# EDIBLE ISLANDS

*Challenge yourself to make an edible model of the Hawaiian Islands and show the process of their formation! If your model doesn't turn out the way you want it the first time, eat your attempt and try again!*

## Background

The Hawaiian Islands are located in the middle of the Pacific Ocean, the largest ocean on Earth. All of the islands in this isolated chain formed as a result of volcanic activity. However, the basalt lava rock that forms these islands is believed to come from one source: the Hawai'i or Hawaiian Hot Spot.

Scientists observed, researched, and took time before coming up with the hot spot theory that explains how volcanoes of the Hawaiian Islands, and other unexpectedly located volcanoes, came to be. In this activity, you will also take some time to come up with a tasty food model to demonstrate how the Hawaiian Islands were formed according to this theory!

## Before making your model

The hot spot theory that explains the formation of the Hawaiian Islands highlights two geological features:

1. **A tectonic plate**, specifically the Pacific Plate, a piece of the Earth's crust or outer later. Tectonic plates are under both land and water and volcanic activity is often observed where the edges of these plates meet.
2. **A hot spot**, specifically the Hawai'i or Hawaiian Hot Spot, an area of the Earth's mantle where molten rock exists below the Earth's crust.

Before starting the activity, visit Bishop Museum's Science Adventure Center, Hot Spot Lava Show live presentation, or Online Learning Center to learn about how a hot spot makes a volcano. Watch our online videos that model the Hawaiian Hot Spot and the movement of the Pacific Plate.

https://www.bishopmuseum.org/online-learning-center/

At Bishop Museum's Science Adventure Center, you can model the formation of a shield volcano with our wax table interactive exhibit. Hawai'i's volcanoes are all shield volcanoes; Mount Kīlauea on the Big Island, or Hawai'i Island, erupted most recently.

With the wax table, you can model the formation of a singular shield volcano by cranking molten wax up to the surface of the table as a "lava flow." As you turn the handle, melted wax gets pushed up through a small hole in the table, then cools. As the wax cools, it shows the formation of an island bit-by-bit. Multiple lava flows (multiple starts and stops of the wax crank) build up on each other, forming a unique shield volcano with each visit. If you look towards the top of the wall lining the large tank beside the wax volcano table, you'll find greenish-grey wax volcanoes from times past mounted at its top.

*Visitor Tip: If you're spending a long day at Bishop Museum, check out what the wax volcano looks like at the beginning of your trip. Then, before you leave, make one last stop to see how large the volcano grows from the help of other visitors throughout the day! If you want to see a "bigger" volcano, make a stop at the Science Adventure Center later in the day.*

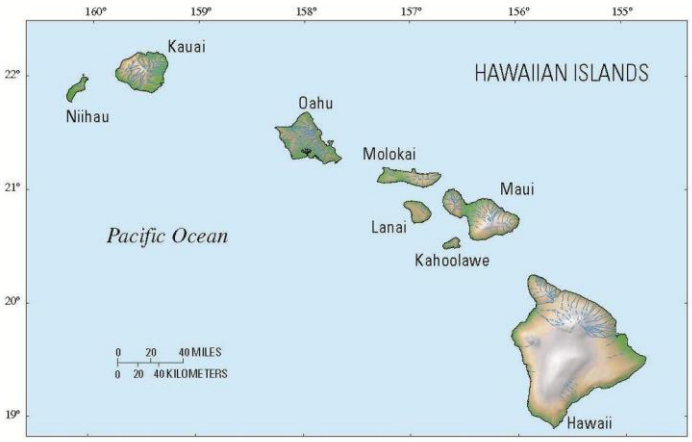


Image: Hawaiian Islands by the United States Geological Survey.

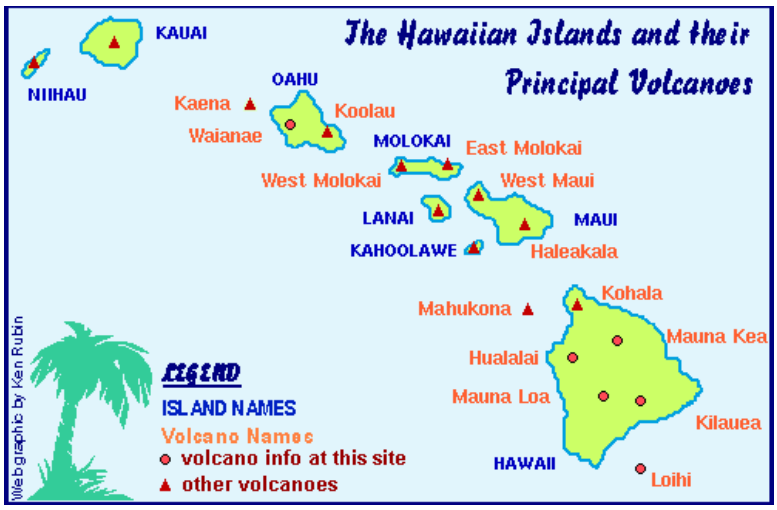


Image: The Hawaiian Islands and their Principal Volcanoes by the Hawaii Center for Volcanology

