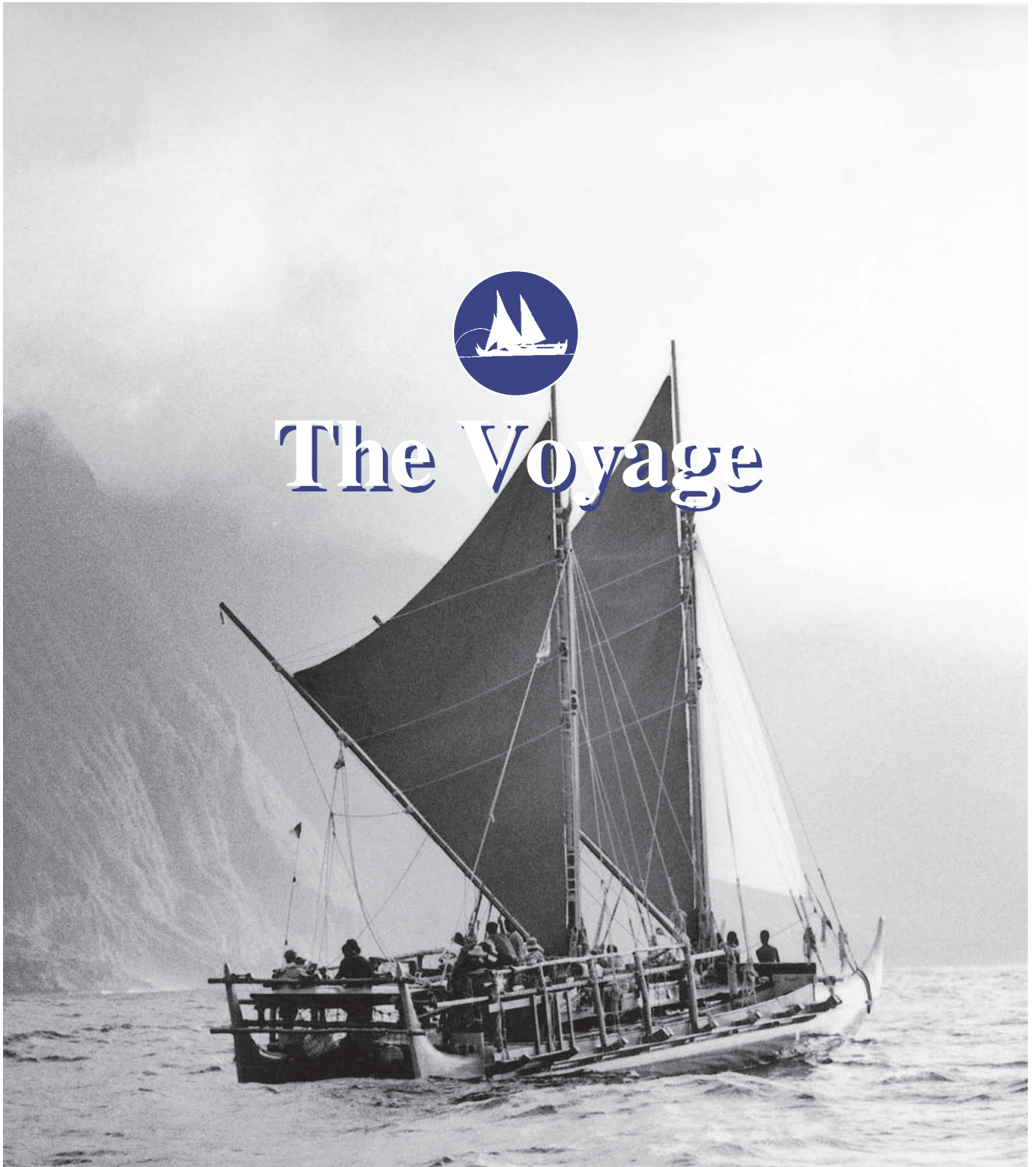




# The Voyage



© Photo by Monte Costa

*Ulu o ka lā.*  
The sun grows.

