Grab some crayons or colored pencils & heighten your creativity by coloring the cover of this activity book! Remember, only you can relax & de-stress.

WEATHER TO BURN

Wildfire Prevention Activity Book

GREAT LAKES FOREST FIRE COMPACT

Understanding Weather can PREVENT Wildfires

Wildland fires are influenced by the **weather, topography** and **fuel.** Before you burn, you need to be aware of the weather! You need to look at the **temperature, wind** speed, relative **humidity,** and the **precipitation.** By observing your **thermometer,** you can determine the temperature in **Celsius** and **Fahrenheit.** High temperatures cause **evaporation** of moisture in the fuel, such as dry grass, twigs and trees, making it easier for fires to start.

The **diurnal burning** cycle means that fire will burn easier in mid-afternoon, when temperatures are higher and relative humidity will be lower, rather than overnight when the opposite typically occurs. Relative humidity is measured by using an instrument called a **psychrometer.** Using a rain gauge, you can see how much **rainfall** or precipitation that has fallen in your area. Large amounts of rain will cause higher relative humidity, making it harder for fires to burn.

Wind will cause fires to spread and supply oxygen for fire to burn. High winds can carry **embers** or **firebrands** for great distances ahead of the wildfire. These **sparks** cause **spotting** or spot fires. The fires will continue burning as long as there is a fuel source. If the winds are really strong, the flames will climb into the tree tops. This is called **crowning.**

Heat from the fire is transferred by **radiation, convection** and **conduction.** Heat dries out the fuel next to fire and allows fires to ignite easily. In addition, the topography of the area can make fire **suppression** more difficult due to limited access and rough terrain. As the heat rises, it preheats the fuels above it in steep terrain and cause fires to burn more rapidly.

Instability in the atmosphere can cause severe **thunderstorm** activity causing erratic **wildfire** behavior. **Cumulonimbus clouds** produce high winds, lightning, and heavy rains. The storm is associated with a cold **front** from a low pressure system, which may have persistent high winds. Firefighters working on the **fireline** need to be aware of these dangers. Dry **lightning** occur when there is very little rain and can be an **ignition** source for more fires.

Fuel sources have a large impact on fire behavior. The ignition and fire **intensity** will depend on the fuel size, **moisture** content, chemistry, **quantity,** continuity and arrangement. Fine fuels will ignite easier than larger material and fuel that is spread out will not allow the fire to spread as quickly. The higher the moisture content in the fuel, the harder it is to ignite and burn.

To suppress a wildfire you need to remove either the fuel, oxygen or heat.

Can you find all the bold words on this page in the word find?

EVER WONDER WHY smoke from a campfire seems to follow you?

If you've spent any time around a campfire you know how frustrating it can be when you get a bunch of smoke blowing right in your face. You try to move away, but it only seems to follow you.

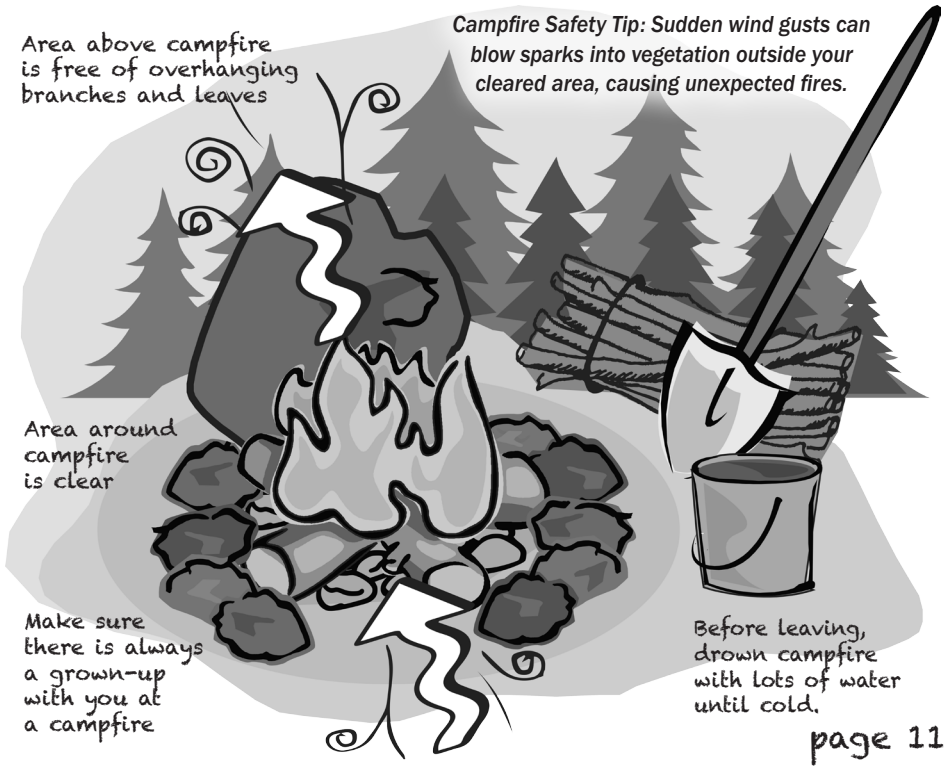
Smoke is attracted to objects, that's why it seems to follow you. As the warm air rises and cool air from the surrounding area comes in to replace it, a vertical object, or person, near the fire, will block the flow of cool air. So, when one combines the blockage of cool inbound air with a rising air mass and someone is standing near a campfire, the person will attract smoke!

