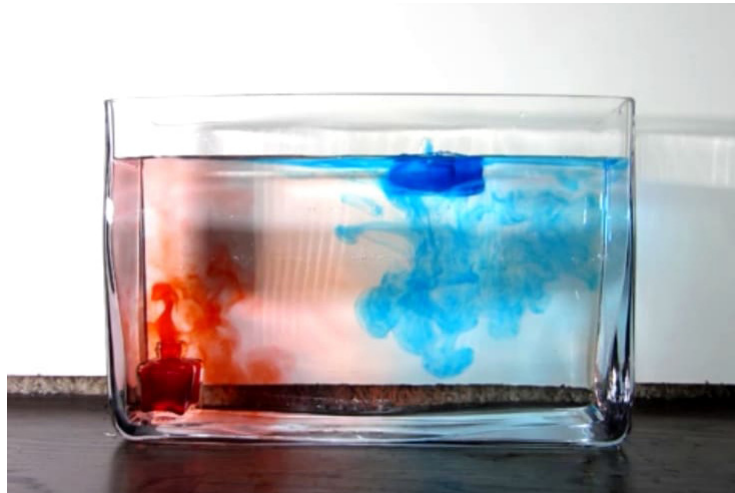


## Activity 1: Thunderstorms

water represent. The blue ice water is the cool sinking air. The red water is the warm air rising. How does this relate to how a thunderstorm forms?

A thunderstorm can develop when warm, moist and cold, dry air masses meet.

When the air near the ground is warmer than the temperature of the air higher up in the **atmosphere** and there is high humidity, conditions are right for a thunderstorm. As the warm, moist air above the ground rises, it gives its heat to the atmosphere. The water **vapor** in the warm air cools, releases heat, condenses, and forms a cloud that grows as water droplets within it get bigger as more water from rising air is added. As defined by the National Weather Service, this vertical transport of heat and moisture in the atmosphere, especially by changes in wind direction (updrafts and downdrafts) in an unstable atmosphere, is known as **convection**.



### Where's the lightning?

As storm clouds rise up into freezing air, ice particles can form. Water moving up higher into the atmosphere bumps into falling ice particles and these collisions cause positive electric charges to develop in the top of the cloud and negative electric charges to develop in the bottom. When a HUGE amount of charge builds up, the negative charges in the cloud connect with positive charges on the ground or in other clouds and ZAP — lightning occurs.

Kids can see how storms discharge static electricity when they make their own tiny sparks.



# Activity 1: Thunderstorms

## Supplies for lightning

- aluminum pie pan
- wool sock or other small piece of wool fabric
- styrofoam plate
- pencil with a new eraser
- flat-head thumbtack
- fork (optional)

## Let's get started!

**In advance:** Work out how to make the room used for this demonstration as dark as possible.

**Step 1:** Have kids turn the aluminum pie pan over and gently push the thumbtack through the center.

**Step 2:** Gently turn the pie pan over again, making sure the thumbtack stays in place. Push the eraser of the pencil into the thumbtack. Set the pie pan aside.

**Step 3:** Turn the styrofoam plate upside down. Have kids briskly rub the plate with the wool sock for at least 2 minutes. Ask kids to think about what this rubbing is doing.

**Step 4:** Using the pencil as a handle, put the pie pan on top of the upside down styrofoam plate.

**Step 5:** One child should touch the edge of the pie pan with a finger. Did they feel a shock?

**Step 6:** Make the room dark. Have a child touch the edge of the pie pan with a finger or a fork. Did they see a spark?

**Step 7:** Give everyone a chance to make a spark. Kids may need to recharge their styrofoam plate with additional rubbing using the wool sock.

Talk with kids about their other experiences with static electricity. Have they ever scooted across the carpet in







## Activity 1: Thunderstorms

their socks and then received a shock from a doorknob? How do other objects become electrically charged? How does the demonstration with the pie pan and styrofoam plate relate to how lightning forms?

### More lightning activities

#### Make Lightning at Home

<https://www.sciencemuseumok.org/smoathome/try-make-lightning-home>

### Where's the thunder?

Thunder is the sound of the quick moving air that has been superheated and expanded by lightning. The flash of lightning happens at about the same time as thunder sounds. But because light travels faster than sound, people see lightning before they hear thunder.

Be sure kids understand that if you can hear thunder, you are close enough to be struck by lightning. Encourage them to remember, "when thunder roars, go indoors" to stay safe from lightning strikes.



Demonstrate the sound of thunder to kids by blowing into a small brown paper bag. When it is filled with air, twist the open end closed, then hit the bag hard with your other hand. The air that gets pushed out of the bag makes a sound when it reaches the ear.

### More thunderstorm activities

Help kids get to know more about thunder and lightning with these online interactive activities:

#### Make a Thunderstorm

<https://scied.ucar.edu/interactive/make-thunderstorm>



# Activity 1: Thunderstorms

**How Far Away Is Lightning? (simulation)**

<https://scijinks.gov/how-far-away-is-lightning/>

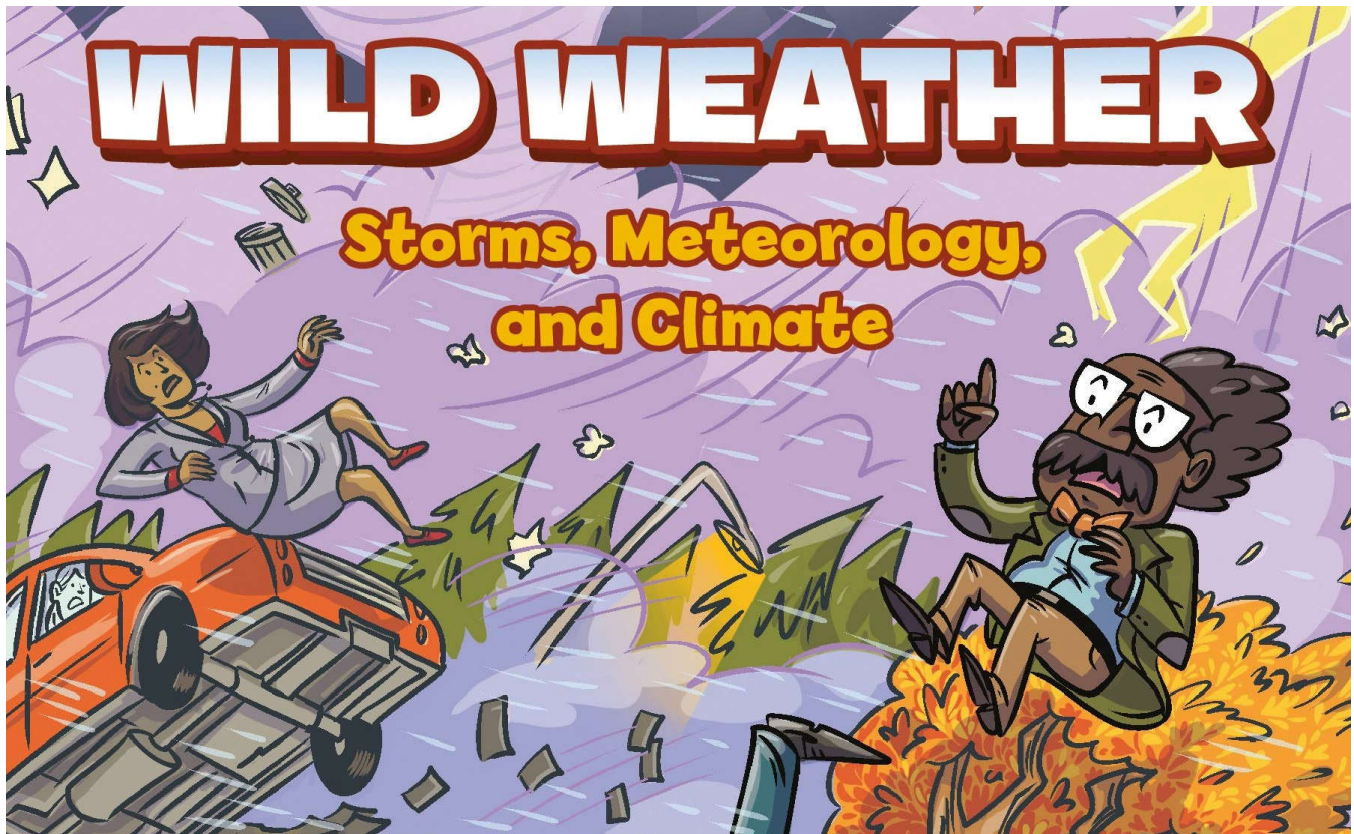
**Make Lightning with ZAP!**

<https://scijinks.gov/zap-game/>

**Get hands on:**

**Make an Indoor Thunderstorm**

<https://insidetheorchestra.org/2019/06/10/family-thunderstorm-activity/>



Page spread from: *Science Comics: Wild Weather: Storms, Meteorology, and Climate* by M.K. Reed



## Activity 2: Tornadoes

### Introduction

Also known as a twister, a tornado is a violent storm with a fast-spinning column of air that reaches down from the base of a powerful thunderstorm and touches the ground. Dust, debris, and water droplets make a tornado's funnel very distinct.

The U.S. has more tornadoes than anywhere else in the world — on average, more than 1,000 each year. Tornadoes can and have occurred in all 50 states and can happen at any time of year and any time of the day. Tornadoes are dangerous and can cause death, injury, and destruction. Reading and talking about how tornadoes form and the impact they have can help kids understand and prepare for this extreme weather event.

With this activity, kids can work in pairs to create their own tornado in a bottle and learn how a **vortex** forms and how the air in a tornado swirls and develops its funnel shape.



### Supplies

- two clear 2-liter plastic bottles with labels and plastic neck rings removed
- water
- duct tape and a 1-inch metal washer (or a tornado tube connector: <https://www.officedepot.com/a/products/588963/Tornado-Tube-Twister-Tube-Connector-Experiment/>)
- food coloring (optional)
- tiny toys (optional)

### Get kids thinking ...

**Ask kids** to think about what they learned about how thunderstorms form when warm, moist air rises through colder air. Air rising causes a change in wind direction, or updraft. **Ask:** What do you think happens when rising air meets falling air in a thunderstorm with winds that are moving with different speeds and in different directions?



## Activity 2: Tornadoes

### Explore tornadoes

#### Tornadoes: Spinning Thunderstorms

<https://www.amnh.org/explore/ology/earth/tornadoes-spinning-thunderstorms>

#### Meet a Tornado

<https://youtu.be/8wMqwCYW7b4>

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### Let's get started!

**Step 1:** Provide each pair of kids with two clear 2-liter bottles. Kids can fill one bottle with water, about 3/4 full. Give the option of adding a few drops of food coloring or small items that represent dirt and debris. (Note that small items can sometimes stop up the connection between the two bottles and interrupt the flow of the tornado.)

**Step 2:** Kids need to connect the two bottles together. If tornado tube connectors are available, kids should twist it onto the top of the bottle with water and then twist in the second bottle on the other end of the connector. Tube connectors can be found in the plumbing section of your local hardware store.

If using a washer and duct tape, get two or three 4-to-5-inch strips of duct tape ready. Then place the washer over the opening of the bottle with water. Turn the second bottle upside down and carefully line it up on top of the washer. One child should hold the bottles together in place while the other uses duct tape to secure the bottles together tightly, making sure there is no leaning or leaking.

**Step 3:** Grabbing either the connector or duct tape, lift the connected bottles up and flip it over so that the bottle with water is on top. Still holding on to the bottle connector, quickly rotate the bottles in small circles. Kids should help keep the bottles lined up by steadying the top bottle with their other hand as they rotate the bottles. Swirl, don't shake!

**Step 4:** Stop rotating the bottles and take a look to see there is a tornado forming in the water. (It might take a few tries to get the water moving quickly enough.)



## Activity 2: Tornadoes

As kids make their observations, **ask**: How does this demonstration relate to how tornadoes form? Talk about the warm, rising air of a thunderstorm. How is that represented in this demonstration? What does the water represent? How is the circular rotation of the bottles similar to the winds inside the clouds that help produce tornadoes? What happens if you rotate the bottles longer and harder?