Said of the light of sunrise just as the sun's rim touches the horizon.  
The morning sun is used for navigation to determine the primary direction of east.  
— Mary Kawena Pukui, *‘Ōlelo No‘eau* 2870

# The Voyage



## Teacher's Introduction

When the sun's rays touch the horizon, the ho'okele (navigator) sets the course for the day's sail. As the sun rose on the voyage of Hōkūle'a to the Northwestern Hawaiian Islands (NWHI), we celebrated the achievements of Hawaiian voyagers, and the opportunities we have to reach out to our island youth with vital messages of caring for the land and sea.

## Discovering Our "Kūpuna" Islands

What will our students discover about the Northwestern Hawaiian Islands as we engage them in this educational voyage? As we explore these islands, which have recently been referred to as the "kūpuna" islands, how will they compare to the main Hawaiian Islands? What knowledge do these "elder" islands hold for us? What is the significance of the newly established Papahānaumokuākea Marine National Monument? To begin the voyage, students will map the "kūpuna" islands and explore geographic data that introduces them to their main features. One of the most striking differences of the NWHI compared to the main islands is that the "kūpuna" islands are much older and smaller. The age and size of the islands as you progress from youngest high island to oldest atoll reveals a fascinating story about the life of our volcanic islands.

### Islands to Atolls

Current geological theory holds that a stationary hot spot beneath the Pacific tectonic plate is responsible for the origin of the volcanic Hawaiian Islands and the adjacent Emperor seamount chain, which extend more than 2,000 miles across the north-central Pacific. Islands formed at the hot spot (where Hawai'i Island is now located) are slowly carried to the northwest as the tectonic plate moves. Erosion and island subsidence gradually transformed the high islands to small basalt pinnacles as they moved to the northwest.

As these basaltic islands submerged, fringing coral reefs became atoll reefs. At a point in the archipelago between 27° to 31° N (the "Darwin Point"), coral growth fails to keep up with the continued submergence/erosion of volcanic islands, and the atolls "drown" to form seamounts.

French Frigate Shoals provides an interesting example of a transitional phase in this geological

process, since it is an atoll with well developed coral reefs, but it also has a small, basaltic pinnacle (La Pérouse Rock) sticking up in the center of the lagoon.

The Northwestern Hawaiian Islands are a geologically unique area that includes three different land forms: small islands formed from volcanic basalt, with little beach area (Nihoa, Necker, and Gardner Pinnacles); coral islands with fringing reef (Laysan and Lisianski); and atolls formed on top of submerged volcanic remnants (French Frigate Shoals, Maro Reef, and Pearl and Hermes Reef). These islands represent various stages in the volcano erosion and subsidence process, and the subsequent formation of atolls.

*Source: United States Fish & Wildlife Services. (2002). About the Northwestern Hawaiian Islands. Honolulu, HI.*

On the following page is a list of the NWHI beginning with the islands closest to the main Hawaiian Islands. An important aspect of Hawaiian culture is the awareness that in numerous instances traditional place names either were replaced with foreign ones or the Hawaiian names were misspelled to the degree that their meanings were changed.



The island names of Nihoa and Mokumanamana are the old names that have been passed down through genealogy, stories, and chants. Kānemiloha'i and Mokupāpapa are old Hawaiian names found in chants that have a new association here. These names and other Hawaiian names were assigned to the islands recently by the Hawaiian Lexicon Committee.

