# THE CASE OF THE DISAPPEARING ISLAND

Grade 3

## Lesson at a Glance

Students develop and test hypotheses to explain why our islands are disappearing.

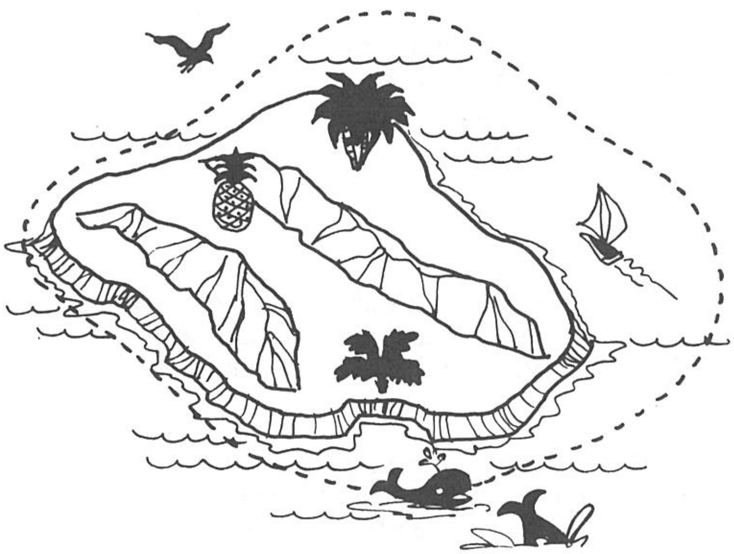
## Key Concepts

Most of the landforms we see on the older Hawaiian Islands are caused by erosion. The main source of erosion in Hawai'i is stream action; wave and wind action are secondary sources of erosion.

## Objectives

Students will be able to:

1) Develop hypotheses to explain the "disappearance" of our islands.
2) Plan and carry out an experiment to test their hypotheses.



## Time

two - three class periods

## Subject Areas

science, Hawaiian studies, language arts

## Materials

student activity sheet (provided)
a large bucket of fine sand
4 foil roasting pans
8 straws
2 meat basters
4 jars of water
newspaper
illustrations of Mauna Loa (optional)

## Teacher Background

The island of Hawai'i, often called "The Big Island" because it is so much larger than the other Hawaiian Islands, is not only the largest island in the chain, but also the youngest, and it is still growing. It is difficult to imagine, but the other major Hawaiian Islands may have at one time been almost as big as Hawai'i, or at least as tall. Maui, Moloka'i and Lāna'i, for example, are believed to have once been joined as one very large island. (See Stearns, Geology of the State of Hawai'i, pp. 217-220 for an illustration of how the Islands were once joined.) O'ahu was once considerably larger than it is today!

The principle force behind these disappearing island masses is **erosion**, primarily from stream action. Rainfall in the mountains converges in streams which flow downslope, gaining speed, mass and force. After heavy rains, streams may carry logs, boulders, and other debris which help to erode the land below. Rainwater also works to chemically break rock apart by combining with carbon dioxide to form a weak acid.

Waves pounding against coastlines also wear away rock, particularly along the rougher windward coasts. Exposed soil and sand are vulnerable to wind erosion. The silt in the rivers after a heavy rain, the sand on our beaches and the debris in our streets after a strong wind are all evidence of nature's destructive processes at work. Even the cracks in the pavement suggest that materials we think of as permanent can be broken down by something as gentle as a blade of grass. We need only multiply these everyday occurrences by millions of years to see that wind and rain have indeed worn away two-thirds of a mountain, or carved deep valleys.

Eventually, most of the lava that built our islands will wear away, leaving behind a fringing coral reef. This, too, will eventually disappear as the tectonic plate the island is riding on moves so far north that it becomes too cold for coral to live. Erosive forces will quickly wear down the remnant coral, and the island will disappear beneath sea level, becoming a **seamount**. The seamount will continue to sink as its mass pushes down on the underlying crust.

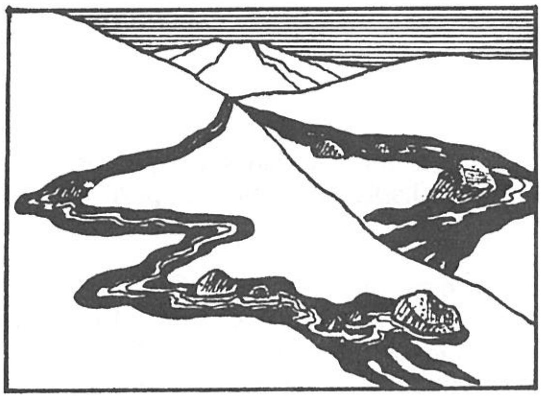
## Teaching Suggestions

1. Remind students that young Hawaiian Islands look like smooth shields or tortoise shells. Display a photo of Mauna Loa, if available. Explain that our islands don't retain that smooth shape forever. Ask students to name familiar landmarks that do not look so round and smooth.

