

Weather



<u>Item</u>	<u>Number of</u>
<u>Peterson Field Guide: Atmosphere</u>	2
<u>The Weather Identification Handbook</u>	2
5 Day Wireless Forecaster Weather FX	1



08.18.2009

Weather Station at the Main Shelter

Introduction

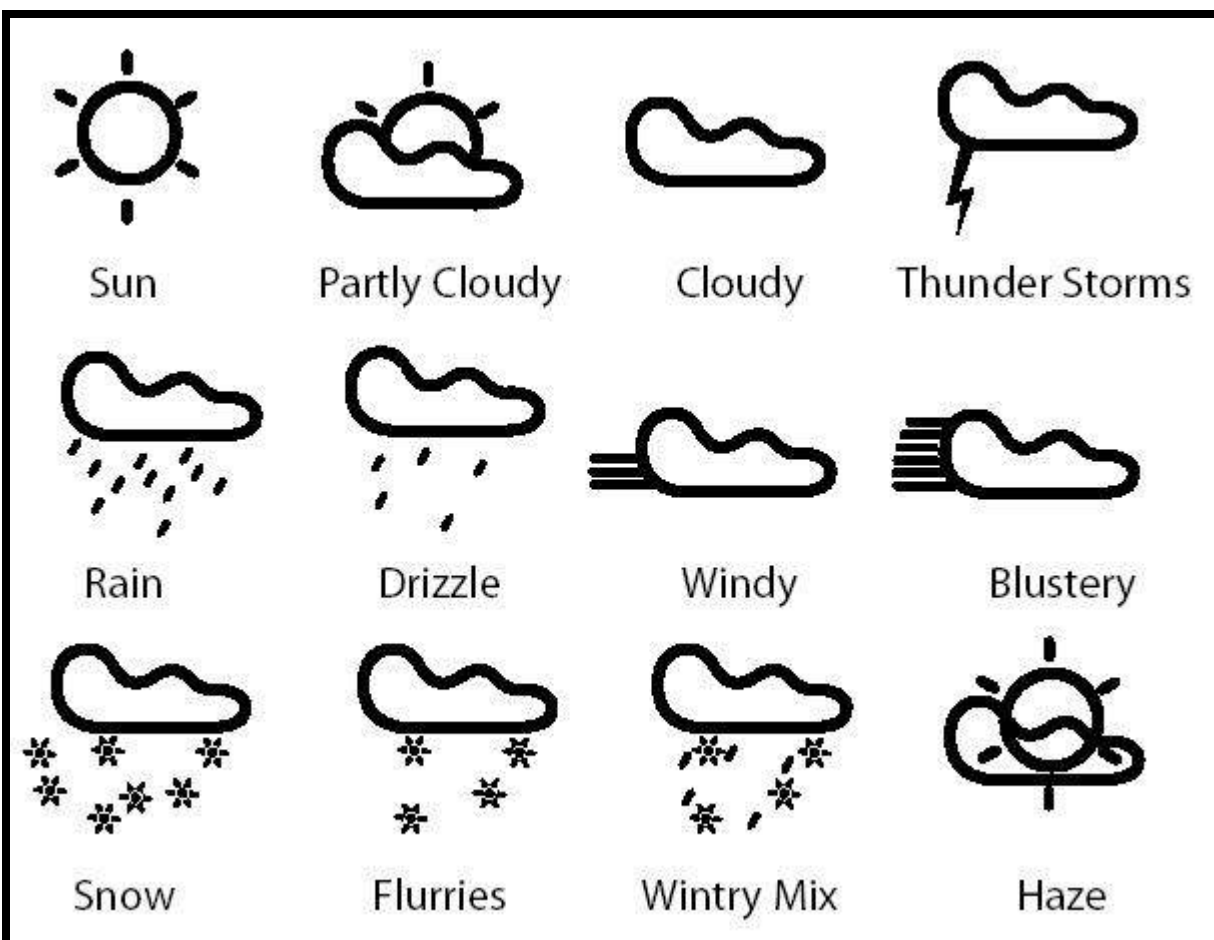
Weather is the state of the atmosphere at any given time and place. Most weather takes place in the lower layer of the atmosphere.