Island Name English	Island Name Hawaiian	Description
Nihoa	Nihoa	A small basaltic islet with many archaeological sites
Necker Island	Mokumanamana	A small basaltic islet with numerous heiau (temple)
French Frigate Shoals	Kānemiloha'i	An atoll of reefs, low sand islets, and the 120-foot- high La Pérouse Pinnacle
Gardner Pinnacle	Pūhāhonu	Means “surfacing of a turtle for air.” These two isolated islands and various rock outcroppings seem to appear unexpectedly to voyagers at sea, like a turtle coming up for air, its back and head emerging above the surface. Turtles can often be seen resting on crevices and rock ledges at Pūhāhonu.
Maro Reef	Ko'anako'a	Breakers generally cover this atoll
Laysan Island	Kauō	This flat island surrounded by sand and surf and harboring a pond resembles a bird's egg, cracked open, with the yolk surrounded by egg white. “Kauō” is used to identify the yolk of an egg or the egg white. Kauō is the habitat of thousands of birds.
Lisianski Island	Papa'āpoho	The literal translation describes the physical appearance of Papa'āpoho, a flat island with a depression.
Pearl and Hermes Atoll	Holoikauaua	This atoll is named for the endangered Hawaiian monk seal, which frequents local waters and hauls out on the beaches. Holoikauaua means “dog-like animal that swims in the rough waters.”
Midway Atoll	Pihemanu	Along with many of the “kūpuna” islands, Pihemanu is a refuge for birds. Its name means “the loud din of birds.”
Kure Atoll	Mokupāpapa	It is the northwesternmost island in the Hawaiian archipelago. It is thought to have been the place where one of Pele's brothers was left as a guard during Pele's voyage to Hawai'i from Kahiki.

Source: Adapted from Kimura, L.L. (1998). *Hawaiian Names for the Northwestern Hawaiian Islands*. In J.O. Juvik & S.P. Juvik (3rd ed.). *Atlas of Hawai'i* (p.27). Honolulu, HI: University of Hawaii Press and from the Hawaiian Lexicon Committee.

For more information about the Papahānaumokuākea Marine National Monument, go to [www.hawaiianatolls.org](http://www.hawaiianatolls.org).







# The Voyage

# Grades 4 - 5 Unit Map

**Unit Essential Question:** What does a voyage to the “kūpuna” islands reveal about these elder islands and Hawaiian values and traditions?