2. Present the case of the disappearing island. Point out that the newer island of Hawai'i is more than twice as tall as the other islands (except east Maui) and that the other Islands may have once been that tall too. Ask students what they think happened to make our islands lose their smoothness and mass. List their ideas on the board and discuss.

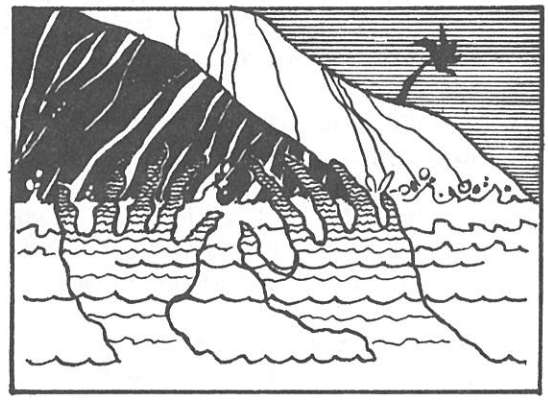
3. Distribute the student activity sheets and review the suspects in the case. Discuss why suspect number four can be ruled out.

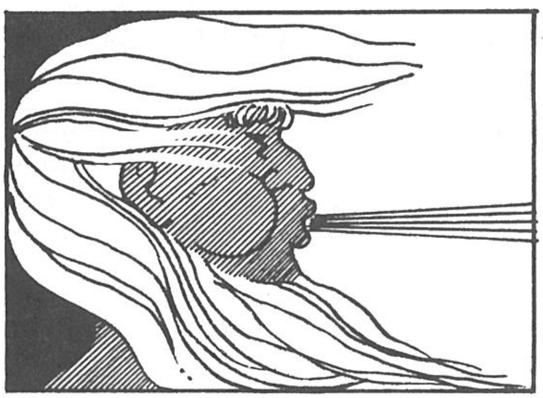
✔ 4. Divide the class into six groups. Ask each group to select one of the first three suspects in the case and write a hypothesis about it. Provide groups of students with the appropriate set of materials from those listed below and have them suggest ways to use the materials to test their hypotheses.



Stream Erosion
materials: sand, baster, water, foil roasting pan
suggested procedure: Place a mound of moist sand in the middle of the pan. Drop water from the baster onto the sand. With steady, persistent droplets, "streams" will begin to carve valleys in the sand.

Wave Erosion
materials: foil roasting pan, sand, water
suggested procedure: Form a mound of moistened sand in a roasting pan. Gently add an inch or so of water to the pan. Use fingers to create waves.





Wind Erosion
materials: newspaper, sand, straws
suggested procedure: Form a mound of moistened sand on the newspaper. Have students sit on one side and blow air through straws from one direction (not straight down). (Note: if it is a calm day, you may wish to do this outside.)

✔ 5. Ask groups to present their results to the class. Each presentation should include the hypothesis, testing procedure, results, conclusion, and if desired, an illustration of the experiment.

6. Discuss the results. Explain that the first three suspects are all guilty, but that in Hawai'i, stream action is the primary force of erosion, and erosion is greatest where streamflow is greatest (usually on the windward sides). Look at the map of the disappearing island and note which side has lost most of its mass. Remind students that while erosion takes place every day, it will take a very long time (millions of years) for the whole island to wear away.

## Extended Activities

- Have students write and illustrate brief summaries of their questions, hypotheses, tests, and results. Alternatively, have them prepare displays of their experiments to be exhibited at a science fair or other function.

- Send the class on an erosion treasure hunt! Ask teams to find evidence of erosion, such as grass breaking through concrete, gullies in bare soil, sand piled on the lee side of a tree or building, a water-worn rock, or a broken wall. Also look for views of erosion on a larger scale such as eroded mountain tops or valleys. Alternatively, categorize "treasures" according to something eroded by wind, sun, rain, streams, waves, or people.

