MWOBS

MOUNT WASHINGTON OBSERVATORY

OBSERVING WEATHER

Some Tips for your own Weather Station

Observing the weather is a great way to get in closer touch with the environment, and to learn some of the basic processes of science. Here are a few tips to help get you started.

Assemble appropriate equipment. It doesn't need to be fancy (though it can be), but there are a few basics you should invest in.

1. A **thermometer** to measure temperature. You can use a liquid expansion (bulb-type) thermometer, a metal-expansion (typically a dial-type) thermometer, or a digital thermometer. You can take readings in Fahrenheit or Celsius degrees, whichever you feel more comfortable using.
   A bonus would be if you could acquire a maximum-minimum thermometer (available at many hardware stores). This would allow you to track high and low temperatures with only a single daily reading.
2. A **rain gauge** to measure rainfall and other precipitation (drizzle, and the water contained in solid precipitation such as snow, hail, and sleet (ice pellets)). You can purchase a commercial rain gauge very inexpensively, or you can make your own, using a parallel-sided, flat bottomed can or similar container plus a ruler. You can take measurements in inches or millimeters.
3. A **snow stake**, to measure new snowfall and to measure the snow on the ground. If you live in snow country, the ideal would be to have a separate stake, marked in inches or centimeters (made of lumber, pipe, or a yardstick or meterstick) to keep track of snow on the ground, and a ruler (marked in inches or centimeters) to measure new snow. Measure new snow on a surface that has been cleared of old snow – either clear a spot down to the ground, or use a flat board on the old snow surface.
4. A **wind direction vane**, which you can make from everyday materials such as lumber and pipe. Mount it in a place well exposed to the wind. Determine directions with the aid of a compass so you can know from what direction the wind blows.
5. An **anemometer**, or other device to gauge wind speed. You can use a roof-mounted or tower-mounted anemometer, or a hand-held wind meter. An anemometer can be a significant investment, so you may wish to use a Beaufort Wind Scale to estimate wind speed by the effects the wind has on the environment.
6. A **cloud chart** to be able to properly identify cloud types – these are available through many school supply houses and science museums.
7. If circumstances allow, you can also acquire a **barometer** to measure air pressure, and to assess the trend of pressure (rising, falling, or steady) and rate of change over time.
8. A final item you might wish to include is a **hygrometer**, or a sling psychrometer and chart, to be able to determine relative humidity.

Remember to place your instruments in appropriate locations to get fair readings of the weather :

- thermometers should be away from direct sun and artificial sources of heat, and away from locations that might skew your readings (such as parking lots).
- Wind measurements should be taken in locations open to the free flow of the air, and not unreasonably blocked by buildings or trees.
- Similarly, rain and snow measurements should be taken in areas which will give a fair measurement of rain and snow, not affected too much by wind, buildings, etc.
- When you assess cloud cover, be sure you can see as much of the sky as possible.

Most important in observing weather is to be consistent in your measurements and assessment. Read instruments the same way every time, and take your readings at the same time each day. Keep careful track of your observations, using a standardized reporting form.

Even if you can't include all these aspects of weather in your observations, it's fine to focus on one or two aspects – such as temperature and general weather conditions – to get started.

Some Extra Observing Hints...

Precipitation is any of the forms of water particles, liquid or solid, which fall from the atmosphere and reach the ground. There are eight types of precipitation – some well know, some less so:

Drizzle consists of fine drops of water, with diameters of less than.02 inch (.5 mm), which fall very close together. Drizzle can appear to float on air currents as it works its way to the ground. Its appearance is generally uniform.

Rain consists of either drops .02 inches (.5 mm) in diameter or greater or smaller drops which are widely separated (if the smaller drops were more uniform in their fall, they would be drizzle).

Snow consists of crystals of various shapes, though most are branched in the form of six-pointed stars.

Snow Grains are very small, white, opaque grains of ice.

Ice Crystals – also known as "Diamond Dust" – are unbranched ice crystals in the form of needles, columns, or plates.

Ice Pellets are transparent or translucent pieces of ice, usually round or irregularly shaped, with a diameter of .2 inch (5 mm) or less. The two main types of ice pellets are hard grains of ice, made of frozen raindrops or melted and refrozen snowflakes, and pellets of snow encased in a thin layer of ice.

Hail is in the form of small balls of other pieces of ice, sometimes separate, sometimes frozen together in irregular lumps.

Small Hail or Snow Pellets are white, opaque grains of ice. The grains are round or cone-shaped. Diameters range from about .08 inch to about .2 inch (2 to 45 mm).

The **rate** of precipitation can be light, moderate or heavy. If precipitation starts and stops suddenly, or changes rapidly in intensity, then it is falling in **showers**. Liquid precipitation – drizzle and rain – can fall onto cold surfaces and freeze into ice on contact, and in this case would be called **freezing drizzle** and **freezing rain**.

Visibility can be limited by precipitation, and by other atmospheric phenomena, such as mist, fog, smoke, volcanic ash, dust, sand, haze, and spray.

Definitions of **Sky Cover** vary. One standard is to use tenths of sky covered by clouds.
A **Clear** sky would have no clouds.
A **Mostly Clear** (or, in daytime, Mostly Sunny) sky would have 1/10 to 3/10 cloud cover. A **Partly Cloudy** (or, in daytime, Partly Sunny) sky would have 3/10 to 6/10 cloud cover. A **Mostly Cloudy** sky would have 7/10 to 8/10 cloud cover.
A **Cloudy** sky would have 9/10 to 10/10 cloud cover. (10/10 cloud cover is considered **overcast**.)

