LESSON 3
Close Relations: Weather, Climate, and Water

This lesson introduces the terms weather and climate, and explores how these relate to the water cycle. Students collect weather data from online sources, local media (weather reports), and their own observations of daily weather to compare weather, climate, and water cycles in Hawai‘i and two other locales. Students will also discuss rainfall and weather patterns during Hawai‘i’s wet and dry seasons. Using a large map of the island, student teams exchange their local weather data and rainfall measurements with schools on neighbor islands. They compare similarities and differences in their local weather, and discuss the impact that weather and climate have on the water cycle in Hawai‘i.

Lesson Duration
Three 45-minute periods
(Allow 5 days for monitoring for Teaching Suggestion II)

Essential Question(s)
What are weather and climate, and how do they relate to the water cycle?

Key Concepts
- Weather and climate are related to the water cycle.
- In Hawai‘i, we have our own special weather patterns and climate that affect our island water cycles.

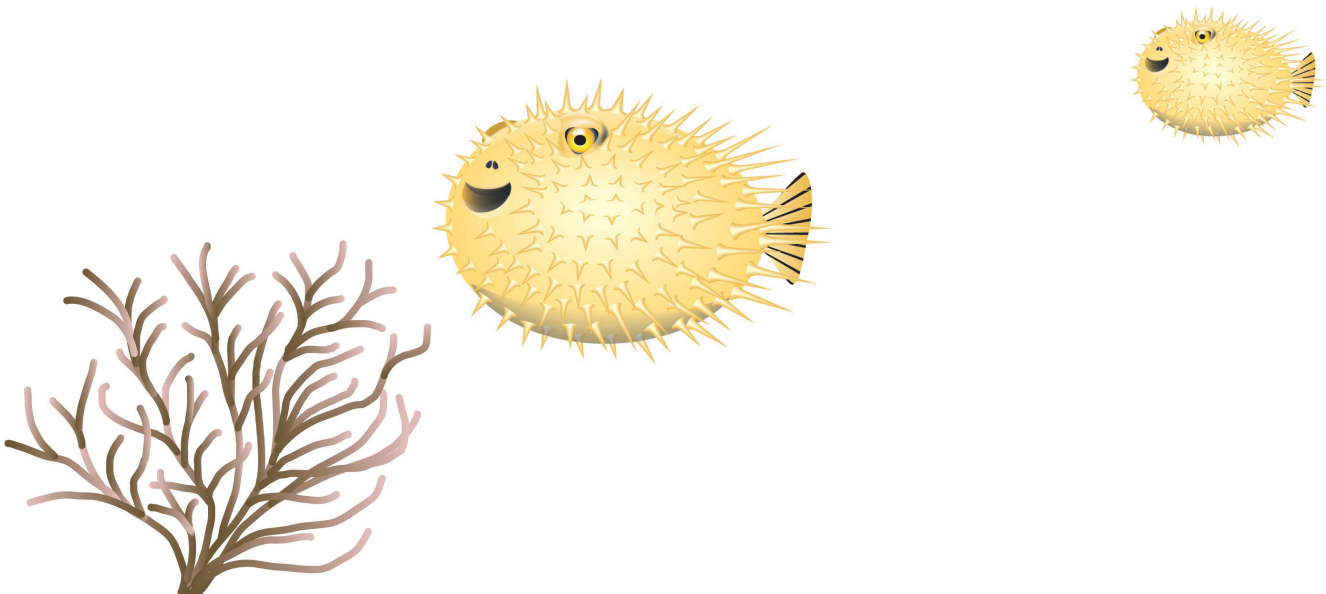
Instructional Objectives
- I can describe the differences between weather and climate.
- I can collect and use weather data to describe the weather in my area.
- I can group related ideas into paragraphs that describe how weather and climate relate to the water cycle.

Related HCPSIII Benchmark(s):

Science SC.3.1.2
Safely collect and analyze data to answer a question.