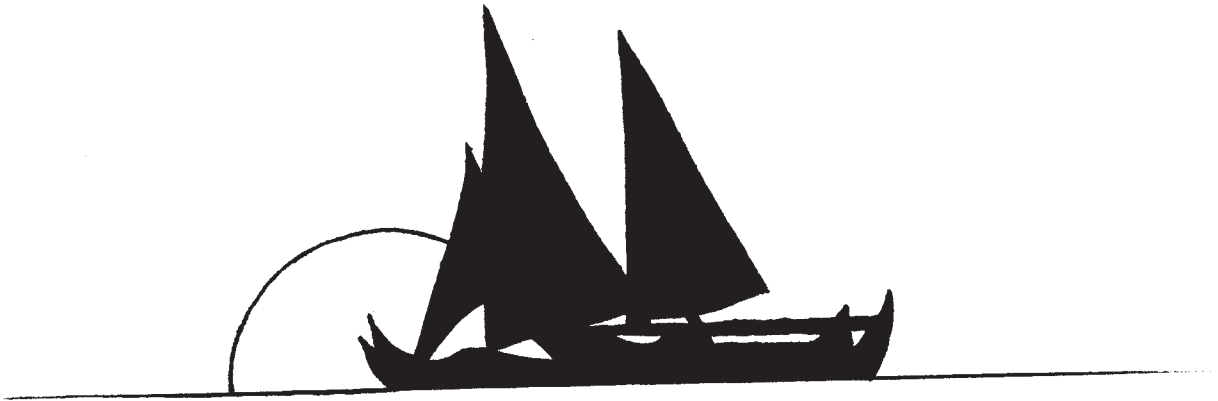
Hawai'i DOE Standards & Nā Honua Maui Ola	Focus Questions & Activities	Key Concepts	DOE Benchmarks
<p><b>Grade 4</b>  <b>Social Studies 7:</b>  <b>Geography</b>  <b>World in Spatial Terms</b>            Places and Regions</p> <p><b>Grade 5</b>  <b>Math 4: Measurement</b>  <b>Fluency with Measurement</b>            Measurement Tools and Techniques</p>	<p>Where are the “kūpuna” islands—Northwestern Hawaiian Islands (NWHI)—located?            How would you compare the major physical characteristics of the different NWHI?  <b>ACTIVITY 1: Where are the “kūpuna” islands?</b></p>	<ul style="list-style-type: none"> <li>The Northwestern Hawaiian Islands include a coral reef ecosystem of 10 islands, atolls, submerged banks, and seamounts that stretch 1,200 miles northwest of the main Hawaiian Islands.</li> <li>The Northwestern Hawaiian Islands include 3 types of islands:               <ol style="list-style-type: none"> <li>1) Nihoa, Necker, and Gardner Pinnacles are islands with volcanic basalt cliffs.</li> <li>2) Laysan and Lisianski are coral islands with fringing reefs.</li> <li>3) French Frigate Shoals, Maro Reef, Pearl and Hermes Reef, Midway, and Kure are atolls.</li> </ol> </li> </ul>	<p><b>SS.4.7.2</b> Collect, organize, and analyze data to interpret and construct geographic representations.</p> <p><b>MA.5.4.3</b> Use map scales to measure the distance between locations and make simple scale drawings.</p>
<p><b>Grade 4</b>  <b>Social Studies 3: History</b>  <b>Pre-Contact Hawai'i</b>            Events in Hawaiian History</p> <p><b>Grades 4 - 5</b>  <b>Fine Arts 1: Visual Arts</b>            How the Arts Shape and Reflect Culture            How the Arts are Communicated</p> <p><b>Grades 4 - 5</b>  <b>Language Arts 4: Writing:</b>            Conventions and Skills - Range of Writing</p> <p><b>Nā Honua Maui Ola 8 - 4</b>            Apply the cultural and traditional knowledge of the past to the present.</p>	<p>What is the significance of the story of Papahānaumoku and Wākea? Why is the Papahānaumokuākea Marine National Monument considered a sacred and significant area?  <b>ACTIVITY 2:</b>  <b>Papahānaumokuākea</b></p>	<ul style="list-style-type: none"> <li>Papahānaumoku and Wākea are honored and highly recognized ancestors of Native Hawaiian people. Their union resulted in the creation, or birthing of the Hawaiian Islands.</li> <li>The Monument is home to ancient Hawaiian cultural sites and it's a place where Native Hawaiians can reconnect to their ancestors and their gods.</li> <li>The Monument is one of the largest protected marine areas in the world; it provides a safe haven for unique plants and animals and its protection today ensures its healthy future for generations to come.</li> </ul>	<p><b>SS.4.3.1 0</b> Describe how significant people, including those of legend (including Papa and Wākea, Pele, and Pa'ao) affected pre-contact Hawai'i.</p> <p><b>FA.4.1.4</b> Explain how art reflects, life, culture, attitudes, and beliefs of the artist.</p> <p><b>FA.5.1.4</b> Explain how an original artwork demonstrates a concept or idea from another discipline.</p> <p><b>LA.4.4.1</b> and <b>LA.5.4.1</b> Write in a variety of grade-appropriate formats for a variety of purposes and audiences, such responses to literature and pieces to reflect on learning.</p>