--adapted from Federal Meteorological Handbook Number 1 and other NOAA sources

Some Ideas for Weather Activities

Make a poster of weather instruments and how they are used.

Make a list (or a poster) of sports, hobbies, and other activities that depend in some way on weather.

Illustrate the Beaufort Wind Scale with your own pictures of wind and its effects on the environment.

Create your own personal cloud chart, based on photographs you have taken or on drawings you have made of clouds you have seen.

Invent new instruments to study aspects of weather, such as temperature, wind speed, and rainfall.

Compare temperatures in the sunshine with temperatures in the shade. Compare temperatures at different heights above the ground. Compare temperatures above grassy surfaces with temperatures above paved surfaces. Compare temperatures on the north, east, south, and west sides of a building, at different times of day.

In winter, compare the temperature under and within the snowpack with the air temperature above the snowpack.

Using identical closed containers of water, thermometers, and a household fan, investigate the "wind chill" effect (i.e. accelerated rate of heat loss due to air movement).

Set up rain gauges at several locations near your school or in your neighborhood. Do the gauges record identical rainfall amounts for every storm?

Keep track of weather at your home AND your school – compare a month's worth of data – can you explain the similarities and differences?

Using graphs, compare your weather with weather at a distant and different location (for instance, a place which is typically much hotter, colder, wetter, or drier than your location).

Using graphs, compare your actual weather for one month with long-term climatic normal conditions for your area.

Using forecasts from a newspaper, radio, TV, or the internet, investigate how accurate forecasts are one, two, and three days ahead.

Compare a long-range forecast from an almanac with actual weather in your region. How accurate is the long-range forecast?

Using weather maps from a newspaper or the internet, explore how the tracking of high and low pressure areas, and warm and cold fronts, relate to your weather.

Every day for one week, check a major newspaper and cut out every news story that involves weather.

Visit a local weather watcher (a hobbyist or a cooperative observer), an official weather station (such as at an airport), or a television or radio meteorologist.

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WEATHER OBSERVATION FORM

Location	Day of Week	Date and Time
Observation Made By		

Current Temperature: _____F _____C

Maximum (Highest) Temperature since last reading: _____F _____C

Minimum (Lowest) Temperature since last reading: _____F _____C

Current Wind speed: _____MPH _____KPH

Current Wind Direction: _____

Maximum (Highest) Wind Speed since last reading: _____MPH _____KPH

Total Sky Cover:

☐ Clear ☐Mostly Clear ☐ Partly Cloudy ☐Mostly Cloudy ☐Cloudy

Cloud Type(s) present: _____

Rainfall / Precipitation since last reading:_____inches_____millimeters

Type(s) of Precipitation since last reading:_____

Snowfall since last reading: _____inches_____centimeters

Snow on ground:_____inches_____centimeters

Current Weather Conditions: _____

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Optional Information:

Wet Bulb Temperature: _____F _____C

Dew Point Temperature: _____F _____C

Relative Humidity: _____%

Barometric Pressure: _____inches _____millibars

Barometric Tendency since last reading: _____falling _____steady _____rising

Visibility: _____miles _____kilometers

Obstructions to Vision: ☐Rain ☐Snow ☐Fog ☐Haze ☐Other:_____

Beaufort Wind Scale

The Beaufort Wind Scale helps you estimate the actual wind speed from observations of the wind's effects on the environment

Beaufort Number	Descriptive Term	Speed in Miles per Hour/ Kilometers per Hour	Observations of the Environment
0	Calm	0 to 1 MPH 0 to 1 KPH	Calm; smoke rises vertically
1	Light Air	1 to 3 MPH 2 to 5 KPH	Drifting smoke indicates wind direction; wind vanes do not move
2	Light Breeze	4 to 7 MPH 6 to 12 KPH	Wind felt on face; leaves rustle; wind vanes moved: flags stir
3	Gentle Breeze	8 to 12 MPH 13 to 20 KPH	Leaves and small twigs are in constant motion; wind extends light flag
4	Moderate Breeze	13 to 18 MPH 21 to 30 KPH	Dust, leaves, and loose papers are moved up; small branches move; flags flap
5	Fresh Breeze	19 to 24 MPH 31 to 40 KPH	Small trees with leaves begin to sway; flags ripple
6	Strong Breeze	25 to 31 MPH 41 to 50 KPH	Large branches of trees in motion; wires whistle; umbrellas difficult to use
7	Moderate Gale	32 to 38 MPH 51 to 61 KPH	Whole trees in motion; resistance felt when walking against wind; flags extend
8	Fresh Gale	39 to 46 MPH 62 to 74 KPH	Twigs and small branches broken off trees; walking is difficult
9	Strong Gale	47 to 54 MPH 75 to 89 KPH	Some structural damage occurs; slate blown from roofs; trees uprooted
10	Whole Gale	55 to 63 MPH 90 to 103 KPH	Seldom experienced on land; trees broken; structural damage
11	Storm	64 to 72 MPH 104 to 119 KPH	Very rarely experienced on land; much damage
12	Hurricane Force	73 MPH or greater 120 KPH or greater	Wholesale destruction!!!