How to create the perfect, smokeless campfire

A good fire needs **heat, fuel** and **oxygen.** By opening up one small section of the fire ring, you can allow more oxygen to enter the fire. This air works to properly feed the fire and help it burn efficiently which reduces smoke.

A horseshoe shaped fire pit with a large flat rock on the opposite end of the opening will give air a clear path to the fire from the open side and a preferred path out up the side of the vertical rock. The air will be drawn through the fire to the large rock. As the heat rises, so will the direction of the smoke in an upward direction.

This design keeps the smoke from hitting you directly in the face and should make your time around the campfire more enjoyable so bring an extra bag of marshmallows!



EVEN IF IT RAINS TODAY, it may not be safe for burning

Smokey Bear signs displaying the daily fire danger are often seen along major roads. These ratings describe the potential for a fire to start and spread and the intensity at which a fire will burn in the wildland. Fire danger ratings are based on weather, fuels and changes in the landscape.

LOW	Fires do not ignite easily and will spread slowly. ***This is the safest time to burn.***
MODERATE	Fires can ignite and will spread, but are relatively easy to contain. ***Use caution if burning.***
HIGH	Serious conditions. Fires ignite easily, spread rapidly and are difficult to control. ***Burning is not recommended.***
VERY HIGH	Dangerous conditions. Fires start easily and spread rapidly with increased intensity. Fires are very difficult to control. ***Burning is not recommended.***
EXTREME	Explosive conditions. Fires start easily, spread furiously and burn intensely. This is the worst possible danger. ***Burning is strongly not recommended.***

How is the Fire Danger Rating Determined?

The Fire Danger Rating is based upon many weather related variables. Small weather stations are located in strategic areas that sense temperature, wind speed and direction, relative humidity, precipitation, hours of sun, and other factors. These stations upload data to the Internet on an hourly basis, and also record weather trends. Wildfire specialists use this data to predict how easily fires will start and spread. They then assign a fire danger rating and post it in high visibility areas around the community.

What weather conditions indicate a critical fire day?

Almost all weather reports include **temperature, relative humidity, wind,** and chances of **precipitation.** Key things to watch for are warmer temperatures, relative humidity below 40%, and wind speeds greater than 10 miles per hour/15 kilometers per hour). Most weather reports also include sky conditions such as “Sunny” or “Partly Cloudy.” This is also important to watch because as more of the sun’s radiation reaches the vegetation, the faster the vegetation (fuel) dries out and is easier to ignite. On days that there is a small amount of rain, but it gets hot, dry and sunny afterward, the fire danger can remain elevated.

Find the bold words from page 2 in the word search below.