Hawai'i DOE Standards & Nā Honua Maui Ola	Focus Questions & Activities	Key Concepts	DOE Benchmarks
<p><b>Grade 4 Science 8: Earth and Space Science</b> Forces That Shape the Earth</p> <p><b>Grade 5 Science 2: The Scientific Process</b> Nature of Science Unifying Concepts and Themes</p> <p><b>Grades 4 - 5 Language Arts 4 - 5: Writing:</b> Conventions and Skills - Range of Writing</p>	<p>How does a Hawaiian volcano change as it ages?</p> <p><b>ACTIVITY 3: Volcanoes on Stage</b></p>	<ul style="list-style-type: none"> <li>• Most Hawaiian volcanoes go through 10 stages beginning with the deep submarine stage and ending with a guyot.</li> <li>• Stream/water, wind and wave action on high islands will eventually erode all volcanic rock.</li> <li>• The high volcanic islands slowly sink and erode away, and corals continue to grow, eventually forming atolls.</li> </ul>	<p><b>SC.4.8.1</b> Describe how slow processes sometimes shape and reshape the surface of the Earth.</p> <p><b>SC.4.8.2</b> Describe how fast processes (e.g., volcanoes, earthquakes) sometimes shape and reshape the surface of the Earth.</p> <p><b>SC.5.4.3</b> Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world.</p> <p><b>LA.4.4.1</b> and <b>LA.5.4.1</b> Write in a variety of grade-appropriate formats for a variety of purposes and audiences, such as narratives that follow a plot and describe a setting and characters or pieces to reflect on learning and solve problems.</p>
<p><b>Grade 4 Social Studies 6: Cultural Anthropology</b> Cultural Systems and Practices</p> <p><b>Grades 4 - 5 Language Arts 4: Writing:</b> Conventions and Skills</p> <p>GLO 2 Community Contributor</p> <p><b>Nā Honua Maui Ola 1 - 8</b> Learners understand and appreciate the importance of Hawaiian cultural traditions, language, history, and values.</p>	<p>What do wayfinding and voyaging reveal about Hawaiian culture and the ability to navigate to distant islands?</p> <p><b>ACTIVITY 4: Wayfinding</b></p>	<ul style="list-style-type: none"> <li>• Pacific navigators have a close relationship to the natural world and are highly skilled at wayfinding—the art of using stars, ocean swells, clouds, winds, and seabirds to navigate to distant islands.</li> <li>• Practicing Hawaiian values such as lailima (working together), kuleana (taking responsibility), and mālama (caring) is essential to successful voyaging.</li> </ul>	<p><b>SS.4.6.1</b> Explain how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.</p> <p><b>LA.4.4.1</b> and <b>LA.5.4.1</b> Write in a variety of grade-appropriate formats for a variety of purposes and audiences, such as pieces to reflect on learning and solve problems</p>



# Student Journal

## Unit 1 – The Voyage



*Ulu o ka lā.*

The sun grows.

Said of the light of sunrise just as the sun's rim touches the horizon.  
The morning sun is used for navigation to determine the primary direction of east.

—Mary Kawena Pukui, *‘Ōlelo No‘eau* 2870

Student's Name: \_\_\_\_\_

School: \_\_\_\_\_

Date started: \_\_\_\_\_

Date ended: \_\_\_\_\_



# Student Assessment Overview

You are about to go on an imaginary voyage to discover the Northwestern Hawaiian Islands in the Papahānumokuākea Marine National Monument. Sometimes people call them the “kūpuna” islands because these elder islands have much to teach us. To begin the voyage, we’ll map the “kūpuna” islands and we’ll discover the new Papahānumokuākea Marine National Monument. We’ll explore how the islands are different from our main islands. We’ll learn the fascinating story of how volcanoes change as they age. We’ll also find out how Hawaiian navigators read signs in nature to find their way to distant islands.

As you progress through the Navigating Change units, you will discover that the “kūpuna” islands can help us to understand how our main Hawaiian islands have changed over time, particularly our coral reefs. Your challenge will be to “navigate change” in your own community; to carry out projects that mālama (care for) the place where you live. Enjoy the journey!

**Unit 1 Essential Question:** What does a voyage to the “kūpuna” islands reveal about these elder islands and Hawaiian values and traditions?

## Nā Honua Maui Ola (Hawaiian Guidelines) in this unit

- Apply the cultural and traditional knowledge of the past to the present.
- Understand and appreciate the importance of Hawaiian cultural traditions, language, history, and values.

## General Learner Outcomes (GLOs) in this unit

- GLO 2: Cooperate with and help and encourage others in group situations.

## How you will be graded for this unit:

### Individual Journal

It is your kuleana (responsibility) to complete a journal for this unit. Following is a checklist of the pages you will need to include in your journal. Place this page in your journal and make a check next to each item when you complete it. You will be given more details during each lesson.