Science SC.3.8.2
Describe how the water cycle is related to weather and climate.

Language Arts LA 3.5.3
Group related ideas into paragraphs.



Assessment Tools

Benchmark Rubric:

Topic		**Scientific Inquiry**	
Benchmark SC.3.1.2		Safely collect and analyze data to answer a question	
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Summarize and share analysis of data collected safely to answer a question	Safely collect and analyze data to answer a question	With assistance, safely collect and analyze data	With assistance, safely collect data and attempt to analyze data

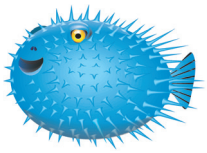
Topic		**Forces that Shape the Earth**	
Benchmark SC.3.8.2		Describe how the water cycle is related to weather and climate	
Sample Performance Assessment (SPA)		The student: Illustrates the water cycle and explains its relationship to weather and climate.	
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Describe how the phases of the water cycle relate to weather and climate	Describe how the water cycle is related to weather and climate	Give an example of how the water cycle is related to weather or climate	Recognize that the water cycle is related to weather and climate

Topic		**Design**	
Benchmark LA.3.5.3		Group related ideas into paragraphs	
Rubric			
Advanced	**Proficient**	**Partially Proficient**	**Novice**
Group related ideas into paragraphs to create a clear and logical organization that guides the reader	Group related ideas into paragraphs	Group some related ideas into paragraphs, but the relationship between other ideas may be superficial or unclear	Group very few related ideas into paragraphs

Assessment/Evidence Pieces

Lesson

- *Weather, Climate, and the Water Cycle Notetaking Sheet student worksheet*
- *Rain Gauge Instructions and Log student worksheet*
- *Imaginary Location Writing Exercise*



Materials Needed

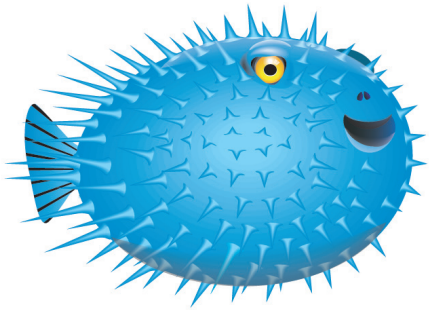
Teacher	Class	Group	Student
• Map of Hawai'i • World map • Weather and Rain Gauge • Bulletin board • Butcher paper • Markers	• None	• Access to internet • Hawai'i weather forecasts from local newspaper or TV station	• Newspaper clipping of local weather forecast depicting low and high pressure areas

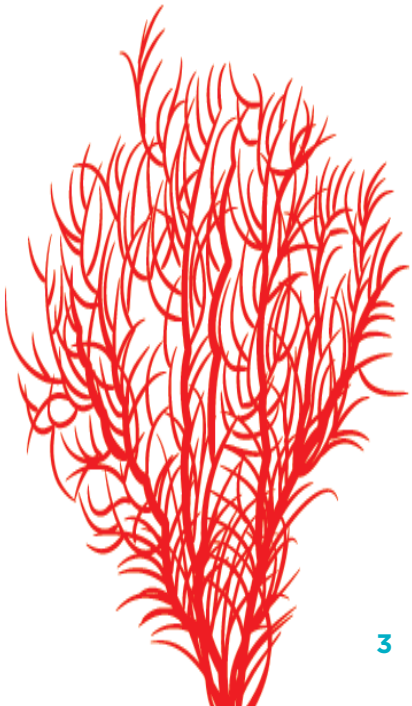
Instructional Resources

PowerPoint Presentation: *Weather & Climate*
Student worksheet: *Weather, Climate, and the Water Cycle Notetaking Sheet*