F	A	H	R	E	N	H	E	I	T	N	E	C	H	E	C	E	R	L	K
W	E	A	T	H	S	E	D	R	O	H	R	C	O	N	N	F	A	L	D
I	C	T	I	K	O	N	N	I	S	E	U	B	E	I	U	F	D	A	O
N	R	E	R	E	A	Y	S	O	C	A	T	W	L	E	U	B	I	F	E
U	O	A	L	L	R	S	N	R	Z	T	A	E	L	G	R	N	A	N	R
S	P	I	D	C	E	T	O	P	O	G	R	A	P	H	Y	O	T	I	I
S	D	L	T	R	I	W	U	W	T	I	E	T	P	Y	W	I	I	A	F
S	I	U	P	A	N	U	I	P	F	N	P	H	A	T	Y	T	O	R	D
W	T	P	O	I	R	N	S	C	I	C	M	E	R	I	T	C	N	F	L
S	U	H	N	L	D	O	U	F	U	J	E	R	E	T	I	E	E	S	I
S	Z	G	W	B	C	H	P	Q	I	M	T	C	T	N	S	V	R	D	W
N	O	I	T	C	U	D	N	O	C	R	U	E	E	A	N	N	U	I	G
L	I	G	H	T	N	I	N	G	A	R	E	L	M	U	E	O	T	U	N
Y	T	I	D	I	M	U	H	I	T	V	H	B	O	Q	T	C	S	R	I
K	H	T	H	E	R	M	O	M	E	T	E	R	R	N	N	U	I	N	N
I	N	S	T	A	B	I	L	I	T	Y	V	D	H	A	I	H	O	A	R
S	P	O	T	T	I	N	G	T	N	O	R	F	C	H	N	M	M	L	U
P	R	E	C	I	P	I	T	A	T	I	O	N	Y	W	T	D	B	Q	B
D	Y	P	E	M	B	E	R	S	W	C	H	G	S	H	W	B	S	U	D
M	R	O	T	S	R	E	D	N	U	H	T	K	P	O	C	S	Q	M	S