Standards and Journal Pages	✓ Completed
<b>1. Where Are the “Kūpuna” Islands?</b> - Standards: Gr. 4 Social Studies 7; Gr. 5 Math 4 <b>Journal - 1:</b> Hawaiian Islands archipelago map <b>Journal - 2:</b> Story comparing the physical characteristics of the different “kūpuna” islands	
<b>2. Papahānumokuākea</b> - Standards: Gr. 4 Social Studies 3 and Gr. 4 - 5 Fine Arts 1 and Language Arts 4 <b>Journal - 3:</b> Reflection about the story of Papahānumoku and Wākea <b>Journal - 4:</b> Class book about Papahānumokuākea Marine National Monument	
<b>3. Volcanoes on Stage</b> - Standards: Gr. 4 Science 8; Gr. 5 Science 2 <b>Journal - 5:</b> Group project - volcano script <b>Journal - 6:</b> Story about a volcano’s life	
<b>4. Wayfinding</b> - Standards: Gr. 4 Social Studies 6; Gr. 4 - 5 Language Arts 4 <b>Journal - 7:</b> Illustration and reflection about wayfinding	



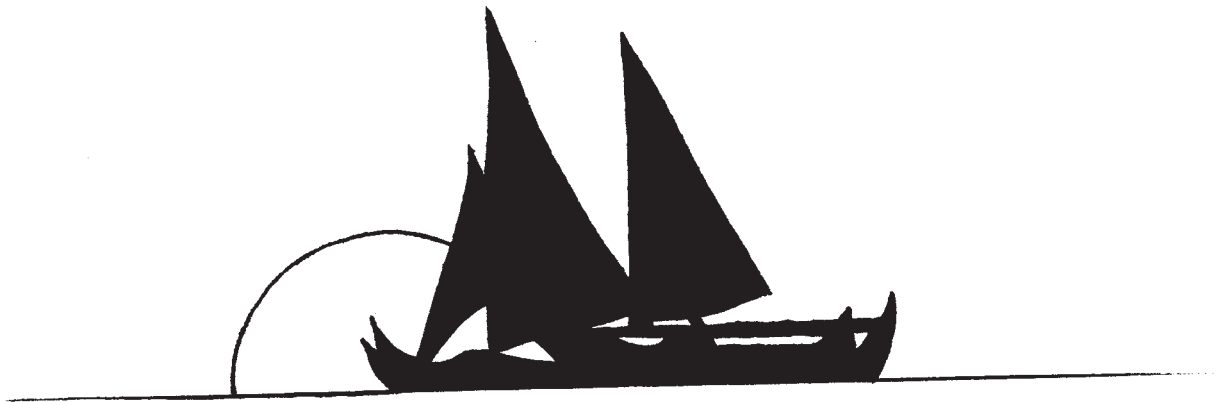


**Unit Culminating Activity - Due Date:** \_\_\_\_\_

Take an imaginary journey on a canoe from your island to Kure. Write a journal about your voyage with an entry for each day of the voyage. Your journal should:

- Answer the unit essential question.
- Identify your role on the canoe (i.e., navigator, captain, cook, etc.).
- Include a map showing the route the canoe sails, including each island the canoe passes (see journal -1). (Grade 5 students include distances between islands).
- Describe each island the canoe passes and how the island has aged from waves, wind, and water.
- Explain how Hawaiian values and practices guide your actions as you work with others on the canoe.

We will review a rubric to guide you as you work toward achieving the standards for this culminating project.



# Unit 1 Culminating Activity Rubric - Grade 4

Name \_\_\_\_\_

Date \_\_\_\_\_

Total Points \_\_\_\_\_

**Essential Question:** What does a voyage to the “kūpuna” islands reveal about these elder islands and Hawaiian values and traditions?