Some determining factors of weather are temperature, precipitation, fronts, clouds, and wind. Other more severe weather conditions are hurricanes, tornadoes, and thunderstorms.

Weather occurs because our atmosphere is in constant motion from the Sun's energy reaching the surface. High pressure occurs when air is sinking. Under these conditions, good, clear weather is the result because the air is stable. However, low pressure areas are associated with unsettled weather conditions such as clouds, storms and wind. This happens because air rises when it is unstable.

Weather changes every season because of the Earth's tilt when it revolves around the sun. Meteorology is the study of weather, and meteorologists are scientists who study and predict weather.

<http://www.windows.ucar.edu/tour/link=/earth/Atmosphere/weather.html&edu=high>



Weather conditions play a vital role in determining what kinds of corn, soybeans, and wheat harvests we have here in Montgomery County. Too dry or wet of a season can cause farmers to lose their crops, which in turn can dramatically affect the local economy. The most direct, visible effect can be noticed at the grocery store when prices escalate.

Weather conditions can also affect our health. For example, people with sinus, arthritis, heart and respiratory problems are affected by heat, cold, and moisture.

In Indiana, severe storms can destroy homes, animals, and lives. We are especially susceptible to tornadoes which destroy everything in their paths. Blizzards, ice storms, droughts, floods can wreak havoc on all natural and man-made structures.

Weather is an exciting topic for students to investigate and experience. By using the skills of observing, measuring, researching, and recording, students can determine daily weather conditions and eventually predict monthly and seasonal weather.

Activity suggestions before visiting the Nature Park

- Have students use their 5 senses to observe wind, rain, snow, sleet, clouds, temperatures and the sun
- Have students list the different types of weather instruments that they can describe and what they are used to measure
- Study weather maps from newspapers or the Internet with various low and high fronts, isobars, temperatures, and weather systems.
- Invite a weather forecasting expert to speak to the class. Have students prepare interview questions before the expert arrives.
- Complete any of the activities contained in the website, <http://www.theteachersguide.com/Weather.html>
- Build a set of weather instruments (see section below). Collect statistics about weather in a selected area.
- Study weather maps, patterns, and symbols from local newspapers' weather maps.

Activity suggestions during your visit to the Nature Park

- Set up the portable weather station when you arrive. Record the weather data. Check the data when you leave. Compare, graph and extrapolate information. Forecast what the weather might be in 24, 36, and 72 hours.

Activity suggestions after visiting the Nature Park

- Continue collecting weather information for an extended period of time.
- Research weather related natural disasters in the area (flood, drought, winter storm) and the effect on the economy, people and the community's attempts to recover
- Describe the weather that was experienced while visiting the Nature Park. Have students write poems, stories, songs about the weather during their visit
- Have students collect weather maps from local newspapers. Put them into a booklet format. Have students predict the weather for the Nature Park based on the relative patterns of weather
- Research weather related natural disasters that have occurred in our county.
- Research how such words as velocity, atmosphere, humidity, gusts, meteorology, relative humidity, climates, barometric pressure relate to weather in the different hemispheres
- Build and use a weather station.
- Research how weather affects animals' moods.
- Graph monthly totals from precipitation, cloud cover, high and low temperature, wind direction and wind speeds.
- Create an alphabet book using weather words.

Resources in the travelling trunk

- Bushnell Weather Station
- [The Weather Identification Handbook: The Ultimate Guide for Weather Watchers](#)
- [Weather for Dummies](#)
- [Peterson First Guide to Clouds and Weather](#)

On-Line Resources

Collection of units on weather related topics,

<http://www.ciese.org/curriculum/weatherproj2/en/activities.shtml>

List of weather lesson plans, classroom activities, projects, and demonstrations that can be modified for all levels, <http://geology.com/teacher/weather.shtml>

Hands-on weather activities for all levels,

http://www.windows.ucar.edu/tour/link=/teacher_resources/main/activity.html#aw2

Current worldwide weather conditions, <http://www.refdesk.com/weath1.html>

The Weather Channel, www.weather.com

National Oceanic and Atmospheric Administration (NOAA), <http://www.noaa.gov/>

Build Your Own Weather Station Instruments



Taken and modified from
[http://school.discoveryeducation.com/lessonplans/activities/
weatherstation/index.html](http://school.discoveryeducation.com/lessonplans/activities/weatherstation/index.html)

Building a Rain Gauge



Background

Rain gauges measure rainfall over short or long periods of time. Short-term gauges are checked after each rainfall. They can simply be open jars left outside to collect rain and measured each day. A more complex rain gauge has oil in it to keep rain water from evaporating over long periods of time.