**Tornado in a Bottle Experiment:** <https://playingwithrain.com/tornado-in-a-bottle-experiment/>



### More tornado activities

Help kids get to know more about tornadoes with these online interactive activities:

**Control a Tornado**

<https://whyfiles.org/2013/control-a-tornado/index.html>

**Tornado Simulator**

<https://scijinks.gov/tornado-simulation/>





## Activity 2: Tornadoes

### Get hands on:

#### Creating a Twister in a Jar

<https://scied.ucar.edu/activity/creating-twister-jar>

#### It's a Twister!

<https://www.redcross.org/content/dam/redcross/get-help/youth/Pedro-supplemental-activity-TORNADO.pdf>



Illustration from *I Am the Storm* by Jane Yolen and Heidi E. Y. Stemple



## Activity 3: Climate Check! Smarter than the Weather

### Introduction

No matter how much kids know about the science of storms, they still need to be in a safe place when one is happening. With climates changing, flooding, wildfires, or really hot days are happening more often.

Kids can help their families and communities meet the challenges of extreme weather and natural disasters by getting smart and getting prepared.

This activity provides guidelines to help kids form their own plan of action to educate others about severe weather, climate change, and make a difference by getting their family, school, or community prepared.

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### Supplies

- writing supplies
- access to research materials through the internet and print

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### Get kids thinking ...

**Ask:** What can you do to show everyone how to be smarter than the weather? How can you help people adapt to the impacts of climate change?

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### Let's get started!

Talk with kids about how planning can help them accomplish a goal. Then, have them sign the PACT — an agreement to develop, follow through, and carry out their plan. Provide them with the steps below and talk them through

**Step 1: Pre-planning.** List problems or situations caused by the weather that concern you. (Some problems many communities deal with include finding safe routes during flooding; evacuating with pets; or securing plans for safety in case of lightning during outdoor events.)



## Activity 3: Climate Check! Smarter than the Weather

After thinking about which interests you the most, choose the climate plan that has the greatest importance to you and your family, and the kind of impact you can make.

Planning starts when you analyze or take a close look at the situation. Use the 5 W's and H questions to get started:

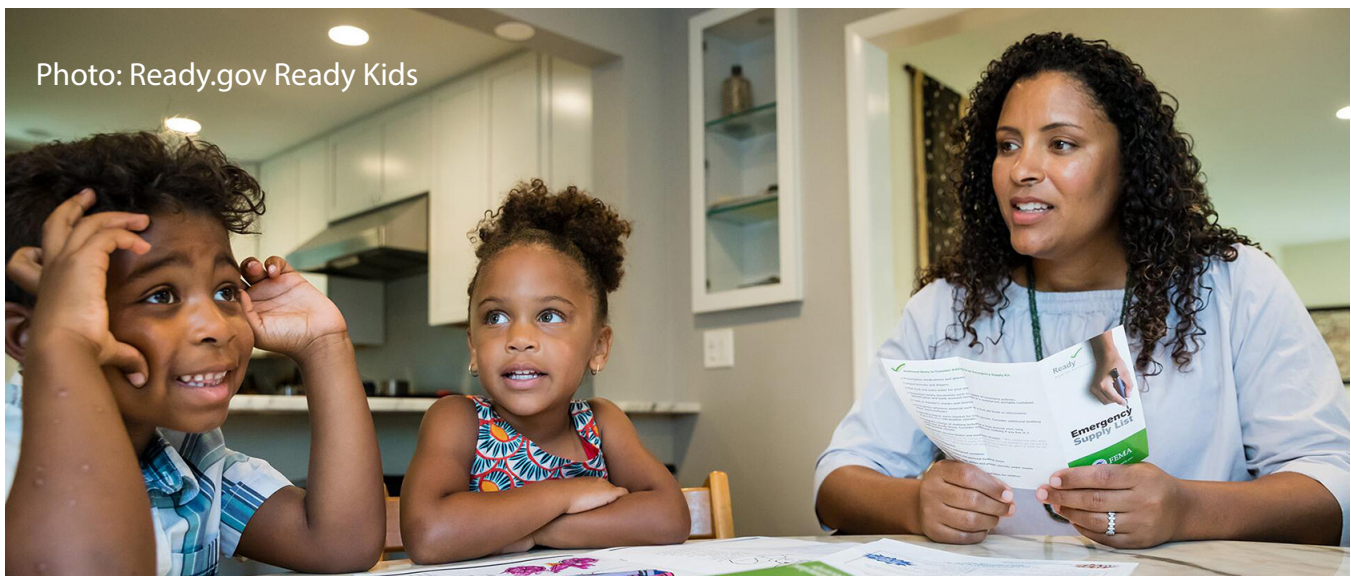
- Who? (the people)
- What? (the action)
- Where? (the location)
- When? (the time)
- Why? (the reason)
- How? (the methods or means)

**Step 2: Get more information.** Be sure you understand the problem. Research and read about the issue online and in books. Talk to people in government or organizations who are already involved with the problem. Try to get a variety of points of view on the issue.

These websites are good places to start:

**Ready Kids:** <https://www.ready.gov/kids>

**National Weather Service Weather-Ready Nation:** <https://www.weather.gov/wrn/>





## Activity 3: Climate Check! Smarter than the Weather

**Step 3: Research solutions.** As you gather information, pay attention to how others are dealing with the problem and note any ideas that you've had about how to make a difference.

**Step 4: Plan to act.** Develop specific ways to be of help. Consider these weather-wise ideas:

- Talk with your parents about making a family emergency plan
- Help prepare Emergency Supply Kits for your family and others in need
- Plant trees to help keep things cooler during extreme heat
- Prepare and make presentations to local soccer, baseball, and football teams and their coaches on lightning safety
- Put together a storm survival kit for the family car
- Raise awareness about water conservation and drought
- Organize a public service campaign on flood safety
- Add a weather forecast with preparedness messages to your school's morning announcements or school newspaper
- Ask your school or public librarian to showcase weather-related titles at the library and provide preparedness information or a poster to complete the display
- Be aware and encourage others to pay attention to weather warnings and watches



Set a realistic goal — something you can really accomplish. Is there an action you can take? What resources or help will you need? How long will it take to complete?

Don't be afraid to ask for help. Your teacher, family members, scout leader, friends, and others may be able to help.

**Step 5: Make a PACT and carry out your plan.**



# Activity 3: Climate Check! Smarter than the Weather

## PLAN + ACT = PACT

As a Weather Wonder, I am excited to help my community get weather wise! I plan to  
*(describe your plan of action):*

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and hope this action will help *(write your goal)* \_\_\_\_\_

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Signed: \_\_\_\_\_

Date: \_\_\_\_\_





## Activity 3: Climate Check! Smarter than the Weather

### Community connection

It's not just people that have to deal with extreme weather and natural disasters. Head outside and ask kids to take a look for the creatures that make their homes around your neighborhood. Talk about what kids find and discuss their awareness of birds and wildlife in your community. Ask students how they think extreme weather and climate change are impacting wildlife in all sorts of settings and why they think it would be important to understand what is happening in their own community.

**Ask:** How is our community part of broader ecosystems? Have kids share their ideas for how to contribute what they observe about weather, climate change, and local wildlife to officials in your community as well as larger efforts that study the impact of climate change on animals and their habitats.

### Explore learning about climate from wildlife

**Marina Ventura's Climate Explorers:** <https://www.funkidslive.com/learn/marina-ventura/climate-explorers/learning-climate-wildlife/>

Talk about why it is important for all citizens to stay informed about things that impact the environment. Together, scan the news for items of interest and importance that affect the environment and your community, such as land development or water restrictions. Find out what issue or issues resonate with kids and talk about their concerns. Discuss their ideas for staying informed about their issues and what they can do to have a voice in what happens in their community.





## Activity 3: Climate Check! Smarter than the Weather

### More preparedness activities

Help kids get to know more about getting prepared for weather and climate change with these online interactive activities:

#### Help the Community

<https://scied.ucar.edu/kids/interactive/help-community-climate>

#### Disaster Master game

<https://www.ready.gov/kids/games/data/dm-english/index.html>

### Get hands on:

#### Disaster Prep Rally Lesson Books and Resources

<https://www.savethechildren.org/us/what-we-do/disaster-relief-in-america/preparedness#kit>

#### Climate Kids Climate Science Activity Book

[https://drive.google.com/file/d/1y\\_0GsRpLo65KTQurnwXkiMf1-lesVB\\_k/view](https://drive.google.com/file/d/1y_0GsRpLo65KTQurnwXkiMf1-lesVB_k/view)





# WEATHER WALK

# 3

Take kids outside to observe the weather. After the **Daily Data Collection** and **Sky Sketch**, ask kids if they see clues or evidence of any precipitation or significant weather changes.

Do they see any signs that extreme weather is coming? Do they see any evidence of past extreme weather events? Invite them to share their observations, why they think what they see is an indication of past or future extreme weather, and write them in their journals.

Follow up on your **World Weather Wise activity** and talk more about the weather and climate of this location. Discuss what weather this location is currently experiencing, if they see evidence of extreme weather, and ask kids how they can tell and what kind of weather this location is having.

**Repeat the Daily Weather Walk every day.**



## Weather yoga

Extreme weather can be stressful. But weather yoga can help kids relax and get into a peaceful state of mind. You can invent your own weather yoga poses or try these weather-themed poses from Kids Yoga Stories (<https://www.kidsyogastories.com/weather-activities-for-kids-yoga/>).

### 1. Sunny — Extended Mountain Pose

Stand tall in Mountain Pose, inhale, look up, take your arms straight up to the sky, and say hello to the Sun. You can then exhale and bring your arms back down alongside your body. Repeat the inhale, raising and lowering your arms, for a few breaths and imagine soaking up rays of sunshine.

### 2. Windy — Tree Pose

Stand on one leg. Bend the knee of the leg you are not standing on, place the sole of your foot on the opposite inner thigh or calf, and balance. Sway like a tree in the wind. Switch sides and repeat the steps.

### 3. Lightning — Chair Pose

Stand tall with your feet hip-width apart, bend your knees, and keep a straight spine. Hold your hands up in front of you with straight arms, pretending to be a lightning bolt.

### 4. Rain — Standing Forward Bend

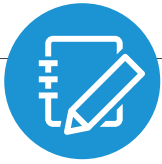
First get into Mountain Pose — Stand tall with your feet hip-width apart, back straight, shoulders relaxed, and palms forward, fingers spread out. Next, bend your upper body, keep a straight spine, and reach for your toes. Pretend your arms are falling raindrops.

### 5. Snow — Child's Pose

Sit back on your heels, slowly bring your forehead down to rest on the floor in front of your knees, rest your arms down alongside your body, and take a few deep breaths. Pretend to be a snowflake falling from the sky. Take a few deep breaths.

### 6. Cloudy — Easy Pose

Sit cross-legged and rest your palms on your knees. Close your eyes, if you are comfortable doing so. Imagine being a cloud floating across the sky. Take a few deep breaths and relax your body.



## Recipe for disaster

Have kids create a serious or silly recipe for a storm. What “ingredients” have to come together in the atmosphere to make a thunderstorm, hurricane, blizzard, or hailstorm? Provide samples of recipes and talk about what a recipe is — a list of ingredients and the steps you need to take to make something with them. Have kids list their ingredients and write the steps needed to mix up their storm.

## Twisting off the page

Kids can make their words swirl and twirl when they create a concrete poem in the shape of a tornado.

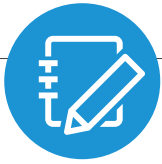
**How to Write a Concrete Poem:** <https://poetry4kids.com/lessons/how-to-write-a-concrete-poem/>

## Map to safety

Invite kids to map out and write down their plan to stay safe in extreme weather or other emergencies. Families need to know what to do and where to go if they are not safe at home because of a natural disaster. Kids can help make those plans for getting to a safe place with the people they care about. Have kids talk with their families about what kind of weather emergencies happen in their communities and what they can do to stay connected to each other and safe. Kids can then do the following:

- Make a paper contact list with names and phone numbers of your family and people you care about so you can reach them in a disaster.
- Pick meeting places outside of the neighborhood you live in to reunite if your family gets separated during the disaster and can't go home.
- Make a map and make sure that everyone knows where the meeting places are and practices getting to them.





# Writing About Weather

## Every photo tells a story

What's happening in this photograph? Present this image or other storm related images to kids and have them use it as a prompt to write a short piece of realistic fiction.

