

Weather Monitoring

Benefits of weather monitoring with your students:

- Practice data collection.

- Practice creating and understanding graphs.

- Practice interpreting data, looking for patterns, and making predictions.

- Become aware, observant, and connected to your outdoor environment.

Content

Topography

Topography means the features found on a particular area of land such as rivers, hills, and roads. San Jose is located southeast of San Francisco Bay in the Santa Clara Valley. The Santa Cruz Mountains are to the west and south reaching a maximum height of 3,791 feet. The Diablo Range, which includes Mt. Hamilton, is to the east reaching a maximum height of 4,570 feet. Most of San Jose is in the flat valley between these mountain ranges.

Climate

Climate means the type of weather a region has; it is the average weather patterns found in a region over time. San Jose and much of California have a Mediterranean-type climate which has very different wet and dry seasons. November through March is the wet season; San Jose receives 82% of its rain during these months.

Depending on the wind direction, San Jose can be affected by coastal, marine weather which can bring cool air and fog. San Jose can also be affected by California's central valley; when the central valley gets hot, the hot air rises and cool ocean air moves in to replace it. This causes cool wind to go through San Jose usually in the afternoon. If the central valley becomes very hot, that hot air can spill over into San Jose making very hot days of over 100 degrees. Fog can also form in sheltered pockets of the valley when there is moist, low-lying air.

Mid-summer high temperatures are usually 80 to 85 and mid-summer lows are usually 55 to 60 degrees F. Mid-winter high temperatures are usually 55 to 60 degrees and mid-winter lows are usually around 40 degrees.

Winter storms generally come from cold fronts from the north and rarely include thunderstorms, snow, or hail. As air rises over the Santa Cruz Mountains, it cools and condenses into rain. $\frac{3}{4}$ of this rain falls on the Santa Cruz Mountains and $\frac{1}{4}$ falls in San Jose.

San Jose Weather Stations

The first weather records in San Jose were made in 1874. The location of the station has always been in downtown San Jose at different locations. It is currently at the Civil Defense Office on Mission Street. There is also a station at the San Jose International Airport.

Equipment

Indoor/Outdoor Maximum/Minimum Thermometer (Taylor)

This thermometer shows you the highest temperature and the lowest temperature that occurred since the last time the reset button was pressed. Press the reset button once a day (preferably in the morning) at the same time for accurate daily readings.

Note: To have accurate readings, check the temperature in the morning at least one hour after sunrise. The highest temperature of the day usually occurs between 2:00 and 3:00pm. The lowest temperature of the day usually occurs at sunrise. If your class checks the temperature and pushes the reset button every day at 2:30pm, it will be unclear whether the high temperature occurred after 2:30pm the previous day or occurred just before 2:30pm on the current day.

Outdoor Rain Gauge (Taylor)

Each inch marked on the rain gauge measures one cubic inch (1³ inches). Notice how the scale becomes narrower vertically as the gauge widens horizontally near the top.

When installing, don't tighten the screws all the way because the rain gauge must be emptied after each reading by lifting it up and pouring out the water.

Anemometer

The anemometer measures current wind speed (air velocity) and temperature. Set the MODE of the anemometer to "AVG" to measure the average air velocity

The Beaufort scale is on the left and top of the display screen. It uses a 12 point system to measure wind speed. It was historically the standard measurement for sailing.

Record your Data

Each piece of equipment provided by BioSITE measures several types of units of measurement. Include as many or few of these as you like in your data collection.

Rain Gauge = inches

millimeters

Thermometer = Fahrenheit

Celsius

Anemometer: Temperature = Fahrenheit

Celsius

Anemometer: Air Velocity = meters/second

kilometers/hour

feet/minute

knots (nautical miles/hour)

miles/hour

Beaufort scale – always shown on the screen in addition to one other unit of measurement.

Note: The Beaufort scale was historically used for nautical travel, but is less used today because of its ambiguous measurement system.

0 = calm

1 = light air

5 = fresh breeze

9 = strong gale

2 = light breeze

6 = strong breeze

10 = storm

3 = gentle breeze

7 = high wind

11 = violent storm

4 = moderate breeze

8 = gale

12 = hurricane force

Graph your Data

There are many ways to put weather data into graphs in order to visualize the changes that take place over time. Here are some recommended ways to make graphs:

Temperature

Graph 1: Daily minimum temperature, average temperature, and maximum temperature

Graph 2: Monthly average minimum temperature, average temperature, and maximum temperature

Wind Speed

Graph 1: Daily wind speed

Graph 2: Weekly average wind speed

Graph 3: Monthly average wind speed

Precipitation

Graph 1: Daily precipitation – great for viewing the number of days with rain and how much rain falls in specific rain events.

Graph 2: Weekly average precipitation

Graph 3: Weekly cumulative precipitation

Graph 4: Monthly average precipitation

Graph 5: Monthly cumulative precipitation

Comparisons - two variables on one chart. Compare daily, weekly, or monthly data and look for trends.

Graph 1: Temperature and wind speed

Graph 2: Temperature and precipitation

Graph 3: Precipitation and wind speed

Compare your Data to other Sources

Use the Resources for Weather Data links to view current weather data and historical weather data.

Compare your class's data to professional data collected on the same dates to see how similar your records are. For example, Weather Underground lists the high temperature in San Jose on November 5, 2013 as 72F, Weather.com lists it at 72F, and Weather.gov lists it at 72F. Is your high temperature the same? These websites receive their data from stations in downtown San Jose and the San Jose International Airport. If your data is different, it may be due to the distance between your school and those locations. Look for trends.

Compare your class's data to historical data. For example, compare your monthly average temperatures in 2014 to the temperatures recorded by the NOAA in 2013.

Weather Prediction

Weather forecasting involves a combination of computer models, observations, and knowledge of trends and patterns. By using these methods, meteorologists can make reasonable, accurate forecasts up to seven days in advance.

After students make observations about weather trends indicated by their graphs, have them make predictions about what the weather will be like the next two or three days. Students can write specific temperatures, rainfall and wind speed or to simplify it, students can draw an up arrow for an increase in that parameter, a down arrow for a decrease, or a flat line for the same.

Resources for Weather Data

National Oceanic and Atmospheric Administration National Climatic Data Center

<http://www.ncdc.noaa.gov/>

Climate Data Online – Request to have data records emailed to you.

<http://www.ncdc.noaa.gov/cdo-web/>

San Francisco Bay Area Climate Page – Click on your county and city to see historical weather data.

<http://ggweather.com/climate/index.htm>

San Jose Climate Page - Weather data for San Jose as far back as 1874.

<http://ggweather.com/sjc/>

Weather Underground - Search for detailed weather records for any city. View daily, weekly, monthly, or custom data.

<http://www.wunderground.com/history/>

Weather.Com - Search for your city, then click “Monthly” on the left side to see weather data for previous months. Click “Averages” at the bottom to see graphs of weather data.

<http://www.weather.com>

LiveWXRadat - View radar satellite images of weather in your area.

<http://www.livewxradar.com/>

Weather.gov - View national forecasts and national maps showing temperature, precipitation, and more.

<http://www.weather.gov>