Materials

- Sharp scissors
- fine mesh screen
- nail file
- 2 two-liter bottles (tops removed)
- permanent marker
- ruler
- duct tape
- vegetable oil
- bleach (optional)

Procedure

1. Carefully cut a two-liter bottle in half to make a funnel. File any sharp edges.
2. Place the cut bottle on the uncut bottle so that spouts are touching and in line.
3. Tightly tape the bottle spouts together. Place the screen over the funnel opening and press it slightly inward. Tape it in place.
4. Mark the rain gauge up the side in 1/4-inch (or 1/2-cm) graduations with the permanent marker. For more accurate readings, tape a ruler to the side of the bottle.
5. Pour in enough vegetable oil to cover the bottom of the rain gauge in a thin layer. Put the screen in place over the gauge.
6. Place the rain gauge outside, preferably in a shady, but not covered, spot.
7. Decide on a time period to wait before collecting data. Periodically check the gauge and put a few drops of bleach in it to retard critter growth.
8. Keep a record of rainfall totals for each day and the average amount of rainfall over the time period you specify.

***It is very important that you not come in contact with the water as it may contain pathogens.

Building a Wind Vane



Background

A wind vane is really just a flat piece of metal or wood on a swivel that catches the wind and points toward and away from the wind. You have probably seen pictures of a wind vane on top of a barn. It is usually shaped like a farm animal such as a horse or a rooster. It usually has an arrow to point in the direction the wind is blowing. However, wind is described in terms of where it is blowing from. For example, a west wind blows east.

Materials

- 3 ft x 3 ft piece of thin wood or plastic
- bicycle wheel or skate wheel or lazy susan
- saw
- screws
- plastic or metal letters, "N, E, W, S"
- sand paper or file

Procedure

1. Cut an interesting shape from wood or plastic. Be sure to include a pointer. Round all edges except the bottom.
2. Mount the shape to your chosen swivel.
3. Install your wind vane on top of a tall pole or on the roof of a shed or house.
4. Keep a log of the wind direction as observed several times a day.

Building a Psychrometer



Background

Air is made of gas particles that are constantly moving. Warm air particles move rapidly; cold air particles move more slowly. When air is warm, the distance between the particles is greater than when air is cold.

Water can exist in all three states on this planet. It has a tendency to evaporate when left sitting for too long. In the gaseous form it is called water vapor. You can't see it in the air or as it leaves a boiling pot or tea kettle. Look at the jet of steam coming from a tea kettle. If the kettle has a whistle top, you'll notice that closest to the opening, you can't see anything. That's the water vapor! A little farther out, you see the white cloud we like to call steam. It's really condensed water vapor (sort of like a cloud).

Water vapor particles can move freely between air particles. At higher temperatures, when air particles are farther apart and moving faster, a lot of water vapor particles can fit in between. At lower temperatures, when air particles are closer together and moving slower, less water vapor particles can fit between the spaces, so they have to "band together," or condense. There's your white cloud above the tea kettle.

The amount of water vapor actually in air as opposed to how much the air is capable of holding is called relative humidity. If the weather report says, "The relative humidity is 72%," that really means that the air (at that temperature) is holding 72% of its actual capacity.

A psychrometer or a hygrometer is used to measure relative humidity. A wet-bulb/dry-bulb hygrometer actually measures how fast air will let water evaporate into it. Evaporation is a cooling process. A wet surface covering the bulb end of a thermometer will cool as water evaporates from it into the air. The drier the air, the faster the evaporation and the cooler the wet bulb will become. The wetter the air, the slower water will evaporate into it and the wet bulb's temperature is not lowered as much.