**NOAA Photo Library:** <https://photolib.noaa.gov/Collections>





# Kid-Friendly Digital Media

## Apps

### **Kids Discover Extreme Weather App \$**

<http://kidsdiscover.com/apps-for-kids/extreme-weather-app-for-ipad/>

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## Online games

### **Disaster Master and Build a Kit**

<https://www.ready.gov/kids/games>

### **Create a Snowstorm**

<https://scied.ucar.edu/interactive/create-snowstorm>

### **Forecast a Hurricane**

<https://scied.ucar.edu/interactive/forecast-hurricane>

### **Make a Hurricane**

<https://scied.ucar.edu/interactive/make-hurricane>

### **Hurricane Allie**

<https://scied.ucar.edu/kids/interactive/hurricane-allie>

### **Make a Thunderstorm**

<https://scied.ucar.edu/interactive/make-thunderstorm>

### **Create a Snowstorm**

<https://scied.ucar.edu/interactive/create-snowstorm>

### **Funny Fill-In: The Fast and the Flurryous**

<https://kids.nationalgeographic.com/games/funny-fill-in/article/funny-fill-in-the-fast-and-the-flurryous>



# Kid-Friendly Digital Media

## Websites

### Severe Weather 101

<https://www.nssl.noaa.gov/education/svrwx101/>

### Weather Center

<https://kids.nationalgeographic.com/science/topic/weather>

### Tornadoes

<https://kids.nationalgeographic.com/science/article/tornado>

### WeatherSTEM

<https://www.weatherstem.com>

### What Is Climate Change?

<https://www.amnh.org/explore/ology/climate-change>

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## Video

### Severe Weather: Crash Course Kids

<https://youtu.be/QVZExLO0MWA>

### Explore Severe Weather with NOAA Weather Briefly

<https://www.youtube.com/playlist?list=PLowCkjeYmJBSnckPFd0T8huUZjqDLS3Jy>

### The Weather Channel: Connect with Weather

<https://vimeo.com/101526273>

### What's With Weather Fronts?

<https://youtu.be/8KNzii1yJuw>



# Kid-Friendly Digital Media

**NASA's Earth Minute: Earth Has a Fever**

<https://youtu.be/nAuv1R34BHA>

**Understanding Lightning: Slow Motion Video of Lightning Flashes**

<https://www.weather.gov/safety/lightning-science-slow-motion-flashes>

**The Story of Man-Kah-Ih (Tornado)**

<https://www.pbslearningmedia.org/resource/momaday19-native-american-mythology-vid-eo-gallery/n-scott-momaday/>

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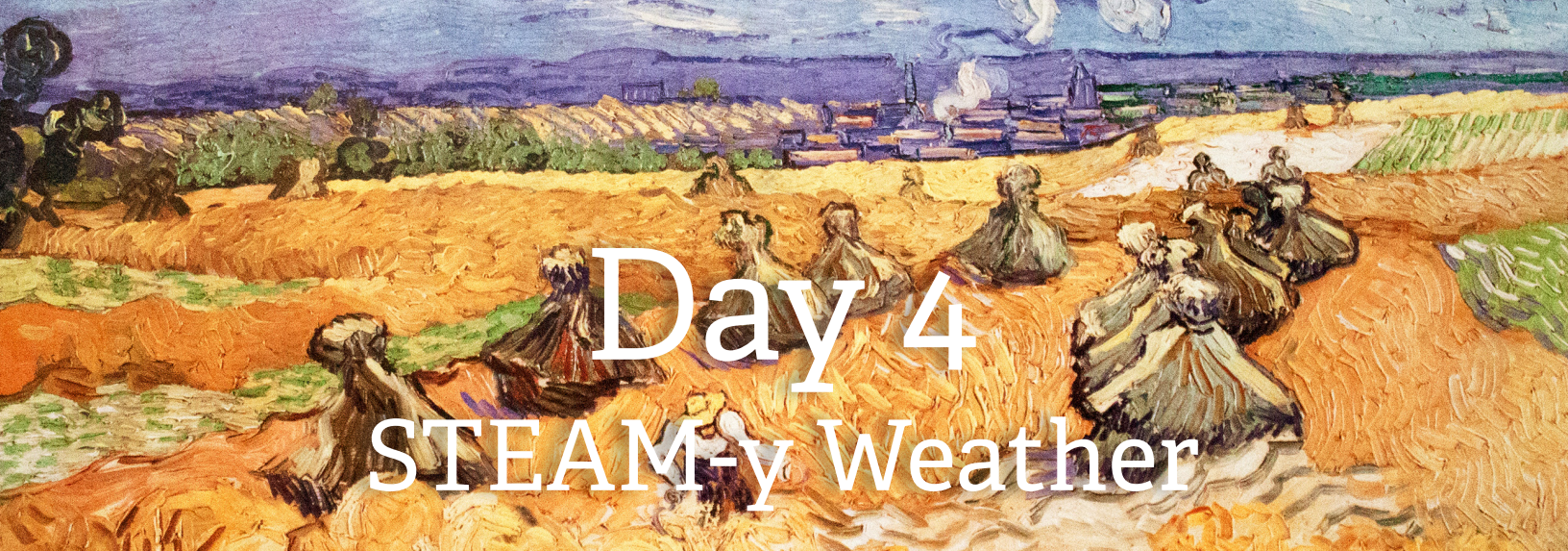
## Podcast

**Wow in the World: The Curious Case of the Everlasting Storm**

<https://www.npr.org/2018/07/20/630920368/the-curious-case-of-the-everlasting-storm>







Wheat Stacks with Reaper by Vincent van Gogh (1888)

## Introduction

People use science, technology, engineering, and math (STEM) ideas and skills to create homes, transportation, clothes, and even food that is suited to the weather where they live. The arts — humanities, language arts, dance, drama, music, visual arts, design, and new media — help advance STEM ideas. When you add art to STEM, you get STEAM!

Sometimes people say “necessity is the mother of invention.” That means that people create things to solve problems. Weather, seasons, and climate shape how we live — and inspire us. Weather influences what kinds of houses people build, how they get from place to place, what they wear, and even what they eat!

Weather also inspires art and culture, too. Music, dance, paintings, poems, stories, and even movies are inspired by weather. People all over the world can relate to weather-inspired art and activities because weather is a universal experience.

This day focuses on how both engineers and artists kids find inspiration for their work in the weather and how it affects their day-to-day lives and how kids can do the same.

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## Questions to guide explorations and experiments

- What is inspiration?
- How does the weather make you feel? How does rain, sunshine, wind, or snow make you feel?
- Can you think of any stories, music, dances, art, or movies that are about weather or seasons?



- What connections do you see between art, science, engineering, and weather?
- How does the weather affect how you get to school or what you wear?
- How does the weather or climate affect your favorite activities like sports or gardening?
- How does where you live, and the weather, affect what you eat? Your home? How you get around?

### Books and activities

- **Books:** about weather in art and culture, stories inspired by weather, and weather-inspired design and engineering
- **Activities:** understanding how weather and climate influence and inspire design and invention; designing a house, transportation, or clothing based on the weather or climate; creating art inspired by the weather





## Fiction

- *Bringing the Rain to Kapiti Plain* by Vera Aardea (Ages 6-9)
- *The Cloud Spinner* by Michael Catchpool (Ages 4-8)
- *Hurricane* by David Wiesner (Ages 6-9)
- *Iggly Peck, Architect* by Andrea Beaty (Ages 4-8)
- *It Looked Like Spilt Milk* by George Shaw (Ages 4-8)
- *Kate, Who Tamed the Wind* by Liz Garton Scanlon (Ages 3-8)
- *Kissimmee Pete and the Hurricane* by Jan Day (Ages 4-8)
- *Little Cloud and Lady Wind* by Toni Morrison (Ages 6-9)
- *Little Cloud* by Eric Carle (Ages 3-6)
- *Mad Scientist Academy: The Weather Disaster* by Matthew McElligott (Ages 6-9)
- *Min Makes a Machine* by Emily Arnold McCully (Ages 3-8)
- *Mirandy and Brother Wind* by Pat McKissack (Ages 6-9)
- *Singing in the Rain* by Arthur Freed (Ages 4-8)
- *The Snow Dancer* by Addie K. Boswell (Ages 4-8)
- *Thunderstorm Dancing* by Katrina Germein (Ages 4-8)
- *Persephone* by Sally Pomme Clayton (Ages 8-12)
- *Rain* by Sam Usher (Ages 3-6)
- *The Rain Train* by Elena De Roo (Ages 3-6)
- *Rosie Revere, Engineer* by Andrea Beaty (Ages 4-8)
- *Sector 7* by David Wiesner (Ages 6-9)
- *Snow* by Sam Usher (Ages 3-6)
- *Storm* by Sam Usher (Ages 3-6)
- *Sun* by Sam Usher (Ages 3-6)
- *Thunder Rose* by Jerdine Nelson (Ages 6-9)
- *Walter Was Worried* by Laura Vaccaro Seeger (Ages 4-8)
- *The Weather's Bet* by Ed Young (Ages 6-9)
- *Winter's Child* by Angela McAllister (Ages 3-7)

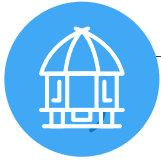


## Poetry

- *Dreaming Up: A Celebration of Building* by Christy Hale (Ages 4-10)
- *Stopping by Woods on a Snowy Evening* by Robert Frost (Ages 3-9)

## Nonfiction

- *Boy, Were We Wrong About Weather!* by Kathleen V. Kudlinski (Ages 6-9)
- *The Boy Who Harnessed the Wind* by William Kamkwamba and Bryan Mealer (Ages 6-9)
- *Bread, Bread, Bread* by Ann Morris (Ages 4-8)
- *Disaster-Proof* by Robin Koontz (Ages 9-12)
- *Engineering for Floods* by Samantha Bell (9-12)
- *Engineering for Hurricanes* by Wendy Hinote Lanier (Ages 9-12)
- *Extreme Snow Vehicles* by Ian F. Mahaney (Ages 8-12)
- *From Here to There* by Robin Koontz (Ages 9-12)
- *Groundhog Day* by Gail Gibbons (Ages 4-8)
- *Hats, Hats, Hats* by Ann Morris (Ages 4-8)
- *A House Gives Shelter* by Kylie Burns (Ages 8-12)
- *Houses and Homes* by Ann Morris (Ages 4-8)
- *How Artists See the Weather: Sun, Rain, Wind, Snow* by Colleen Carroll (Ages 6-9)
- *I, Matthew Henson: Polar Explorer* by Carol Boston Weatherford (Ages 9-12)
- *If You Lived Here: Houses of the World* by Giles Laroche (Ages 3-7)
- *The Legend of Lightning and Thunder* by Paula Ikuutag Rumbolt (Ages 6-9)
- *On the Go* by Ann Morris (Ages 4-8)
- *On the Same Day in March* by Marilyn Singer (Ages 5-7)
- *Shoes, Shoes, Shoes* by Ann Morris (Ages 4-8)
- *Snowflake Bentley* by Jacqueline Briggs Martin (Ages 4-8)
- *Staying Warm, Keeping Cool* by Linden McNeilly (Ages 9-12)
- *Sugaring Time* by Kathryn Lasky (Ages 8-12)
- *Weather Legends* by Carole G. Vogel (Ages 10 and up)
- *Weather Robots* by Christine Zuchora-Walske (Ages 6-9)



# Activity 1: Weather-Inspired Design

# 4

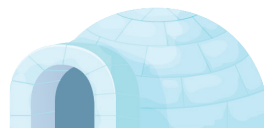
## Introduction

Weather and climate inspire all kinds of invention and innovation. From the first cold person in the 12th century who decided to build a chimney to have fire more safely warm his home to recent innovators improving upon the electric car, weather and climate are important factors in how many items that we use every day were developed.

With this activity, kids can look to the weather and climate to inspire new innovations and design a house, a form of transportation, or a piece of clothing that is specifically suited to a certain kind of weather or climate.

## Supplies

- paper
- pencils and markers
- resources to research homes, transportation, and clothing used in various climates
- supplies for building models such as cardboard boxes, bottle caps, plastic bottles or containers, aluminum foil, balsa wood, glue, tape, fabric scraps, yarn, ribbon, etc.







# Activity 1: Weather-Inspired Design

# 4

## Get kids thinking ...

Start by asking a couple of questions:

- What does a house need to be a comfortable, safe house?
- What do people need in a form of transportation? A seat? Storage space? A way to move over the ground easily?
- What kinds of clothes do people need to be comfortable where they live?

The answers often depend on where people live and the weather conditions they experience.

Have kids brainstorm features that all houses, all forms of transportation, and all clothes need, regardless of weather or climate. For example, a house needs a roof, floors, walls, doors and/or windows, a place to sleep, etc. Forms of transportation can be for one person or more, but they need to move people, and sometimes their things, through the environment safely and efficiently. Clothes need to fit and keep a person comfortable.

Read *The Boy Who Harnessed the Wind* and talk about how William used what his climate had: wind, and science, technology, and engineering to solve a problem. Read *Hats, Hats, Hats* and talk about how hats worn in different climates have different features. Share *Houses and Homes* and *On the Go* to show homes and transportation in different climates.