From the letters that are left uncircled, unscramble to find the hidden message

__ __ __ __ __

__ __ __ __ __ __ __

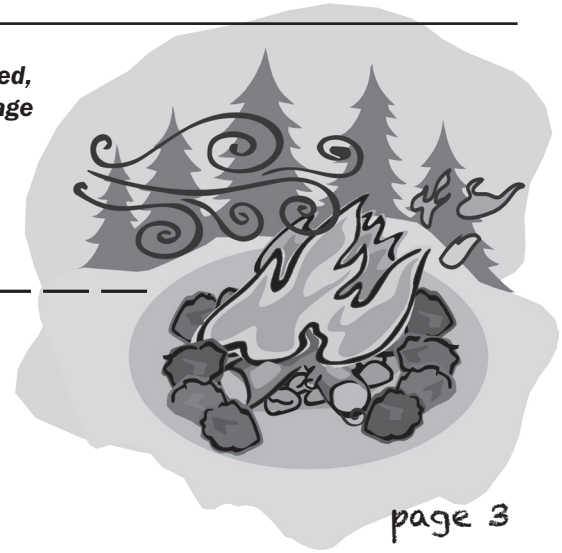
__ __ __ __ __ __ __ __ __ __

__ __ __ __ __ __

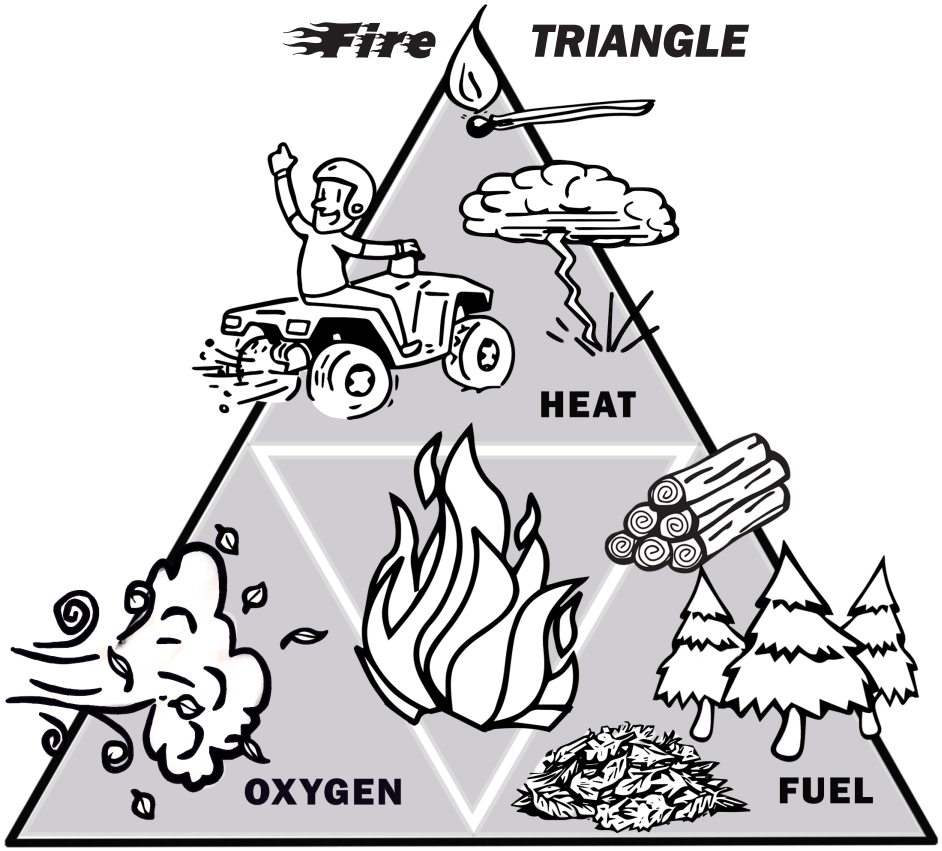
__ __ __

__ __ __ __

SOLUTION: check weather conditions before you burn



Fire TRIANGLE



This is a fire triangle.
A fire cannot occur unless all three sides are present. Firefighters suppress fire by removing at least one component (oxygen, heat, or fuel) of the triangle.

Weather is very important to wildland firefighters. They can determine with a high degree of certainty whether or not a fire will occur and where (based on fuel types) and can plan accordingly.

Fill in the blank: What side of the fire triangle does weather affect?

Wind: Dries _____ and gives the fire _____.

Rain: Wets _____ and takes _____ from the fire.

Clouds: Keep temperatures down and allow _____ to retain moisture.

Lightning: Acts as a _____ source and ignites fires.

Snow: Wets _____ and keeps them moist for extended periods.

Low Humidity: Allows _____ to dry faster.

High Humidity: Helps _____ retain moisture and burn less readily.

High Temperatures: Dries and warms _____.

Low Temperatures: Allows _____ to stay moist longer.

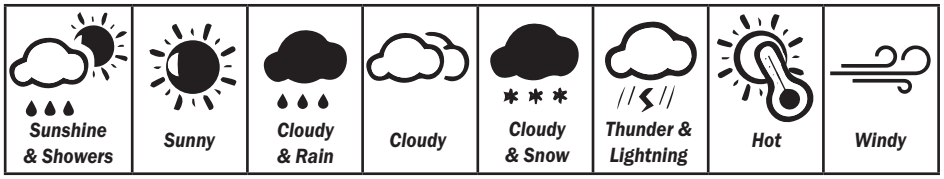
MY FIRE WEATHER DIARY

Wildfire season is generally anytime the ground is not snow-covered and can be most active in spring or summer months during extended periods without rain. Why is that, you ask? The forest fuels are dry and weather conditions get warm, dry and windy. This is the perfect environment for a fire to start and spread.

In the first part of this activity, fill out the ***7-day*** fire weather diary during fire season to see if there are any trends. Use the key to weather symbols to describe the weather for the day. Get your local or national weather report. From the weather indicators, tell us whether you think there is potential for fires on those days or not. Remember, a potential fire day is typically a warm, dry and windy day.

Date	Daily Weather Observation (see below)	Temp.		Rainfall	Relative Humidity	Wind Speed/ Beaufort Scale	Potential for Fires Today (Yes/No)
		High	Low				

Key to daily weather observations



TEST YOUR KNOWLEDGE of how weather affects fire! Choose one day that you observed the weather where you said there was potential for fires. Describe why you think there might be fires that day based on the weather you observed.