Materials

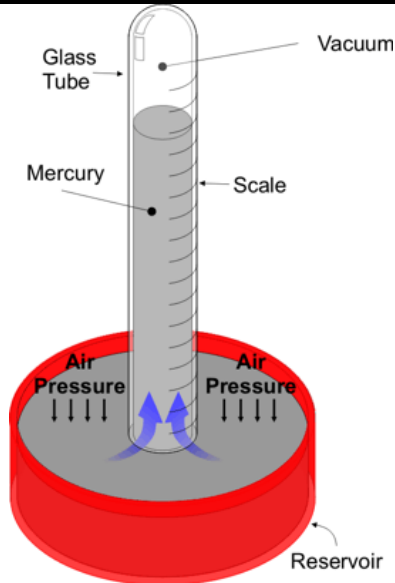
- 2 alcohol-filled air thermometers (they must read exactly the same temperature when placed side by side out of direct sunlight)
- clear packing tape
- cotton shoelace (the hollow type)
- 1- or 2-liter bottle (label removed)
- water (distilled is best but tap will do)
- thread
- awl
- relative humidity chart

Procedure

1. Punch a hole in the side of the bottle about an inch from the bottom. Heating the awl will make a perfect hole. The same thing can be done with a hot nail held with tongs. Use great caution when doing this so you don't burn yourself or others. After you've made the hole, place the hot object in cold water.
2. Be sure the tips are cut off the shoestring. Cut about 2 inches of shoestring and slip it over the bulb of one of the thermometers. Carefully tie it in place with thread.
3. Cut a small piece of packing tape. Position the bulb of the shoestringed thermometer about 1/8 inch over the hole. Be sure the top of the thermometer is aligned with the top of the bottle. Tape the thermometer to the bottle. Tape the other thermometer parallel to the first one and about 1/4 inch away. Put a strip of tape around the bottle and both thermometers to make sure they don't fall off.
4. Push the shoelace through the hole. Put room temperature water in the bottle until it reaches just below the hole.
5. Wait 5 to 10 minutes and read both thermometers. There will be a difference in the two. Use the chart below to calculate the relative humidity.
6. Keep a record of the daily humidity for a few weeks. Next to your entries, describe the way you feel on those days.
7. The dry-bulb temperature can also be used to record the air temperature!

Air Temp. (Dry Bulb)	Difference between wet- and dry-bulb readings in degrees F														
	1	2	3	4	5	6	7	8	9	10	15	20	25	30	35
20	85	70	55	40	26	12									
25	87	74	62	49	37	25	13	1							
30	89	78	67	56	46	36	26	16	6						
35	91	81	72	63	54	45	36	29	19	10					
40	92	83	75	68	60	52	45	37	29	22					
45	93	86	78	71	64	57	51	44	38	31					
50	93	87	80	74	67	61	55	49	43	38	10				
55	94	88	82	76	70	65	59	54	49	43	19				
60	94	89	84	78	73	68	63	58	53	48	26	5			
65	95	90	85	80	75	70	66	61	56	52	31	12			
70	95	90	86	81	77	72	68	64	59	55	36	19	3		
75	96	91	86	82	78	74	70	66	62	58	40	24	9		
80	96	91	87	83	79	75	72	68	64	61	44	29	15	3	
85	96	92	88	84	80	76	73	69	66	62	46	32	20	8	
90	96	92	89	85	81	78	74	71	68	65	49	36	24	13	3
95	96	93	89	85	82	79	75	72	69	66	51	38	27	17	7
100	96	93	89	86	83	80	77	73	70	68	54	41	30	21	12
105	97	93	90	87	83	80	77	74	71	69	55	43	33	23	15
110	97	93	90	87	84	81	78	75	73	70	57	46	36	26	18
115	97	94	91	88	85	82	79	76	74	71	58	47	37	28	21

Building a Barometer



Background

Air exerts pressure on Earth's surface. In fact, it exerts pressure in all directions—down, up and sideways—at the same time! At sea level, air weighs 14.7 pounds per square inch. That means that a desktop area 2 inches by 2 inches has almost 59 pounds of air sitting over it. Standard copy paper (8.5 x 11 inches) has close to 1,375 pounds of air holding it down AND up at the same time.