## Explore transportation and homes around the world

### Peculiar Transport Around the World

<https://youtu.be/hVJOyy-ooH8>

### Little Human Planet — Homes Around the World

<https://www.teachertube.com/videos/little-human-planet-homes-around-the-world-386131>



# Activity 1: Weather-Inspired Design

# 4

## Let's get started!

As a group, either choose a type of weather or climate that is inspiring kids' designs — or have the group decide on what they'll design: a house, a form of transportation, or a piece of clothing. If the group selects a type of weather, then each kid can choose what to design. If the group chooses a certain thing to design, then each kid can choose the kind of weather or climate to design their thing for.

Either way, the challenge the weather presents is the problem to be solved!

**Step 1:** Invite the kids to brainstorm ways weather or climate impacts how people design and build their houses, what kind of transportation they use, or the clothes they wear. For example, if they live in a place with heavy rain or flooding, they may build their house on stilts! And they may get around in a boat instead of on a bike or by foot. Give them different weather conditions or climates to brainstorm for: hot and dry/desert, blizzards or lots of snow and ice, rain or flooding, high winds, etc.



**Step 2:** Provide ways for kids to research the weather or climate and design choices for what they are designing — house, transport, or clothing — such as picture books, reference books, magazines, or internet access.

**Step 3:** Invite the kids to draw their design for a house, transport, or piece of clothing for their weather or climate and label it with details about how it works.

**Step 4:** Support them as they make a model with the materials provided.

Ask kids to share what they've made and point out how weather and climate influenced and inspired the design of their item.



# Activity 1: Weather-Inspired Design

# 4

More weather-inspired engineering design activities

**Construct and Test Roofs for Different Climates**

[https://www.teachengineering.org/activities/view/roofs\\_for\\_different\\_climates](https://www.teachengineering.org/activities/view/roofs_for_different_climates)

**Simple Snow Load Roof Model Demo: Which Roof Is Tops?**

[https://www.teachengineering.org/activities/view/which\\_roof\\_is\\_tops](https://www.teachengineering.org/activities/view/which_roof_is_tops)

**What to Wear and Drink? Weather Patterns and Climatic Regions**

[https://www.teachengineering.org/lessons/view/cub\\_earth\\_lesson3](https://www.teachengineering.org/lessons/view/cub_earth_lesson3)



Page spread from: *The Boy Who Harnessed the Wind* by William Kamkwamba and Bryan Mealer, illustrated by Elizabeth Zunon



## Activity 2: Weather-Inspired Art

# 4

### Introduction

Artists share their unique ways of seeing things through their depictions of our world. In how they capture light and weather, artists may be giving glimpses of how the world looks to them, but may also be portraying moods or emotions — or making a record of a specific moment in time.

With this activity, kids can get inspired by other art and artists, form an appreciation of an artist's vision and their approach to a theme, and create their own artistic representations of weather, wind, sun, and skies.

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### Supplies

- paper
- pencils or markers
- other materials for creating art such as paints and brushes, crayons, pastels, modeling clay, scissors, glue, found items for making a sculpture, etc.
- photos or videos of different weather conditions

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### Get kids thinking ...

Prompt discussion about how artists express their feelings and ideas. **Ask kids:**

- Do you have a favorite season or kind of weather? How does it make you feel?
- Have you ever seen a painting or drawing that shows some kind of weather? Or heard a poem, story, or music about a weather event or a season? What feeling or meaning did the artist capture in their work? What story are they trying to tell?

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### Let's get started!

Start with a book such as *How Artists See the Weather: Sun, Rain, Wind, Snow* by Colleen Carroll and then have kids explore some other examples of art inspired by weather:





## Activity 2: Weather-Inspired Art

# 4

### The Weather Artist: Chasing Storms With Sculpture

<https://youtu.be/1ES4Ds7ApQw>

### Nathalie Miebach: The Water Line

<https://youtu.be/KUtbOmCp1HI>

### Excerpts from Virtual Tour of Weather Report

<https://youtu.be/NR69IgiOFXc>

### 10 great works of art depicting snow

<https://www.bbc.com/culture/article/20151218-ten-great-works-of-art-depicting-snow>

### Astounding Weather-Inspired Art Installations

<https://weather.com/travel/news/uk-weather-inspired-art-20130426>

### Tate Museum: Weather and Art

<https://www.tate.org.uk/art/student-resource/exam-help/weather>

<https://www.tate.org.uk/art/weather-and-art>

### The Nutcracker — The Waltz of the Snowflakes

[https://youtu.be/UYalQNjAX\\_8](https://youtu.be/UYalQNjAX_8)

**Step 1:** As you share and discuss various works of art, get kids thinking about how artists use colors, textures, shapes, and different materials in their art to show something about weather or seasons. Ask them to point out what they see in the examples you share.

**Step 2:** Talk with kids about the kinds of materials you have available to use to make a piece of art. Get them brainstorming how they could use the different materials to show some aspect of weather or how different kinds of weather make them feel.

**Step 3:** Invite kids to create a piece of visual art — painting, drawing, or sculpture — that shows or reflects a kind of weather or season. It can be representational — showing the subject as it







## Activity 2: Weather-Inspired Art

# 4

might be seen. Or it can be abstract — showing not the actual weather or season, but how the artist feels or thinks about the subject.

**Step 4:** Have kids work together to set up a weather-themed art show. Help “kid curators” understand how they can display their art to its best advantage, develop artist statements for their works, and create an experience for others to learn from and enjoy.



### More arts and weather activities

Help kids get to know more about tornadoes with these online interactive activities:

**Weather: Noticing Feelings**

<https://www.place2be.org.uk/media/8d97464e92adf74/art-room-weather-project.pdf>

**Patterns in the Sky**

<https://www.stemmaterials.org/wp-content/uploads/2019/07/PatternsintheSky.pdf>





# Activity 2: Weather-Inspired Art

# 4

## Making Weather Predictions

<https://ackland.org/wp-content/uploads/sites/1075/2021/04/Making-Weather-Predictions.pdf>

## Weather or Not

<https://new.artsmia.org/programs/teachers-and-students/teaching-the-arts/five-ideas/weather-or-not>

## Exploring Weather

<https://www.kennedy-center.org/education/resources-for-educators/classroom-resources/lessons-and-activities/lessons/3-5/exploring-weather/>

## Watching the weather

<https://artuk.org/learn/learning-resources/watching-the-weather>

## Inventing Art

<https://www.pbslearningmedia.org/resource/pinka18-arts-bestpresent-lp/best-pink-present-lesson-plan-pinkalicious-peterrific/>



Hunters in the Snow by Pieter Bruegel (1565)



# Activity 3: Climate Check! Climate & Technology Scavenger Hunt

4

## Introduction

Throughout history, people and communities have adjusted to and dealt with changes in climate and extreme weather. To solve problems that people experience due to climate or weather, humans have often turned to science and technology in developing adaptations.

In this activity, kids think about and look for evidence of some of the ways that humans have altered their environments to help them survive all kinds of weather and climates.

## Supplies

- pencils
- Weather Journal
- books, atlases, newspapers, magazines, and/or internet access for information about your World Weather Wise location
- markers, crayons, or colored pencils
- cameras or smart phones — for Community Connection
- clip boards (optional)
- ability to print photos taken (optional)

## Get kids thinking ...

Kids may not have noticed but weather or climate have inspired or influenced design or infrastructure in their neighborhood. Get them thinking and talking about the challenges or advantages of living in a rainy or very hot or very cold climate.

Share that people come up with lots of ways to live successfully in their climate using science and technology to build climate-appropriate places to live and ways to get around. Read *If You Lived Here: Houses of the World*, *Building Up*, or *Houses and Homes* and talk about ways people build their houses to suit the climate. Read *On the Go* and talk about how climate impacts transportation.





# Activity 3: Climate Check! Climate & Technology Scavenger Hunt

## Let's get started!

Invite kids to work in small groups to research how people use science, technology, design, and engineering to adapt to their climates in your World Weather Wise location. Have them look for the following things:

- **Building construction:** What do the buildings have to help take advantage of or with this location's climate? What kind of building materials are used? What kinds of design is used for roofs, windows, doors, or porches?
- **Transportation:** How do people get around? What kinds of vehicles do they use? How are these vehicles suited or not suited to the climate? What kinds of infrastructure (roads, ports, railroads) make transportation possible?
- **Other climate adaptations:** Are shade trees and solar panels in use if this is a hot, sunny climate? How do people stay warm in cold climates? Does the climate affect how people get energy?

Have kids make a list and draw examples of how people use science, technology, engineering, and design to adapt to their climate. Invite them to share and compare examples they've found.





# Activity 3: Climate Check! Climate & Technology Scavenger Hunt

## Community connection

Head outside and ask kids to look around their own neighborhood for ways people have adapted to their climate. Have them note the evidence they find in a list of what they see along with examples they draw or photographs they take.

Looking at the information they have collected about the climate and climate adaptations in their World Weather Wise location and in their own neighborhood, ask kids to compare and contrast the two locations and write about which location they would prefer and why.

## More climate exploration activities

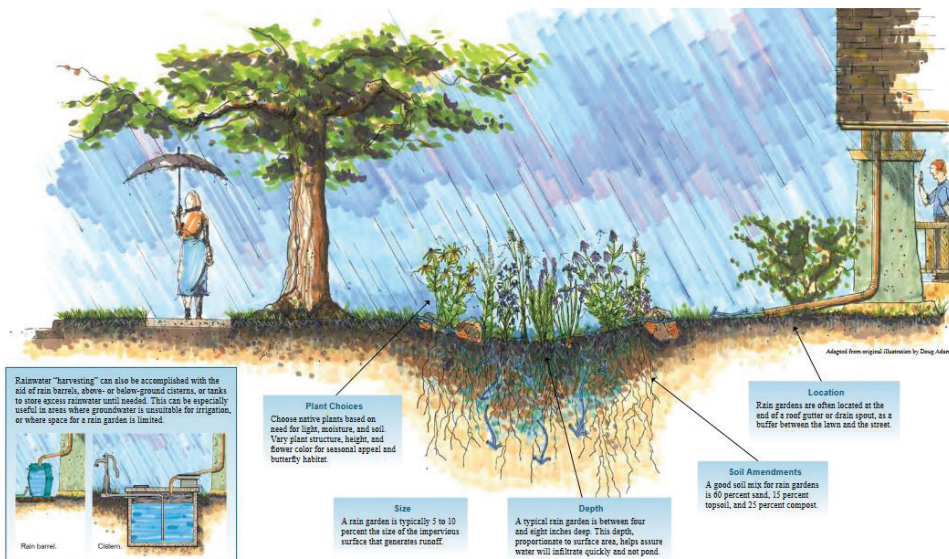
Help kids get to know more about getting prepared for weather and climate change with these online interactive activities:

### Climates! It's All in the Data

<https://seagrant.who.edu/k-12/lesson-landing/climates/>

### Write a Climate Solutions Song

<https://subjecttoclimate.org/resource/write-a-climate-solutions-song>







# WEATHER WALK

# 4

Take kids outside to observe the weather. After the **Daily Data Collection** and **Sky Sketch**, talk with kids about how climate change is causing more extreme weather events around the world.

Then take a walk around the neighborhood to see if they see any evidence of a changing climate. For example, is the ground hard and baked from drought? Are plants withered from lack of rain? Are water levels in streams, rivers, and lakes high from flooding or low from drought? Is there burned or scarred land from a fire? Are there birds that have migrated to your community earlier than usual?

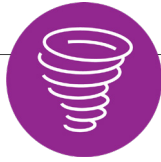
What do they notice about how their community is adapting to the changing climate? What are people wearing? How do they get from one place to another? Is there evidence of how the community deals with extreme weather events?

Follow up on your **World Weather Wise** activity. Discuss how the climate in this location might be changing experiences and how they can tell. Can they see or imagine how weather or climate has influenced design or infrastructure there?

Research how weather inspires design and creativity in their World Weather Wise location. Have kids write down their observations and what they've discovered through research in their **Weather Journals**.

If you have the opportunity, take the kids outside more than once during the day to observe how the weather changes.