Date: _____

Reason for Potential Fire Day: _____

_____

_____

MAKE A RAIN GAUGE

COLLECT

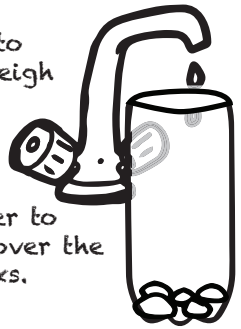
- ❑ Clean 2-liter Soda Bottle
- ❑ Scissors
- ❑ Duct Tape
- ❑ Rocks/Sand
- ❑ Sharpie
- ❑ Ruler

CUT

Completely cut the top portion of soda bottle off, save it for later.

ADD

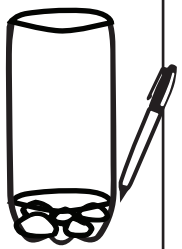
Place rocks into the bottle to weigh it down so it doesn't tip over as easily.

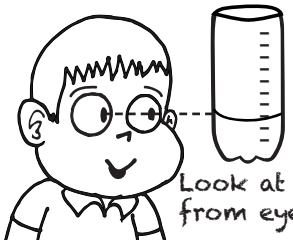


Add some water to the bottle to cover the top of the rocks.

MARK

Use Sharpie to make the water line. This is "0."

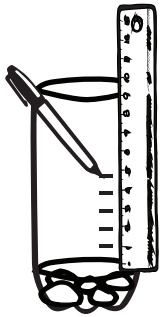




Look at water level from eye level.

MEASURE

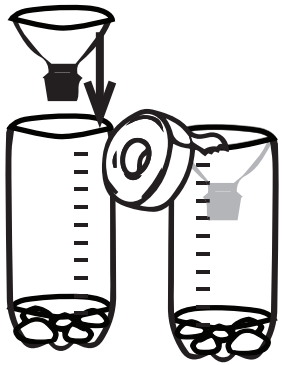
With a ruler, line up the "0" with the "0" mark on the bottle.



Continue marking your preferred increments (inches, centimeters) onto the front of the bottle.

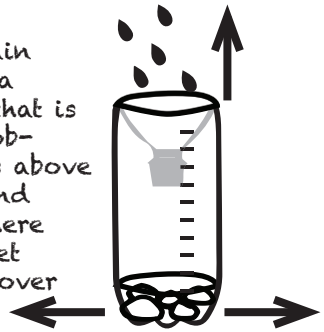
COVER

Invert the cut off top and tape it inside the top of the bottle. This will help funnel rain into the gauge.

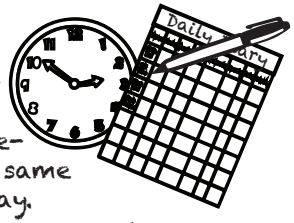


POSITION

Put the rain gauge in a location that is clear of obstructions above and around it, and where it won't get knocked over easily.



MONITOR



Monitor your rain gauge. Take measurements at the same time every day.

Empty the rain gauge between measurements but remember to leave the water level at the "0" level.

Record the amounts in your Fire Weather Diary.

TOOLS TO MEASURE Fire Weather

Wind socks and weather vanes will point out the wind's direction pretty easily but how do you measure the speed without an anemometer, a wind speed measuring tool? Look around! The **Beaufort scale** estimates wind speed by looking at how things are moving around you. Wildland firefighters can observe smoke, trees and water around them to guess how fast the wind is blowing. Knowing the wind's speed and direction keep firefighters safe by helping them understand how the wildfire will behave. Look at the trees around you and see if you can estimate how fast the wind is blowing using the chart below:

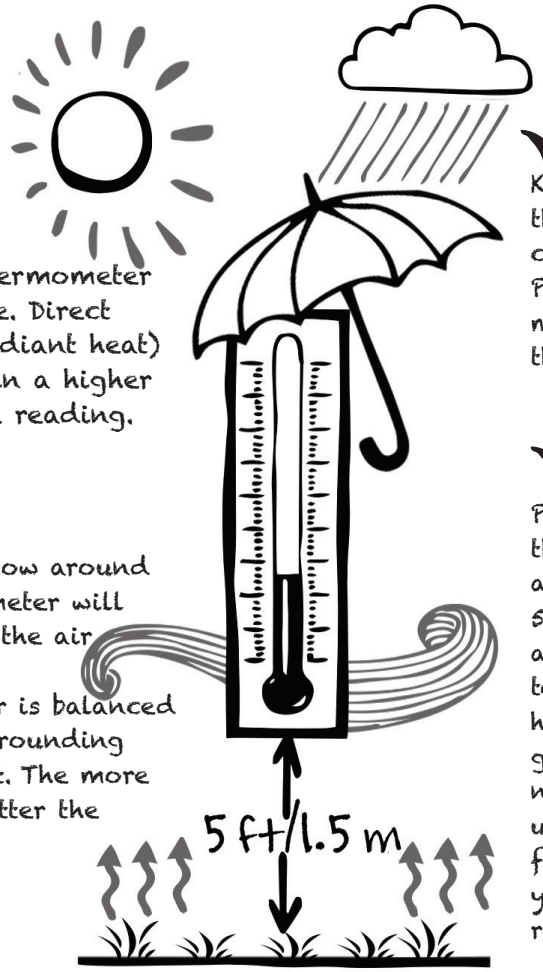
Beaufort Scale

Beaufort Number	Wind Speed (mph)	Seaman's Term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Light branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Temperature

Temperature is important to fire weather as heat is one of the components of the fire triangle. Radiant heat from the sun dries fine fuels such as leaves, twigs and needles allowing them to ignite easily and burn more rapidly helping the fire to spread. Many hot days in a row will allow larger fuels such as branches and logs to dry and ignite making the fire more difficult to put out.

Thermometers are used to measure temperature. It is important to hang them in an appropriate location to ensure accurate readings.



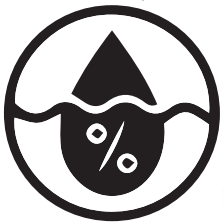
✓ Hang the thermometer in the shade. Direct sunlight (radiant heat) will result in a higher temperature reading.

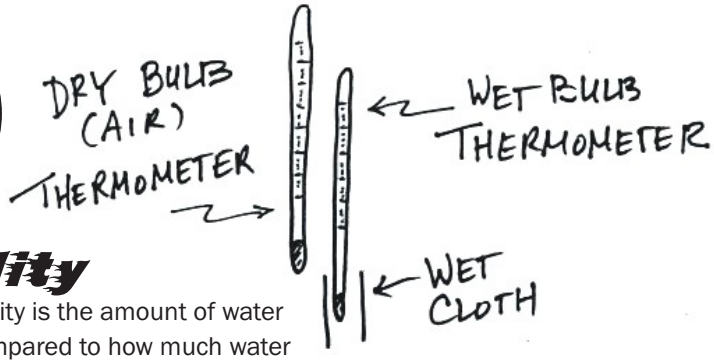
✓ Keep the thermometer covered. Precipitation may damage the thermometer.

✓ Good air flow around the thermometer will help ensure the air around the thermometer is balanced with the surrounding environment. The more open, the better the reading.

✓ Place the thermometer approximately 5 feet/1.5 meters above the ground to avoid excess heat from the ground and natural cooling up in the air from affecting your thermometer's reading.

✓ Place the thermometer over a grassy or dirt surface and at least 100 feet/30 meters from any paved/concrete surfaces. Concrete and pavement attract much more heat than grass.





Humidity

Relative humidity is the amount of water vapor in the air compared to how much water it can hold at that temperature. Warmer temperatures can hold more water vapor in the air. Lower temperatures can hold less water vapor. Relative humidity is important to the firefighter because low relative humidity in warm temperatures results in very dry fine fuels that burn very easily. To properly measure relative humidity you would need a psychrometer (wet-and-dry bulb thermometer). Most people don't have a psychrometer lying around the house so how can you measure humidity if you don't have one? In warm temperatures, look for common indicators of low and high humidity.

Higher Humidity	Lower Humidity
Condensation on a cool glass of water	Crunchier leaves on the ground
Skin sweats easily	Dust hangs in the air longer
Storm clouds forming	Static cling

Precipitation

Rain is key to wildfire conditions. Without rain, grass, plants and trees dry out and it is easier for fires to start and spread quickly. A drought is when it hasn't rained for a long time and makes for dangerous fire conditions. When rain does fall, a long steady light rain is much better than a lot of rain in a short time. It will just wash away instead of soaking in if too much rain falls too quickly.

A rain gauge is a type of instrument used by **meteorologists** and **hydrologists** to gather and measure the amount of **precipitation** over a set period of time.