Materials

- Empty coffee can
- large, heavy-duty latex balloon
- heavy rubber band
- scissors
- coffee stirrer
- 3x5 card
- duct tape
- white glue

Procedure

1. Smoothly tape the rim of the coffee can so the metal edge is completely hidden but remains open. Be sure the tape smoothly extends down the side of the can an inch or more. To effectively do this, tape around upper side of the can leaving at least 1/2 inch of tape sticking up over the rim. Use scissors to make 8 to 10 cuts in the protruding tape straight down to the can rim. Fold the tape down and smoothly stick it to the inside of the can.
2. Cut the filler hole off the balloon and discard. Stretch the balloon tightly over the taped edge and secure it with a rubber band. Make the rubber band as tight as you can.
3. Put a drop of white glue in the center of the stretched balloon. Put the coffee stirrer on the glue and position it so that it protrudes about 1/2 inch over the edge of the can.
4. Tape the 3x5 card on the side of the can so that it extends over the top and is close but not touching the coffee stirrer.
5. Mark the card at the tip of the stirrer. It isn't necessary to put numbers there.
6. Write the current barometric pressure in a journal. Determine if the pressure is high, low or "somewhere in between." This will be your baseline pressure. Be sure to note the position of the mark on the 3x5 card corresponding to the pressure.
7. Repeat step 6 through several cycles of weather. Be sure you have several highs and lows marked on your card and that you have entered all information in your journal.

When you become accustomed to the way your barometer works, you will have a tool with which to predict the weather. Determine how the barometric pressure correlates to present weather.

Building an Anemometer



Background

You're used to feeling the wind. Sometimes there's not much of it and other times you wish it would stop. An anemometer is used to measure wind speed.

Materials

- Old bicycle wheel assemblies
- bicycle speedometer
- 5, 2-liter soda bottles
- 1-gallon plastic milk container
- 4-foot wood closet rod
- hammer
- 3 "L" shaped wood brackets
- drill with drill bits
- nuts and bolts
- washers
- level
- file
- fine sand-paper
- wood screws
- twist ties

Procedure

1. Clamp the closet rod firmly in place on a work bench. Drill a shallow hole in one end of the closet rod with a diameter slightly smaller than the threaded screw on the bicycle wheel's axle.
2. Be sure the caps on the 2-liter bottles are securely tightened. Cut off the bottoms of the bottles. File or sand any rough or sharp ends until smooth.
3. Drill 4 holes in the wheel using a drill bit the diameter of the bolts you have. The holes should be at 0 degrees, 90 degrees, 180 degrees and 270 degrees on the wheel. Drill a second hole 4 to 5 inches next to each of the first ones. It's important that the distances be exactly the same for each new hole. Otherwise, your wheel will be out of balance. You now have 2 holes apiece through which you will secure a nut and bolt (the screws must face outward).
4. All the bottles must face the same direction when mounted on the wheel. The open ends and top will lie on the circumference of the wheel. Mark the bottles where the bolts touch. Drill or punch holes at those locations.

5. Put washers on the bolts. (You will now have a bolt through a hole, a nut on the bolt and a washer on the bolt.) Slip a bottle in place on the bolts. Reach in the bottle and put a washer on the bolts. Be careful, in case you left any sharp edges! Then tighten the nuts in place. Do the same for the other bottles.
6. If you have room, you can mount another 4 bottles on the wheel.
7. Turn the wheel assembly sideways and place the axle screw over the hole in the closet rod. Hammer the screw into the hole.
8. Mount and level the anemometer to the side of a shed or construct a base from 24 x 24 inch by 3/4 inch sealed plywood. L-brackets will make it easy to attach the rod using wood screws.
9. Attach the speedometer to the wheel according to manufacturer's instructions. Attach it to the closet rod, or anywhere you can see it well. If it isn't waterproof, design a cover for it.
10. Cut the bottom from a 1-gallon plastic milk container to use as a rain shield for the axle. Poke holes around the cut end to insert twist ties. Attach the ties securely to spokes. Plastic sheeting can also be used to cover a larger area.
11. Be sure the axle is accessible so you can oil it periodically.
12. Take readings several times a day, more often as weather changes are apparent.