**Repeat the Daily Weather Walk every day.**



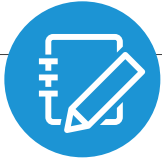
## Weather the obstacles

Get kids hopping, jumping, spinning, balancing, marching, dancing, and zigzagging when they follow the chalk path of your weather obstacle course! On the sidewalk or in an empty, secure parking lot, use sidewalk chalk to draw a course for kids to follow that could include:

- **Gathering clouds:** Have kids pick up a cotton ball with a spoon and follow the “wind” you’ve drawn without dropping it until they reach the “storm front” basket to deposit it
- **Zigzagging with lightning:** Kids have to move quickly along the zigs and zags of the long lightning bolt you’ve drawn.
- **Sounding the weather warning:** Have a bell for kids to ring to let everyone know severe weather is on the way.
- **Splashing down:** Kids jump with two feet through a series of “puddles” you’ve drawn.
- **Spiraling with the tornado:** Kids twist and turn as they follow the lines of a cone-shaped funnel from its largest to smallest point.
- **Leaping over the mud puddle:** Kids jump over a “puddle” you’ve drawn.
- **Going over the rainbow:** Kids can step over a rainbow you’ve drawn or over several arced pool noodles.

Kids can contribute too! Ask for their weather-themed obstacle course suggestions or let them design and build a course of their own.





## Legendary weather

Have kids read myths or legends about weather such as Norse myths about Thor, the god of thunder, or Persephone, goddess of the harvest. Or try *Bringing the Rain to Kapiti Plain*, which explains how a boy ends a drought by shooting a cloud with his arrow, or *Thunder Rose*. Discuss with kids how people in cultures around the world created stories to explain weather events and seasonal changes. Invite them to choose a weather episode, like a snow storm, tornado, or a windy day and write their own story that explains why this kind of weather happens.

## It all “ads” up

Invite kids to brainstorm inventions (existing or new) that help with a situation or solve a problem caused by weather and climate. What do they know about why we have windshield wipers? What if there was a special hat that became an umbrella when it started raining? Have them choose an existing invention or create an idea for an invention and then have them write about it in great detail — what it is made from, its origin, how it works, and what it does. Then have them use that information to create an advertisement about their real or imaginary invention.

## Action weather

In books like *Thunderstorm Dancing* and *Sun*, the weather forces the action of the characters. Have kids write their own story where weather plays a role in determining what the characters do or don't do.



Page spread from *Thunderstorm Dancing* by Katrina Germein, illustrated by Judy Watson



## Apps

**Tinkergarten OutdoorLearning App \$**

<https://www2.tinkergarten.com/>

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## Online games

**Don't Flood the Fidgets game**

[https://pbskids.org/designsquad/games/dont\\_flood/](https://pbskids.org/designsquad/games/dont_flood/)

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## Websites

**Engineering Girl**

<https://www.engineergirl.org/>

**PBS KIDS Plum Landing science exploration**

<https://pbskids.org/plumlanding/>

**James Dyson Foundation engineering for kids**

<https://www.jamesdysonfoundation.com/>

**Girl Scouts activities for STEM, outdoors, earth day, climate**

<https://www.girlscouts.org/en/activity-zone/grade-levels/all-ages-levels-badge-activities.html>

**National Gallery of Art for Families**

<https://www.nga.gov/learn/families.html>

**The Tate Gallery for Kids**

<https://www.tate.org.uk/kids>

**Chrome Music Lab experiments**

<https://musiclab.chromeexperiments.com/Experiments>





## Video

**New ways to stand up to floods, wildfires, earthquakes and HAZMAT disasters**

<https://youtu.be/jkkPN-w37zc>

**How we can adapt to climate change — all over the world**

<https://youtu.be/SLluDOD8HL0>

**Exploring the Natural World through Weather: A Look at Georges Schreiber's Spring Storm**

<https://vimeo.com/531393077>



Spring Storm (lithograph) by Georges Schreiber (1943)



# Day 5

## Weather Brings Us Together





## Introduction

Weather is a universal experience. It connects us to each other, to the world around us, and even supports us. Weather, seasons, and climate affect and shape the communities we live in.

Communities often come together to celebrate weather and the seasons. Washington, DC has the Cherry Blossom Festival every spring. Countries around the world celebrate ice and snow or rain. *Teej* festivals in India and Nepal welcome and celebrate the monsoons. Harvest festivals celebrate fall and the collection of different crops around the world. In Pennsylvania in February, we ask Puxatawney Phil, a groundhog, if he thinks winter will be long or short!

Communities also experience extreme weather and climate change together. Sometimes the way the community grows — how buildings and streets are built and how many trees and plants live in the community — can affect how hot it is or how well rainwater is absorbed into the ground.

No matter how you look at it, communities both experience and celebrate weather together in many ways.

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## Questions to guide explorations and experiments

- What are ways that weather affects activities and events in daily life?
- What important consequences does weather have for people? For communities? For plant and animal life?
- What can communities do to adapt as climate changes and weather becomes more extreme?

- Why do communities hold celebrations that are based on the seasons or the weather?
- Do you have a favorite holiday, festival, or celebration that is related to weather or the seasons?

### Books and activities

- **Books:** about how weather and seasons are celebrated and how weather impacts people and communities
- **Activities:** understanding how weather and climate bring people together and impact the way we live



Page spread from *We Are Grateful: Otsaliheliga* by Traci Sorell, illustrated by Frané Lessac





## Children's Books

### Fiction

- *Almost Time* by Gary D. Schmidt and Elizabeth Stickney (Ages 4-8)
- *Apple Picking Day* by Candice Ransom (Ages 3-6)
- *A Fall Ball for All* by Jaime Swenson (Ages 4-8)
- *Firsts and Lasts: The Changing Seasons* by Leda Schubert (Ages 4-8)
- *Groundhog Gets It Wrong* by Jess Townes (Ages 4-8)
- *I Am the Wind* by Michael Karg (Ages 4-8)
- *I'm in Charge of Celebrations* by Byrd Baylor (Ages 6-9)
- *Kite Flying* by Grace Lin (Ages 3-6)
- *The Longest Storm* by Dan Yaccarino (Ages 6-9)
- *One World: 24 Hours on Planet Earth* by Nicola Davies (Ages 6-9)
- *Our Roof Is Blue* by Sara E. Echenique (Ages 5-8)
- *Over in the Wetlands: A Hurricane-on-the-Bayou Story* by Caroline Starr Rose (Ages 5 and up)
- *Pumpkin Pumpkin* by Jeanne Titherington (Ages 4-8)
- *Snow Horses: A First Night Story* by Patricia MacLachlan (Ages 4-8)
- *The Snowy Day* by Ezra Jack Keats (Ages 3-8)
- *Sun Bread* by Elisa Kleven (Ages 3-6)
- *Still This Love Goes On* by Buffy Sainte-Marie (Ages 3-8)
- *The Sugaring-Off Party* by Jonathan London (Ages 4-8)
- *The Sun Shines Everywhere* by Mary Ann Hoberman (Ages 4-8)
- *Thanking the Moon: Celebrating the Mid-Autumn Moon Festival* by Grace Lin (Ages 4-8)
- *Together We Grow* by Susan Vaught (Ages 4-8)
- *Together with You* by Patricia Toht (Ages 3-6)
- *Twelve Kinds of Ice* by Ellen Bryan Obed (Ages 9-12)
- *Weather Together* by Jessica Sima (Ages 4-8)
- *When the Storm Comes* by Linda Ashman (Ages 4-8)
- *Wild Is the Wind* by Grahame Baker-Smith (Ages 6-9)
- *A Year of Celebraciones* by Carrie Lara (Ages 4-8)



## Children's Books

### Poetry

- *A Cold Snap! Frosty Poems* by Audrey B. Baird (Ages 4-8)
- *Every Month is a New Year: Celebrations Around the World* by Marilyn Singer (Ages 6-12)
- *Watersong* by Tim McCanna (Ages 4-8)
- *Winter Bees and Other Poems of the Cold* by Joyce Sidman (Ages 6-10)

### Nonfiction

- *The Autumn Equinox: Celebrating the Harvest* by Ellen Jackson (Ages 6-9)
- *Buried Sunlight: How Fossil Fuels Have Changed the Earth* by Molly Bang and Penny Chisholm (Ages 4-8)
- *Climate Action: What Happened and What We Can Do* by Seymour Simon (Ages 6-10)
- *Climate Change and Energy Technology* by Rebecca E. Hirsch (Ages 8-12)
- *Climate Warriors: 14 Scientists and 14 Ways We Can Save Our Planet* by Laura Gehl (Ages 7 and up)
- *Emperor of the Ice: How a Changing Climate Affects a Penguin Colony* by Nicola Davies (Ages 6-9)
- *Groundhog Day* by Gail Gibbons (Ages 4-8)
- *The Longest Day: Celebrating the Summer Solstice* by Wendy Pfeffer (Ages 3-8)
- *Renewable Energy: Discover the Fuel of the Future* by Joshua Sneideman (Ages 9-12)
- *Running on Sunshine: How Does Solar Energy Work?* by Carolyn Cinami DeCristofano (Ages 4-8)
- *The Shortest Day: Celebrating the Winter Solstice* by Wendy Pfeffer (Ages 3-8)
- *Snack, Snooze, Skedaddle: How Animals Get Ready for Winter* by Laura Purdie Salas (Ages 4-8)
- *Solar Power* by Rebecca Pettiford (Ages 7 and up)
- *Solar Story: How One Community Lives Alongside the World's Biggest Solar Plant* by Allan Drummond (Ages 4-8)
- *The Spring Equinox: Celebrating the Greening of the Earth* by Ellen Jackson (Ages 6-9)
- *We All Celebrate!* by Chitra Soundar (Age 5-8)
- *We Are Grateful: Otsaliheliga* by Traci Sorell (Ages 4-8)
- *We Gather Together: Celebrating the Harvest Season* by Wendy Pfeffer (Ages 6-9)
- *What Do You Celebrate? Holidays and Festivals Around the World* by Whitney Stewart (Ages 5-9)
- *Where We Live: Mapping Neighborhoods of Kids Around the Globe* by Margriet Ruurs (Ages 7-10)
- *Wind Energy: Blown Away!* by Amy S. Hansen (Ages 7-10)





## Introduction

In Spearfish, South Dakota on January 22, 1943, the temperature was  $-4$  degrees at about 7:30 a.m. Then the Chinook winds blew in and picked up speed rapidly. Two minutes later the temperature was 45 degrees above zero. The temperature in Spearfish got to  $+54$  degrees that day before the Chinook winds died down, and the temperature dropped back to  $-4$  degrees in 27 minutes, shattering windows and freezing vehicles. Spearfish is in the Guinness Book of World Records for “world’s fastest temperature drop” and “world’s fastest temperature rise.”

And Spearfish celebrates this with Chinook Days, a winter festival with music, arts, food, sports, a bonfire, and community events!



What weather, season, or aspect of your climate would kids like to see celebrated in your community? Work with kids to research and choose a kind of weather or seasonal event worthy of a celebration. Then plan your event and celebrate!

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## Supplies

- materials to research celebrations including books, magazines, newspapers, and/or library or internet access
- paper and pencil for taking notes
- craft materials to make decorations, posters, or games
- other materials determined by the celebration you choose to have

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## Get kids thinking ...

Talk with kids about existing activities that bring your community together. Are there cultural celebrations? Holiday parades?

**Ask kids:** When you hear people talking about our weather, what are they saying? What do you find unusual or wonderful about the weather or climate where we live? Can you think of



## Activity 1: Weather Celebrations

anything in our community related to our weather and climate that we should celebrate? What is your favorite kind of weather or season? How could you create a party to celebrate it? Throw out some ideas to get kids brainstorming:

- How about a festival that celebrates plants that grow in our climate like cherry trees, tulips, cacti, or ramps?
- What about a celebration related to an activity that takes place in a specific season or type of weather, such as harvesting, kite flying, maple syrup making, or bird or butterfly watching of specific species

Next, read *I'm in Charge of Celebrations* by Byrd Baylor. Discuss with kids how the narrator in the story finds things in the natural world to celebrate. Some of them are related to weather: the dust devils and the rainbows. Others happen in certain seasons. The narrator ultimately chooses to celebrate a new year in spring instead of in January, near the winter solstice. Talk about how where the narrator lives shapes her celebration.

Other books about seasonal celebrations or fun weather-related activities can shape a conversation too.

### Explore other celebrations:

- **Going to a Cherry Blossom Festival in Japan:** <https://youtu.be/WDy4ciwgLTc>
- **Cherry Blossom Festival:** <https://youtu.be/k68VdWyMGJM>
- **Plymouth Annual Ice Festival:** <https://www.clickondetroit.com/video/news/2023/02/03/plymouth-hosting-41st-annual-ice-festival-this-weekend/>





## Activity 1: Weather Celebrations

### Let's get started!

Make a plan to celebrate weather (or a season or seasonal event) in your community.

**Step 1:** Have kids work together in small groups to develop recommendations of what to celebrate. Ask them to present their ideas to the larger group, hold some discussion, and then choose together what will be celebrated.