Student Vocabulary Words

climate: the average weather conditions of a particular place or region over a period of years.
energy: transmitted in the form of electromagnetic waves, such as heat waves from the sun.
equator: is an imaginary circle around the earth everywhere equally distant from the North Pole and the South Pole.
ho'oilo: the Hawaiian term for a wet season.
humidity: the measure of how much water vapor is in the air.
kau: the Hawaiian term for summer.
Kona storm: an unusual winter storm, often lasting days with potentially heavy rain and high winds.
Kona weather: warm, humid, calm weather with typical winds from southwest.
latitude: a distance north or south from the equator measured in degrees.
leeward: the side of an island that is downwind and is usually dry.
makai: the Hawaiian term for ocean side, or an area located next to an ocean.
mauka: the Hawaiian term for mountains, or an area located next to the mountains.
trade winds: winds that blow from the northeast above the equator and which blow southeast below the equator.
weather: the state of the atmosphere in regard to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness. It is the day-to-day conditions of the atmosphere.
westerlies: winds that blow from the southwest above the equator and which blow from the northwest below the equator.
windward: the side of an island that is upwind and is usually wet.





Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit Overview.
- Preview PowerPoint *Weather & Climate* and make arrangements to project it.
- Review and make copies of the student worksheet *Weather, Climate and the Water Cycle Notetaking Sheet,* one per student.
- Plan a one-week period for students to engage in making local weather observations, and one period to report their findings (Teaching Suggestion II).
- Gather supplies to make rain gauges, construct a sample rain gauge, and organize how you will distribute the supplies and engage the students in making their own gauge and the materials for the activities (Teaching Suggestion II).
- Optional: Plan a weather exchange with other schools. Contact three or four other schools to set up the *Interisland Weather Exchange*.
- Acquire and post an enlarged map of your island and an enlarged map of the main Hawaiian Islands. The Internet provides a plethora of maps that can be printed and projected onto a screen.
- Enlarge and post data collection charts below.

I. *The Water Cycle, Weather, and Climate*

A. Hand out student worksheet *Weather, Climate, and the Water Cycle Notetaking Sheet*. Go over the directions with the class. Show PowerPoint *Weather & Climate*. Notes at the bottom of each slide will assist in guiding the discussion. After the PowerPoint, students should add any new vocabulary that they learned to the word wall for this lesson.

B. Write the word "weather" on the board and discuss with students using the notes they took during the Power Point, how they would describe the weather where they are today. To illustrate what data are included in weather reports, have a recent newspaper weather report available, or look up the local weather at this NOAA website: http://www.srh.noaa.gov/zipcity.php. (Students may need instruction on zip codes. If so, consult a phone book as a reference.) Point out weather reports. Include daily high and low temperatures, whether it is sunny, or amount of cloud cover, and amount of rainfall (or snow).

C. Ask students: "How different is weather in different places in the world?" Pick two very different locations such as Anchorage, Alaska, and Las Vegas, Nevada. Either look up the actual weather conditions reported for each location, or help students make reasonable guesses that the daily temperature in Anchorage is lower than the daily temperature in Las Vegas. Point out that weather reports at both locations report the same data: the temperature, the amount of sunshine or cloud cover, and the chances of rain or snow that day.

D. Now write the word "climate" on the board. Ask the students which climate is colder (or hotter), the climate in Alaska, or the climate in Nevada? Discuss their ideas about climate, and point out that climate refers to overall yearlong weather patterns.