Table: Volcanoes forming the Main Hawaiian Islands (excluding those now underwater)

| Island | Volcano |
|---|---|
| Niʻihau | Niʻihau |
| Kauaʻi | Kauaʻi |
| Oʻahu | Waiʻanae<br>Koʻolau |
| Molokaʻi | West Molokaʻi<br>East Molokaʻi |
| Lānaʻi | Lānaʻi |
| Maui | West Maui<br>Haleakalā |
| Kahoʻolawe | Kahoʻolawe |
| Hawaiʻi | Kohala<br>Hualālai<br>Mauna Kea<br>Mauna Loa<br>Kīlauea |

**Making the model**

*You will need:*

- A tectonic plate: a foil cake or roasting pan, thin plastic food tray, sheet of foil-covered cardboard, or any similar flat object, made of material that is easy to cut or pierce.
- A hot spot: a food-grade syringe or refillable squeeze bottle (12 oz or smaller recommended) with a tip that comes to a point.
- Magma: a tasty assortment of runny materials to fill your hot spot with, such as chocolate sauce, soft-set gelatin, pudding, honey, whipped topping, frosting, and more. Any food material that can be squeezed out and might hold some shape can be tested!
- A sharp object: a box cutter or push pin. This object will be used to make a hole, or multiple holes, in your tectonic plate.
- Bowl(s) for containing your magma.
- Two spoons, one for filling your hot spot, and one for eating your model.
- Extra trays, towels, or newspaper to line your workspace for easy clean-up.

As you work on your model, you may decide that you need more objects than those suggested above. If intending to eat your model after it's made, make sure that your objects and surfaces are clean.

*To do:*

1. Observe the characteristics of your magma.
    a. Which materials hold their shape when moved?
    b. Which materials spread and run?
    c. Which material do you think would best show how lava flows and builds up to form a volcano?
2. Add holes to your tectonic plate.

    a. Look at the map of the Main Hawaiian Islands and accompanying table and decide how many islands you would like to try to make based on the size of your tectonic plate. Plan to make a hole for each volcano you plan to model. Examine the shape of the islands.
    b. Examine your tectonic plate. Mark the locations where your volcanoes will form.
    c. With the help of an adult, cut a small hole where each of the selected volcanoes will form. Make this hole just large enough that the tip of your syringe or squeeze bottle can fit through.
3. Prepare your experiment area.
    a. Cover your workspace with trays, towels, or newspaper for easy cleanup. Wash all materials that will touch food or will be used for food, if planning to eat.
4. Fill your hot spot with magma for eruption.
    a. If using a syringe, you can transfer your magma material to a bowl and draw up the material through the tip of the syringe to fill it. If using a squeeze bottle, open and fill. You will want to fill your hot spot with as much material as possible.
5. Prepare your order of eruption.
    a. The Hawaiian Islands are oldest in the northwest and youngest in the southeast. The volcanoes and resultant land in the northwest (such as Niʻihau and Kauaʻi) formed before the land in the southeast (like Kīlauea, which erupted in 2018).
    b. For your selected islands, plan out your order of eruption. Which volcano formed first? Which volcano is the newest and would erupt last?
6. Erupt!
    a. Optional: prepare tape or another type of plug to cover holes where volcanoes are done erupting.
    b. Place your tectonic plate and hot spot over the covered workspace. Have an adult hold up the tectonic plate, or set up a stack of materials to hold up the tectonic plate high enough above the covered workspace for you to hold the hot spot underneath and reach the holes that you'd made.
    c. Start at the first volcano. Place the hot spot underneath and squeeze the magma out from underneath "through" and onto your tectonic plate. Observe how the magma flows. Is it forming the shape of an island? Plug the hole if the magma is runny and if you are continuing more eruptions.
    d. Refill the hot spot. The Hawaiian Hot Spot did not always erupt, so imagine that the time you are taking to refill the hot spot is the time between eruptions from the hot spot. You can use the same magma material or test out a new material.
    e. Set your hot spot under the second hole in the tectonic plate as planned. In the hot spot formation theory, it is believe that the tectonic plate is what moves, not the hot spot. The Pacific Plate has been moving in a northwest direction. Erupt in the same manner and observe the way your magma flows! Is it forming the shape of the island?
    f. Continue refilling your hot spot magma and repeat until you are satisfied with your model!
7. Eat and enjoy!

**Further Exploration**

Clean and save your materials for future repeated experiments. Can you find a better magma material or combine other edible materials to make a volcano model that builds up in layers? How many eruptions from a single hot spot does it take to form a volcano into a familiar island shape? Can you "eat" away at a volcano to help create the shapes of islands that we now see on maps? How else can you improve your model? Test and enjoy!

This activity was inspired by a few cool resources:

- "Single-Serving Volcanism" by the Exploratorium Teacher Institute: https://www.exploratorium.edu/snacks/single-serving-volcanism
- "What Causes a Volcano to Erupt?" by funsciencedemos on YouTube: https://youtu.be/c3-q9qpfNo4
- "Gelatin Volcanoes" by Hawai'i Space Grant Consortium, Hawai'i Institute of Geophysics and Planetology, University of Hawai'i: http://www.spacegrant.hawaii.edu/class_acts/GelVolTe.html