**Step 2:** Research the chosen weather, season, or event. What is it? When and how does it happen? Research if this topic is celebrated in other places around the world. (For example, are you celebrating ice and snow? Hurricanes? Rain starting or stopping? Trees blooming or losing leaves? Commemorating a record-breaking weather event?) How do people celebrate? Discuss WHY the chosen theme is important to the group or community. (Are there lots of apple trees near you? Do birds stop in or return to your area when they migrate?) Discuss HOW the chosen theme is related to weather, season, or climate.

**Step 3:** Brainstorm ideas of how you'd like to celebrate. Ask kids how they celebrate things in their family or neighborhood. What kinds of traditions do they know about? Make a list of possible elements like foods, music, performances, games, contests, parades, special clothes, decorations, speeches or presentations, etc.

**Step 4:** Identify the community to be invited to the celebration, pick a date, and find an appropriate location. Is it just your Weather Wonders group? That's fine! Do you want to throw a bigger party and get the neighborhood or larger community involved? You can do that, too. You can do this with the kids or make this decision on your own based on your program's constraints.

**Step 5:** Identify elements of your celebration. Have the kids create a skit or video about the celebration, sharing what they've learned. If your event is based on a seasonal food, like blueberries or pumpkins, include recipes with that ingredient. Do they want to invite people to share their experiences such as farmers, people who make art with snow or sand, or experts on animals or plants? Can the kids think of games or contests that would be appropriate?

**Step 6:** Have kids choose elements to work on, including invitations, posters, or outreach if you are thinking big — and get to work. Here are some examples of things to do:



# Activity 1: Weather Celebrations

- Research and invite guests/speakers
- Create presentations or performances informing guests about and celebrating the theme
- Make decorations
- Prepare games or contests (materials, rules, judges/referees)
- Research and prepare food options
- Make posters and invitations and invite guests/community members, publicize your event, invite families of Weather Wonders participants

**Step 7:** Celebrate! Bring people together and celebrate your theme as a community — small or large. Reflect on what the theme means to your community, how it brings you together, and how you can share that with others.



Page spread from *We All Celebrate!* by Chitra Soundar, illustrated by Jenny Bloomfield



## Activity 1: Weather Celebrations

### More festival and celebration activities

#### Fall Activities

<https://winterkids.org/blog/11-outdoor-learning-activities-that-celebrate-fall/>

#### Winter Activities

<https://www.backwoodsmama.com/2018/01/7-winter-carnival-activities-for-kids.html>

#### Spring Activities

<https://www.hillsboroughstreet.org/blog/post/spring-fest-kids-zone-activities>

#### Earth Day

<https://www.earthday.org>

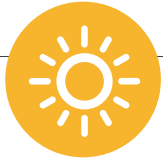
#### Summer Activities

<http://www.walkthroughindia.com/festivals/the-10-major-monsoon-festivals-in-india/>  
(Monsoon Festivals)

<https://runwildmychild.com/100-outdoor-summer-activities/>







## Activity 2: Weather Powered

### Introduction

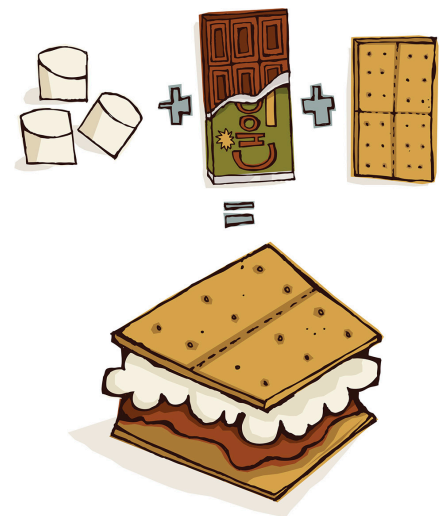
Energy begins with the Sun — energy on Earth originated with the Sun! The Sun’s energy is stored in coal, petroleum, natural gas, food, water, and wind. It is also the power source of our weather, such as wind and rain, which we use to power windmills and dams to make electricity.

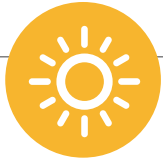
Energy from the Sun is transferred through space and through the atmosphere to Earth’s surface. This transfer is called **radiation**. Since this energy warms the Earth’s surface and atmosphere, some of it is or becomes heat energy.

With this activity, kids learn more about the Sun’s heat energy by making a solar oven and cooking up some tasty treats.

### Supplies

- a sunny day!
- cardboard box with attached lid that closes tightly. Look for a box with flaps that is at least 3 inches deep and large enough to fit an aluminum pie pan inside, such as a pizza box
- aluminum foil
- clear plastic wrap
- glue stick
- duct tape or other strong tape
- stick (about 1 foot long) to prop open reflector flap. (Use a skewer, knitting needle, ruler, or whatever you have.)
- ruler or straight edge
- box cutter or Xacto knife (with adult help, please!)
- graham crackers
- large marshmallows
- plain chocolate bars (thin)
- aluminum pie pan





## Activity 2: Weather Powered

### Get kids thinking ...

Find out what kids know about energy and where it comes from. **Ask:** What is energy? What are some sources of energy? How does energy change? What do we use energy for? How does the need people have for energy bring them together?

Next get them thinking and talking about how energy provides the power to make something work. Have kids list all the energy forms and/or power sources they have used so far today (electricity to run their refrigerator or television, natural gas to heat hot water or cook, gas/oil in a bus or car they rode in, food that gave them energy to run and play, etc.) See who has used the greatest variety of energy sources and talk about what the Sun has to do with all of the energy sources they have shared.

**Make S'Mores With a Solar Oven!** <https://climatekids.nasa.gov/smores/>

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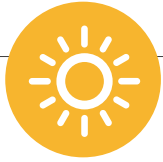
### Let's get started!

A basic tenet of meteorology is that the Sun warms the ground and the ground warms the air. This activity focuses on radiation, the process by which the Sun warms the ground. Energy from the Sun is the driving force behind weather and climate.

Almost all the energy on Earth comes from the Sun. The Sun's energy warms the Earth — the ground, water, and atmosphere — and is turned into heat that creates winds — and weather — in the atmosphere. When energy from the Sun is focused in other ways, it can provide power to spin a turbine or power an engine to generate electricity. It can even be focused to heat a solar oven that can cook food.

**Step 1:** Depending on the size of the box, have kids use a ruler and a straight edge to draw a 1½ to 2 inch border on the three sides of the box lid that aren't attached to the box. After kids have finished drawing, an adult should use their guidelines and a box cutter or knife to cut a three-sided flap.

**Step 2:** Kids should fold back the just-made flap and cover the inside with a layer of glue then affix aluminum foil with the shiny side out. Have them try not to wrinkle the foil and ask them why it would be important to have a smooth reflective surface.



## Activity 2: Weather Powered

**Step 3:** Next, kids should open the box and cover the bottom and sides with foil.

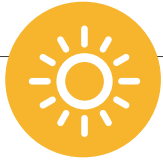
**Step 4:** Close the box, but have one child hold the flap open while another covers the flap opening with a layer of plastic wrap. Tape the plastic wrap tightly into place along three sides. Then open the box lid and add a layer of plastic wrap to the underside of the box lid. **Ask kids** what they think the purpose of the plastic wrap is. What are their ideas about how it will help cook their s'mores?

**Step 5:** Have kids test the stick or other object they will use to prop open the reflective flap. Head outside to a sunny spot and let them experiment with how they will keep the flap open and facing the Sun.

**Step 6:** Once they have their flap secure and facing the Sun, let the oven "preheat" for 15 minutes or so. While the oven is warming, kids can get their ingredients for s'mores.

**Step 7:** Get cooking! Have kids break graham crackers in half to make squares and place four squares in the pie pan. Place a marshmallow on each square then put the pan into the preheated oven. They should close the lid tightly and make sure the flap is reflecting sunlight into the box.





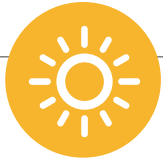
## Activity 2: Weather Powered

**Step 8:** Watch and wait. While waiting, talk about what’s happening. The foil covered flap is collecting the sunlight and directing it into the box. The sunlight is transformed into heat which is trapped inside the box, making it possible to cook the s’mores. Ask kids to think about and share other foods they could make in their solar oven. Talk about their ideas for improving upon their solar oven. What would happen if they used a box that was a different shape or size? What about changing the shape of their reflector? What if they used a different kind of plate to cook on?

The marshmallows can take up to an hour to get melty. When they squish with a poke, kids should carefully — the solar oven can get very hot! — add a piece of the chocolate bar to the top of each marshmallow and another graham cracker square on top of the chocolate. Have them close the oven again for about 10 to 15 minutes to let the chocolate soften.

**Step 9:** Eat! As kids enjoy their treats, keep the discussion going. **Ask:** How does cooking with the Sun relate to the weather? Is it quick to cook using the Sun? What are some problems or limits you might face cooking only with the Sun? What other ways are there to cook marshmallows?





## Activity 2: Weather Powered

### More weather-powered energy activities

#### **Renewable Energy Virtual Experiments**

The National Renewable Energy Laboratory (NREL) offers virtual 60-minute experiments related to an NREL research topic (solar, wind, or energy transformation). Register for a virtual experiment, offered every Tuesday and Thursday from 1:00 to 2:00 p.m.

<https://calendly.com/k-8th-grade-programs/1-day-experiment-grades-k-6?month=2023-04>

#### **Energy Choices and Climate Change**

<https://scied.ucar.edu/interactive/energy-choices-and-climate-change>

#### **Energy!**

<https://www.pbslearningmedia.org/resource/reach-with-stem-energy/energy/>

#### **What Is Energy? Short Demos**

[https://www.teachengineering.org/activities/view/cub\\_energy2\\_lesson01\\_activity1](https://www.teachengineering.org/activities/view/cub_energy2_lesson01_activity1)

#### **Melts in your bag, not in your hands**

[https://www.weather.gov/jetstream/ll\\_melts](https://www.weather.gov/jetstream/ll_melts)

#### **Watching the weather**

<https://artuk.org/learn/learning-resources/watching-the-weather>

#### **Build a Wind Turbine**

<https://www.msichicago.org/science-at-home/hands-on-science/wind-turbine/>





## Activity 3: Climate Check! Hot Stuff

### Introduction

Climate change is responsible for the increasing number of extreme weather events, including heat waves. As climate changes, people are coming together in their communities to solve immediate problems and work to reduce climate change. In order to develop new adaptations for current and future impacts of climate change, it is important to understand more about climate science.

This activity will help kids understand how different surfaces of the Earth reflect and absorb heat and think about what that means for communities in a changing climate.

### Supplies

- a sunny day!
- two clean, empty metal cans of the same size (28 oz. to 3 lb.)
- flat white and flat black paint (spray paint works best or other paint that will cover metal). One can will be painted white, the other black. You'll want to do this ahead of time, giving the paint time to dry.
- white and black fabric (old t-shirts) or white and black pieces of cardboard
- thermometer
- timer
- cold water
- ice cubes

### Get kids thinking ...

Talk with kids about what they know about [greenhouse gases](#) and the [greenhouse effect](#). What would Earth be like if our planet and its atmosphere did not absorb the Sun's energy? Why do they think that understanding how much energy from the Sun is reflected back out to space and how much becomes heat is important for understanding climate and climate change?



## Activity 3: Climate Check! Hot Stuff

### Let's get started!

Have kids imagine they are getting ready to get dressed and find out that the weather today is going to be 100 degrees! What would be the best clothes to wear to stay cool? What is the best color to wear outside on a hot day? Ask kids to share other ideas of when color makes a difference in how hot something gets in the Sun. Then have them see the difference for themselves with this demonstration.



**Step 1:** Fill the two cans with about two inches of cold water.

**Step 2:** Use a thermometer to find the temperature of the water in each can. They should be the same temperature. Have kids note what the temperature is.

**Step 3:** Remove the thermometer and take the cans outside to a sunny spot that will get about two hours of sunlight. Have kids predict and make a note of what they think will happen to the temperature of the water in each can.

While you are waiting, talk about what's happening in your demonstration. On Earth, surfaces reflect and absorb light. Lighter colored surfaces such as ice, clouds, snow, and sand reflect more light. Dark surfaces such as the ocean and bare mountains absorb more. Scientists use the word **albedo** to explain how strongly a surface reflects back solar energy.