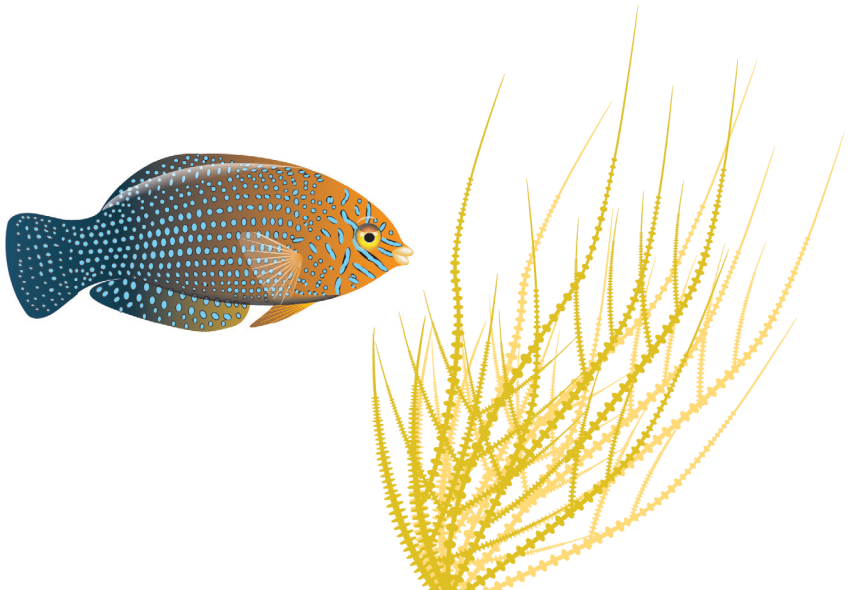
E. Ask students whether the water cycle in Alaska is any different from the water cycle in Nevada. Refer back to the parts of the water cycle using the water cycle diagram or transparency from Lesson 2.

   1) Using guiding questions, ask the students how they would draw the water cycle for Alaska. What parts of the water cycle diagram would they change? What parts remain the same? Help students to understand that precipitation in Alaska would probably mean snow in the winter and rain in the summer.
   2) Also ask the students how they would draw the water cycle for Las Vegas. Ask them whether the desert there means more or less evaporation from the land, and whether it means more or less precipitation. What kind of precipitation would they expect, rain or snow?

3) Help the students to conclude that all of the parts of the water cycle diagram are found at each location, but that the amount and type of precipitation depends on the weather and climate conditions.

II. *An Interisland Weather Exchange*

A. Students will identify weather and climate conditions from three distinct geographic locations - one of which is Hawai'i - to answer the question:
   1) How does weather and climate differ in various geographic locations?
B. Compare and contrast weather and climate from two different locations in Hawai'i. Using these two locations, describe how weather and climate is related to the water cycle.
C. Divide students into groups of 4 and assign each group 3 locations.
D. Student teams will use local weather channel reports, as well as Internet sources. To facilitate their obtaining online weather data, students should go to the National Oceanic and Atmospheric Administration National Weather Service website at http://www.prh.noaa.gov/hnl/kids/.
E. Record weather reports in a table like the one shown below for sites in Hawai'i. Choose locations in the windward, leeward portions of the island, also *mauka, makai* locations. You may want to include locations on other islands, as well.
F. During the week of data collecting, the teacher should look for and save weather maps and images from newspapers or posted online by television or the National Weather Service. Use these to help students envision statewide changes in weather.
G. Using a map of the Hawaiian Islands, facilitate student team reports of the weather data. As a class, decide which locations were the wettest or driest, which the warmest or coolest, and which had the most wind and cloud cover**.**
H. As a class, students collect data then make statements or summarize data differences and similarities and connect the impact about weather and rainfall differences in the various locations.
I. Discuss how weather and climate relate to the water cycle. Group similar data and have students hypothesize why they are similar. Direct connections need to be made between geographic location, plant life in the area, elevation and proximity to the ocean. In addition, data should be disaggregated further to compare Hawai'i locales. Use the following topics as basis for discussion:
   1) Specifically discuss how the water cycle varies on the windward, leeward, *mauka*, and *makai* parts of the islands. Also discuss how changes in the weather affect the water cycle.



2) Also use this as an opportunity to talk about the rainy and dry seasons in Hawai‘i. Point out that in Hawai‘i, the wet season occurs during the winter months, making Hawai‘i very different from other parts of the world where the rainy monsoon season occurs during the summer. Note that the term “monsoon” is not used in Hawai‘i, and that to describe weather and the water cycle in Hawai‘i, we use other terms such as trade winds and Kona weather.