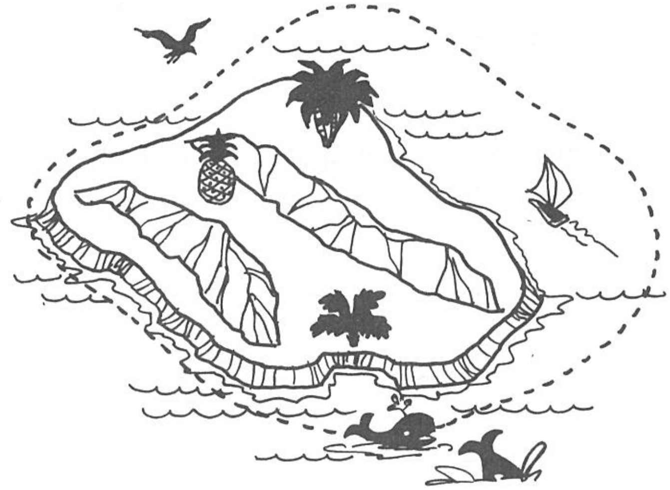
- Have students write myths about how the older Hawaiian Islands got their steep and irregular shapes.

- Take time on a class field trip to stop at a lookout and view natural landforms. Ask students to identify those landforms shaped by erosion. See the Field Sites Appendix for more information.

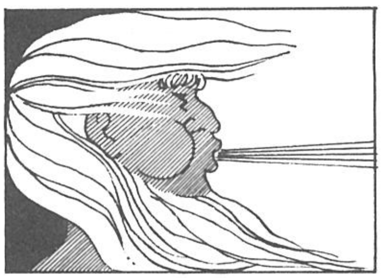
- Use papier mache to prepare class models of the main Hawaiian Islands. Make Hawai'i diamond-shaped with five smooth bumps for the volcanoes. It should be the tallest. Successive islands should be smaller, and more deeply eroded, especially on the windward sides. Use a map of the Islands as a guide, and place them in order from youngest to oldest.

- Ask students to write mystery stories entitled "The Case of the Disappearing Island." In the stories, they can provide clues (such as "the floor was damp" or "the suspect left rocks behind") that lead their detective classmates to solve the mystery of our disappearing islands.

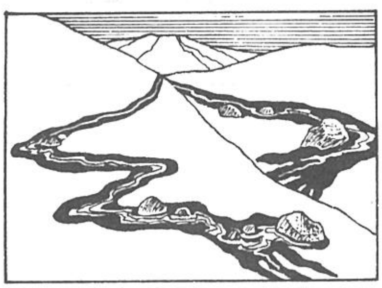
An island is slowly disappearing in the middle of the Pacific Ocean. For more than 2 million years, something has been taking the island away, piece by piece. You have just been appointed a detective in the case. Find out what is making the island disappear!



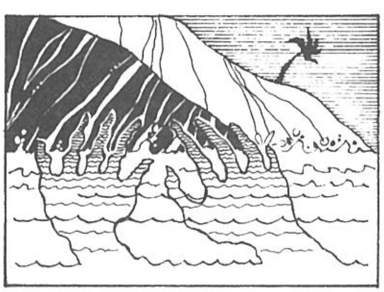
O'ahu: The dotted line shows how big the island was 2 million years ago.



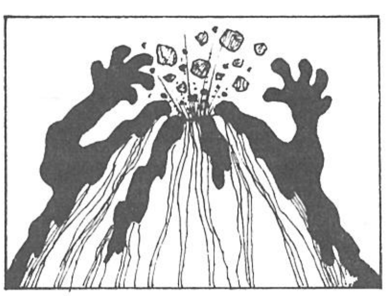
**Suspect #1**
Wind — This suspect makes things move! It can sometimes be strong enough to blow over a tree. Could it be slowly blowing the island away?



**Suspect #2**
Streams — Suspect #2 is wet and slippery and when streans get going, watch out! They can tumble boulders and carry trees away!



**Suspect #3**
Waves — When the surf is up, beware, Suspect #3 is stronger than you. And waves never seem to stop! Could they be washing the island away?



**Suspect #4**
Volcanoes — Volcanoes are very powerful, and can throw liquid rock high into the air. Could they be blasting the island away?

Choose one suspect and develop a hypothesis to explain what this suspect might have done to the island. Use sand and other materials provided to test your hypothesis.

Question: Which suspect is making the island disappear?
My hypothesis:

______________________________________________

______________________________________________

______________________________________________

How I tested my hypothesis:

______________________________________________

______________________________________________

______________________________________________

What happened (results):

______________________________________________

______________________________________________

______________________________________________

Conclusion: Suspect # ________ is making the island disappear by

______________________________________________

______________________________________________

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