**Learn more about albedo:** <https://www.pbslearningmedia.org/resource/buac912-sci-whatalbedo/whatalbedo/>

**Step 4:** After two hours, use the thermometer to measure and compare the water temperature in each can.

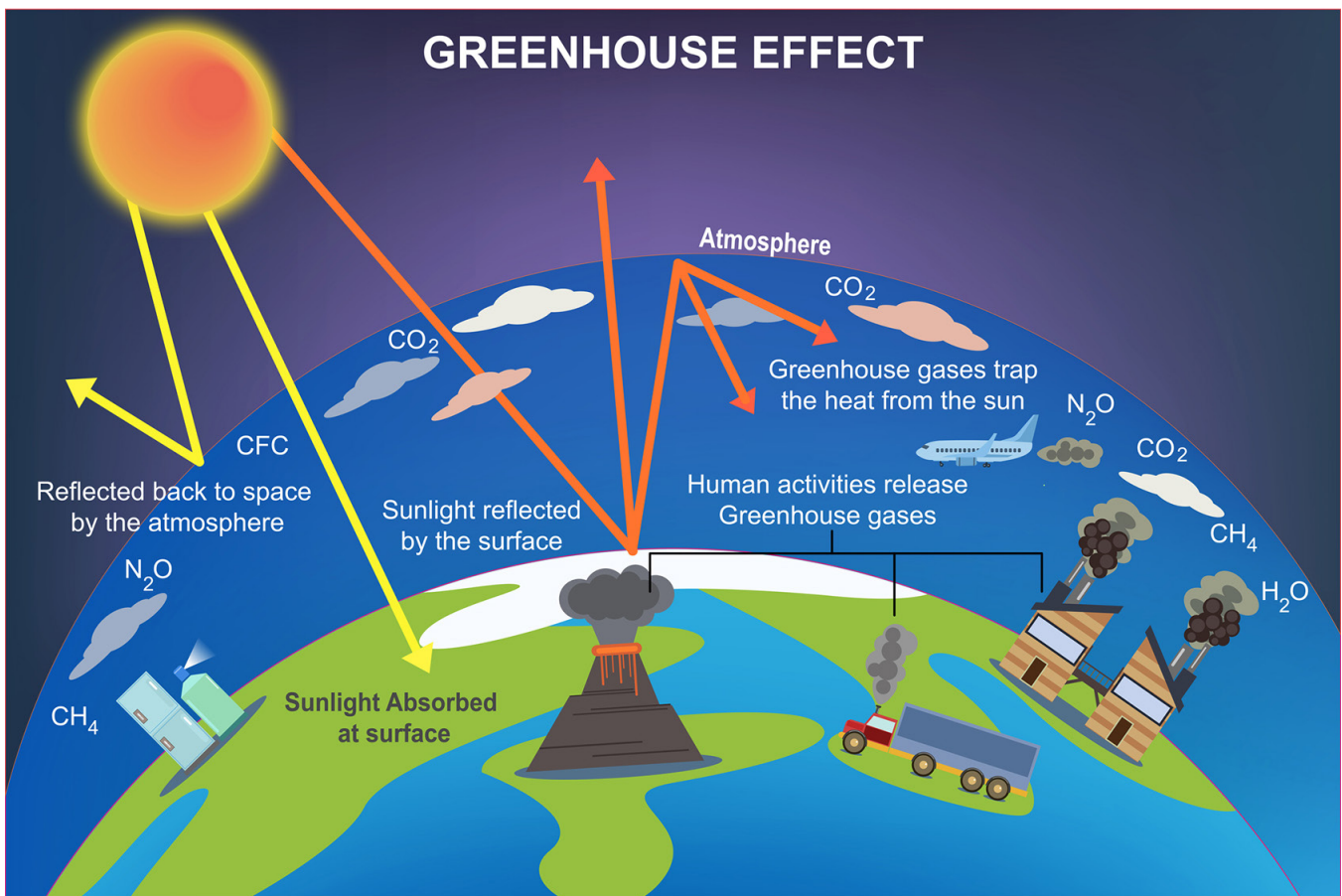
Talk about what the results mean in terms of climate and climate change. Kids should recognize that the darker color absorbed more of the Sun's energy and made the water warmer than the water in the white container.

If the Earth absorbs more energy from the Sun than it sends back out into space, the Earth gets warmer. If the Earth reflects more of the Sun's energy than it absorbs, the Earth gets colder. If



# Activity 3: Climate Check! Hot Stuff

the Earth's climate is colder and there is more snow and ice on the planet, albedo increases. That means more sunlight is reflected out to space, and the climate gets even cooler. When more heat is trapped by greenhouse gases and higher temperatures cause snow and ice to melt, darker colored surfaces are exposed. Then albedo decreases and less solar energy is reflected out into space, causing the Earth to warm even more.



**Next, let kids work in small groups to try their own albedo experiment.**

**Step 1:** Provide each group with a black piece and a white piece of fabric or cardboard.

**Step 2:** Head outside and have kids lay their two surfaces side-by-side in direct sunlight.

**Step 3:** Give each group eight ice cubes — four for each surface. Have them place the ice cubes



## Activity 3: Climate Check! Hot Stuff

on their surfaces in approximately the same positions. Ask them to predict and note what they think will happen.

**Step 4:** Have each group observe what happens on each surface and how long it takes. Ask them to think about what else besides color might affect how a surface reflects or absorbs the Sun's energy.

Let each group share their observations after the ice has melted. How does this affect their understanding of the Earth's changing climate and rising temperatures? What places on Earth do they think absorb the most solar energy and which would absorb the least?

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### Community connection

Urban areas don't have a lot of water, plants, or trees, and they are full of dark colors, like black asphalt and brick buildings. Without water to evaporate, the Sun's energy goes into warming the surface. Without plants and trees, there's no increase in water vapor in the atmosphere to bring clouds and precipitation. In places like this, urban heat islands form.

After learning about albedo, get kids thinking about heat in their own community. **Ask:** Is it an urban heat island? Are there lots of places that are usually warmer, such as areas covered with black asphalt versus white cement? What can people do about adapting to the high temperatures that many communities are already experiencing? How can what we know about albedo help?



Some cities now paint roofs white to help deal with the urban heat island effect or create green roofs with rooftop gardens. Ask kids to come up with ideas for what they could do to help keep their neighborhood cooler and ideas to get the attention of adults in their community who could help them put their ideas into action.





## Activity 3: Climate Check! Hot Stuff

More heat absorption and reflection activities

**Earth's Albedo and the Sun's Brightness Affect Climate**

<https://scied.ucar.edu/interactive/albedo-brightness>

**Can the Color of Your House Reduce Your Energy Footprint?**

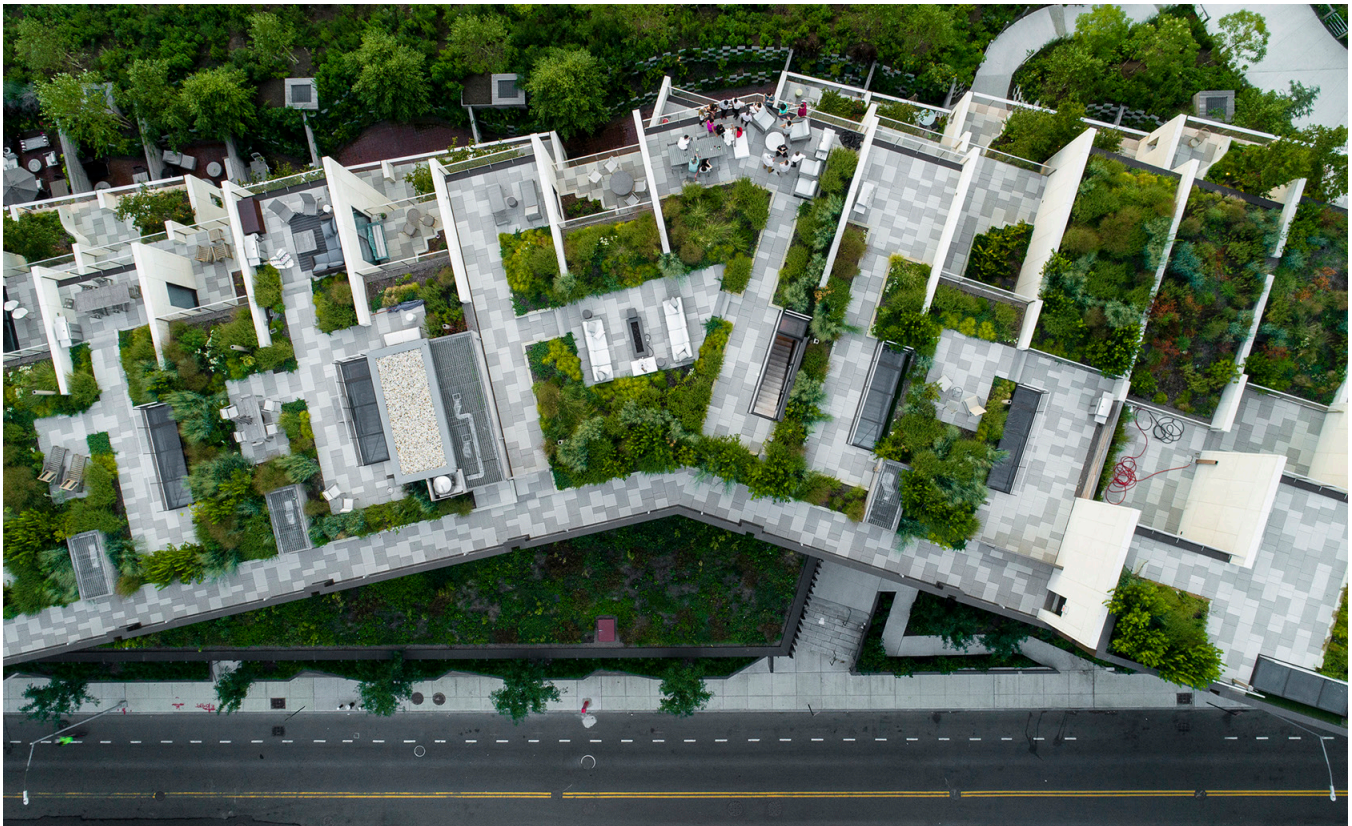
[https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvEng\\_p012/environmental-engineering/can-the-color-of-your-house-reduce-your-energy-footprint](https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvEng_p012/environmental-engineering/can-the-color-of-your-house-reduce-your-energy-footprint)

**Do Different Colors Absorb Heat Better?**

[https://www.teachengineering.org/activities/view/colors\\_absorb\\_heat\\_better](https://www.teachengineering.org/activities/view/colors_absorb_heat_better)

**A Mini Urban Heat Island**

<https://youtu.be/4kPsc6N2MiA>







# WEATHER WALK

# 5

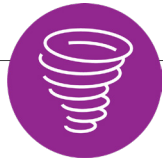
Take kids outside to observe the weather. After the **Daily Data Collection** and **Sky Sketch**, ask kids if they see clues or evidence of any precipitation or significant weather changes.

Do they see any clues that could help them predict the weather or a change in the season? Do they see any evidence of the community preparing for a weather event (like a coming storm) or a celebration? What do they notice about people they see and how they are experiencing today's weather? Invite them to share their observations, why they think what they see is an indication of precipitation or changing weather, and write them in their **Weather Journals**.

Follow up on your **World Weather Wise** activity and talk more about the weather, season, and climate of this location. Discuss what weather this location is currently experiencing and ask kids how they can tell. Ask if they found any evidence of that community preparing for a weather event or seasonal celebration.

If you have the opportunity, take the kids outside more than once during the day to observe how the weather changes.

**Repeat the Daily Weather Walk every day.**



## Weather Movement

### Weather dance

In previous weather movement activities, kids have come up with actions that show various weather forms. Have them build on those actions and explore other movement possibilities to develop a sequence of movements or a dance that celebrates the weather or a season! Start by sharing some inspiration:

#### **The Waltz of the Snowflakes from The Nutcracker**

[https://youtu.be/UYalQNjAX\\_8](https://youtu.be/UYalQNjAX_8)

#### **Maypole Dance**

<https://youtu.be/nclAdeQGxoo>

#### **Traditional Hawaiian Rain Dances**

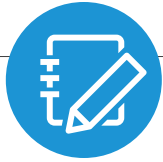
[https://youtu.be/Y0vbRhL\\_\\_l4](https://youtu.be/Y0vbRhL__l4)

Next, get kids thinking about how dance brings people together and bonds communities and cultures. Then, work with kids to create an inclusive dance that celebrates the climate and weather of your community. Talk with kids about how they would describe their climate and weather. What parts of it do they want to recognize or celebrate through movement?