Date	**Location A:** Name of my School	**Location B:** Honolulu	**Location C:** Las Vegas
Example 5/15/07	Trade winds with isolated showers. No water in rain gauge.	20% Isolated Showers. High 8˚F	20% Isolated Showers. High 81˚F
Day 1			
Day 2			
Day 3			
Day 4			
Day 5			
Climate Data		tropical	desert

III. *Integrated Activity (Science and Language Arts) – Weather Forecasting*

A. Review the weather Recipe Card at http://eo.ucar.edu/webweather/basic.html.
B. Invent a three-day weather report for a fictional location that is very different from Hawai‘i. Write a description of the weather, climate, and water cycle at that location.
C. Pose this scenario to prompt students’ writing: “You just got a job at the Weather Channel as a lead reporter. The problem is that you were not given a specified location to report! You must create your own town by describing its location and overall climate. Give the imaginary town you created a name. Next, invent a three-day weather report for your fictional town. Include a description of where your town is located. Identify the month and season (summer, fall, winter, spring).”

D. As needed, facilitate students' efforts at imagining and describing the climate in that location. Be sure that students identify rainfall and temperature patterns.
E. Help students to connect their descriptions of weather and climate to the water cycle at their imaginary location. Refer to earlier discussions of weather conditions in Alaska and Nevada, one a much colder and the other a much drier area than Hawai'i. You might want to mention how altitude affects weather and climate in Hawai'i, for example on *Mauna kea* or *Haleakala*.

Extended Activities

1. Play the role of weather forecasters. Divide students into their four groups and assign each team one of the four selected areas. Instruct students that each day, team members will record the weather patterns on the Weather Chart, and that one team per day will play the role of weather forecasters. If possible, have a camcorder or digital camera available for students to record themselves. Prompt the student forecasters to: a) introduce themselves ("Hi, this is channel 10 weather report for xyz town"); b) state the current temperature; and c) state the current rain/storm conditions. There may be other weather data to report. Consider encouraging students to dress up for the role-play by bringing in "weather forecaster" clothes from home. The costumes may include suit jackets, dresses, ties, and others.
2. Invite a Hawaiian Studies Institute representative as guest speaker to discuss Hawaiian gods of water and weather. *'Ike Pono Hawai'i* (IPH) Hawaiian Traveling Resource Program offers statewide instruction of Hawaiian Cultural curriculum aligned to the Hawai'i State Department of Education, Content & Performance Standards III (HCPS III) to students in grade 4 and 7. A highlight of this program is the incorporation of artifacts, replicas and additional resources that assist in the delivery of pre and post contact Hawaiian history. Information can be found at http://extension.ksbe.edu/content/index.php?option=com_content&task=view&id=38&Itemid=60
3. Learn more details about weather by visiting these websites:
   - The Weather Dude at http://www.wxdude.com/basics.html
   - Visit University of Wisconsin Stevens Point World Climates at http://www.uwsp.edu/geo/faculty/ritter/geog101/uwsp_lectures/climates_toc.html
4. Share student collection and recording of weather data with other classes:
   - Email Classroom Exchange at http://www.epals.com
   - Mighty Media Network Keypals Club at http://www.teaching.com/keypals
5. Integrate the following readings into this lesson, or add these books to your classroom library for the duration of the unit:
   - Legault, M. (Ed.). (2004). *Scholastic Atlas of Weather.* Danbury, CT: Scholastic Press.
   - *World Book's Young Scientist, Vol. 4*. (1991). Chicago, Il: World Book, Inc.

LESSON 3

Weather, Climate, and the Water Cycle

Notetaking Sheet

Instructions:

Write main ideas and important details like new vocabulary words from each slide in the boxes provided.

Main Idea	Details/Notes
Example: Weather begins with the sun.	Weather systems start because the sun's energy heats up some parts of Earth more than others.