After you develop a list together, have kids work out movements that could be part of a circle dance. Once they've given each weather element its own movement, write the steps down so you can be the dance "caller" as kids circle to the music you've chosen together for their dance. Here's an example:

- "Beautiful Sunny days are all around us. All join hands and circle to the left."
- "Step with your feet and feel the heat." (Drop hands and reach arms up toward the Sun while circling.)
- "Breezes come to keep us cool. Blow on back on the same track." (Holding hands, circle back to the right.)
- "Our summer weather is fun to spend together. Come into the center with a cheer for the season." (Holding hands, walk toward the center of the circle, throw arms up and down with a whoop, then back out.)

Add as many steps as you like and/or repeat them in any order you choose.



## Writing About Weather

### Weather jokes

Nothing brings people together like a good laugh — about the weather! Have kids channel their inner comedian and write their own riddles and knock-knock jokes about the weather.

One way to write a riddle is to ask a question that describes something without actually naming what it is. Then come up with an answer that has an unusual twist! Here are some examples:

- What do clouds way up high in the atmosphere say as they pass each other? *Have an ice day!*
- What do clouds wear under their raincoats? *Thunderwear!*



Knock-knock jokes follow a pattern. There are 5 lines of text, with the first line always “Knock knock” and the second line “Who’s there?” To write a knock-knock joke, find a noun (person, place, or thing) for the third line that can also sound like another word or phrase used in the fifth line. Here’s an example:

- *Knock knock!*  
Who’s there?  
*Snow.*  
Snow who?  
*Snow one is there. It was just the wind!*

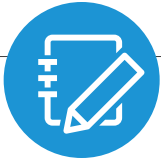
Compile everyone’s jokes into a book and spread the laughs around.

**Note:** You might also want to look at the book: *Partly to Mostly Funny: The Ultimate Weather Joke Book* (from the American Meteorological Society). <https://bookstore.ametsoc.org/catalog/book/partly-mostly-funny>

### Dear Sun

Have kids imagine that they are planning an event that will take place outside and requires a certain kind of weather — a sunny day for a picnic, a windy day for a kite festival, a cold day for an ice carnival, etc. To ensure they get the weather they need, have them write a letter to the Sun, requesting their desired forecast, describing their event, and why it is important to their event that they get the weather they are asking for.





# Writing About Weather

## Weather folklore

Weather sayings and rhymes are a part of American folklore and have been shared in communities around the country long before weather satellites and radar helped predict the weather.

Ask kids to share any sayings they might have heard before. Then share these Weather Lore Sayings (see link below) which include the saying and the real weather behind it. Next, have kids come up with specific details about a weather phenomenon of their choosing and make up their own weather saying to go with it.

**Weather Lore Sayings:** <https://www.nps.gov/grte/learn/education/classrooms/upload/Weather-Lore-Sayings.pdf>

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## Climate change comic

Share, read, and discuss *A Kid's Guide to Climate Change* comic from NPR. Then have kids think about some of the problems that contribute to climate change. Get them to explore different solutions to climate change problems that involve people planning and working together. Ask them to share these ideas in their very own comic.

**A Kid's Guide to Climate Change:** <https://www.npr.org/2023/01/17/1144849154/climate-change-kids-guide>



# Kid-Friendly Digital Media

## Online games

### Greenhouse Gas Game

<https://scied.ucar.edu/activity/greenhouse-gas-game>

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## Websites

### Butterfly Festivals

<https://butterflywebsite.com/butterfly-festivals.cfm>

### Spring Celebrations

<https://kids.nationalgeographic.com/celebrations/article/spring-celebrations>

### Winter Celebrations

<https://kids.nationalgeographic.com/pages/topic/winter-celebrations>

### What's the winter solstice?

<https://kids.nationalgeographic.com/history/article/winter-solstice>

### What Is an Urban Heat Island?

<https://climatekids.nasa.gov/heat-islands/>

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## Video

### Cooking Cookies with Solar Power

<https://www.pbslearningmedia.org/resource/phy03.sci.phys.mfe.zsolar/cooking-cookies-with-solar-power/>

### Exploring Windmill Design

<https://www.pbslearningmedia.org/resource/phy03.sci.phys.matter.zmill/exploring-wind-mill-design/>

### Climate Change's Best Hope

<https://www.pbs.org/video/climate-changes-best-hope-wfgae1/>

### What Is Climate Adaptation?

<https://www.youtube.com/watch?v=tn0IYD3D31U>







# Weather Words

## **Adaptation**

The act or process of changing or adjusting something to fit in a new role or context.

## **Air**

The invisible mixture of odorless, tasteless gases that surrounds the Earth, such as nitrogen and oxygen.

## **Albedo**

How strongly a surface reflects back solar energy.

## **Altitude**

The height of something above the Earth's surface or above sea level.

## **Anemometer**

A weather instrument that measures the wind speed.

## **Architecture**

The act or process of designing buildings.

## **Arid**

Extremely dry, especially from the lack of rainfall.

## **Atmosphere**

A mix of gases held in place around the planet by gravity.

## **Atmospheric pressure (or air pressure)**

The weight of air as it presses on objects below or within it.

## **Axis**

An imaginary line that an object turns around. The Earth's axis runs from the North Pole through its center to the South Pole.

## **Barometer**

An instrument that measures air pressure.

## **Carbon**

A chemical element found in all living things.



# Weather Words

## Climate

The average weather conditions in a place over a long period of time, such as 30 years.

Five climate types are:

**Tropical:** In this hot and humid zone, the average temperatures are greater than 64°F (18°C) year-round and there is more than 59 inches of precipitation each year.

**Dry:** These climate zones are so dry because moisture is rapidly evaporated from the air and there is very little precipitation.

**Temperate:** In this zone, there are typically warm and humid summers with thunderstorms and mild winters.

**Continental:** These regions have warm to cool summers and very cold winters. In the winter, this zone can experience snowstorms, strong winds, and very cold temperatures — sometimes falling below -22°F (-30°C)!

**Polar:** In the polar climate zones, it's extremely cold. Even in summer, the temperatures here never go higher than 50°F (10°C)!

## Climate change

When the typical weather in a region changes over a long period of time.

## Cloud

A mass of water vapor that floats in the sky. Different cloud types form at different altitudes and temperatures. Three common cloud types:

**Cirrus:** thin, wispy and feathery cloud.

**Cumulus:** fluffy white cloud with a flat bottom.

**Stratus:** wide, thick low-lying gray cloud.

## Condensation

When gas cools and changes to a liquid; for example, when warm steam touches a cold window.

## Convection

Vertical transport of heat and moisture in the atmosphere, especially by changes in wind direction (updrafts and downdrafts) in an unstable atmosphere.

## Density

The quantity of living things in a shared environment. Also, how much mass (amount of matter an object is made up of) there is in a particular space.



# Weather Words

## **Design**

To make or draw plans to create something.

## **Drought**

A shortage of rain over a long period of time. Drought affects plants, animals, and people.

## **Engineering**

Using science and math to do practical things, such as designing machines.

## **Equinox**

Either of the two times during the year when the Sun's rays are perpendicular to the Earth's equator, occurring in March and September. During the equinox, day and night are both 12 hours long all over the world.

## **Evaporation**

When gas cools and changes to a liquid; for example, when warm steam touches a cold window.

## **Fog**

A thick mass, like a cloud, made up of tiny water drops floating in the air and touching the ground.

## **Forecast**

Weather prediction, or to predict the weather.

## **Greenhouse effect**

The warming of the Earth's surface that takes place when heat from the sun is held in by the Earth's atmosphere.

## **Greenhouse gases**

These are gases in Earth's atmosphere that trap heat. They let sunlight pass through the atmosphere, but they stop the heat that the sunlight brings from leaving the atmosphere.

The main greenhouse gases are:

- Water vapor
- Carbon dioxide
- Methane
- Ozone
- Nitrous oxide
- Chlorofluorocarbons



# Weather Words

## **Hail**

Frozen rain, or small balls of ice that fall from the sky.

## **Humidity**

Water vapor or moisture in the air.

## **Hygrometer**

An instrument that is used to measure the humidity of the air.

## **Inspiration**

Motivation or creative spark.

## **Meteorologist**

A scientist who studies weather conditions and patterns.

## **Meteorology**

The branch of science that studies weather and the atmosphere.

## **Orbit**

The path described by one celestial body in its revolution about another.

- **Orbital period:** the time taken for a given object to make one complete orbit about another object; the Earth takes 365 days to orbit the Sun.
- **Rotation:** a single complete turn.
- **Solar system:** a sun with the celestial bodies that revolve around it in its gravitational field.

## **Precipitation**

Water falling in the form of rain, snow, or hail.

## **Prediction**

A declaration of an expected outcome.

## **Radar**

An electronic instrument that determines the direction and distance of objects that reflect radio energy back to the radar site. Meteorologists use radar systems to see rain or snow.

## **Radiation**

Energy that moves from one place to another in a form that can be described as waves or particles.





# Weather Words

## Rain

Drops of water that form in the clouds and fall from the sky.

## Rain gauge

An instrument used to measure the amount of rain that has fallen.

## Rainbow

A curved arc of light of many colors across the sky caused by the Sun's rays shining through drops of water during or after rain.

## Satellite

Anything that orbits, or revolves around a bigger object. A weather satellite orbits Earth and provides information about the weather.

## Season

A season is a period of the year that is distinguished by special climate conditions.

## Snow

Soft, white flakes of ice that fall from the sky. Snow is formed when water in the upper air freezes into crystals.

## Solstice

Either of the two times in the year when the Sun is furthest from the celestial equator, occurring in June and December.

## States of matter

Matter is anything that takes up space. The three most familiar forms, or states, of matter are solid, liquid, and gas. Heating and cooling a substance may change it from one state to another. Ice and snow are solid water. Steam or fog are gas or vapor forms of water.

## Storm

A violent disturbance in the atmosphere that brings rain, snow, wind, thunder, and lightning.

- Rain storm words: shower, thunderstorm, downpour, monsoon, flood, flash flood
- Winter storm words: cold snap, frost, blizzard, ice storm, freeze, snowfall, icicle

## Technology

A way of solving practical problems that comes from research in science and industry.



# Weather Words

## Temperature

The measurement of heat or cold as shown in degrees on a thermometer.

## Thermometer

An instrument that measures temperature.

## Vapor

Tiny drops of water in the air; the gas form of water. Clouds are made of water vapor.

## Velocity

The speed of an object in a particular direction.

## Vortex

A mass of spinning air or liquid that pulls things into its center.

## Water

A clear, thin liquid that has no color or taste when it is pure. It falls from clouds as rain or snow and enters rivers, lakes, and oceans. All animals, people, and plants need water in order to live.

## Water cycle

The continuous, natural circulation of the Earth's water through evaporation, condensation, precipitation, and collection in lakes, streams, rivers, and oceans.

## Weather balloon

A type of high-altitude balloon which carries instruments up in the sky to send back information on atmospheric pressure, temperature, and humidity.

## Weather forecast

When meteorologists use many different tools to predict what the weather in the near future will be.

## Weather vane

An instrument that determines wind direction.

## Weather

The state or condition of the atmosphere.

## Wind

Movement of air over the surface of the Earth.

# Weather Wonders Name Cards

Make copies of these name tags and let child each choose their own Weather Wonders name. They can select from the Weather Words list (how about Albedo, Cirrus, Equinox, Fog, Rainbow, Snow, Solstice, Vapor, or Vortex?) — or choose another invented name.

My Weather Wonders name is:

---



My Weather Wonders name is:

---



My Weather Wonders name is:

---



My Weather Wonders name is:

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# Weather Log

**Date/Time:** \_\_\_\_\_

**Location:** \_\_\_\_\_

Temperature: \_\_\_\_\_

Sky (description): \_\_\_\_\_

Wind (description): \_\_\_\_\_

Wind direction: \_\_\_\_\_

Wind speed: \_\_\_\_\_

Atmospheric pressure: \_\_\_\_\_

Humidity: \_\_\_\_\_

Precipitation type: (at data collection time): \_\_\_\_\_

Precipitation amount (in last 24 hours): \_\_\_\_\_

# Weather Log

**Date/Time:** \_\_\_\_\_

**Location:** \_\_\_\_\_

Temperature: \_\_\_\_\_

Sky (description): \_\_\_\_\_

Wind (description): \_\_\_\_\_

Wind direction: \_\_\_\_\_

Wind speed: \_\_\_\_\_

Atmospheric pressure: \_\_\_\_\_

Humidity: \_\_\_\_\_

Precipitation type: (at data collection time): \_\_\_\_\_

Precipitation amount (in last 24 hours): \_\_\_\_\_

Weather Wonders

# Weather Journal



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Your name here

.....  
Fold cover along dotted lines



# Weather Wonders



*This certificate is presented to:*

To celebrate your participation in  
the Weather Wonders program!



Date

Signature