<b>Hawai'i DOE Benchmarks &amp; Nā Honua Maui Ola</b>	<b>Kūlia (Exceeds Standard)</b>	<b>Mākaukau (Meets Standard)</b>	<b>'Ano Mākaukau (Almost at Standard)</b>	<b>Mākaukau 'Ole (Below Standard)</b>
<b>Social Studies 7: Geography: World in Spatial Terms</b> Collect, organize, and analyze data to interpret and construct geographic representations. <i>Points</i> ____	Map includes labels and shows islands in the archipelago accurately located. Map shows evidence of extra effort to provide details that make the map easier to understand.	Islands are accurately located and labeled on the map.	Map includes some of the islands accurately located; map is adequate, but needs labels for the islands.	Map does not accurately depict the islands in relationship to one another.
<b>Science 8: Earth and Space Science</b> Describe how slow processes sometimes shape and reshape the surface of the Earth. <i>Points</i> ____	Journal entries use evidence to describe how each island the canoe passes has been affected by waves, wind, and water. Information also includes how the islands have been affected by gradual sinking (subsidence) and the formation of coral reefs.	Journal entries describe how each island the canoe would pass has been affected by waves, wind, and water.	Journal entries provide examples of affects of waves, wind, and water on some islands.	Journal entries do not describe how islands have been affected by waves, wind, and water.
<b>Social Studies 6: Cultural Anthropology</b> Explain how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture. <b>Nā Honua Maui Ola 1-8</b> Learners understand and appreciate the importance of Hawaiian cultural traditions, language, history, and values. <i>Points</i> ____	Journal entries are creative descriptions of the role of the voyager. Writing includes how the behavior of the voyager reflects Hawaiian values and practices.	Journal entries describe the role of the voyager and interpret how the behavior of the voyager reflects Hawaiian cultural values and practices.	Journal entries describe the role of the voyager but do not interpret how the behavior of the voyager reflects Hawaiian cultural values and practices.	Journal entries do not describe the role of the voyager or interpret how the behavior of the voyager reflects Hawaiian cultural values and practices.



# Unit 1 Culminating Activity Rubric - Grade 5

Name \_\_\_\_\_ Date \_\_\_\_\_ Total Points \_\_\_\_\_

**Essential Question:** What does a voyage to the “kūpuna” islands reveal about these elder islands and Hawaiian values and traditions?

Hawai'i DOE Benchmarks & Nā Honua Maui Ola	Kūlia (Exceeds Standard)	Mākaukau (Meets Standard)	'Ano Mākaukau (Almost at Standard)	Mākaukau 'Ole (Below Standard)
<p><b>Math 4: Measurement Fluency with Measurement</b></p> <p>Use map scales to measure the distance between locations and make simple scale drawings.</p> <p><i>Points</i> _____</p>	<p>Map is drawn to scale and includes a legend or labels. Islands in the archipelago are accurately located and map shows evidence of extra effort to provide details that make the map easier to understand. Journal includes accurate distance between islands.</p>	<p>Map is drawn to scale and includes a legend or labels. Islands are accurately located. Journal includes accurate distance between islands.</p>	<p>Map includes some of the islands accurately located and drawn to scale; map is adequate, but needs a legend or labels for the islands. Journal needs to include distance between islands.</p>	<p>Map does not accurately depict the islands in relationship to one another. Journal does not include distances between islands.</p>
<p><b>Science 2: The Scientific Process</b></p> <p>Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world.</p> <p><i>Points</i> _____</p>	<p>Journal entries use evidence to describe how each island the canoe passes has been affected by waves, wind, and water. Information also includes how the islands have been affected by gradual sinking (subsidence) and the formation of coral reefs.</p>	<p>Journal entries describe how each island the canoe would pass has been affected by waves, wind, and water.</p>	<p>Journal entries provide examples of affects of waves, wind, and water on some islands.</p>	<p>Journal entries recognize that the shaping and reshaping of the islands is due to slow processes but do not describe how islands have been affected by waves, wind, and water.</p>
<p><b>Language Arts 4: Writing Conventions and Skills</b></p> <p><b>Nā Honua Maui Ola 1 - 8</b></p> <p>Learners understand and appreciate the importance of Hawaiian cultural traditions, language, history, and values.</p> <p><i>Points</i> _____</p>	<p>Journal entries are creative descriptions of the role of the voyager. Writing includes how the behavior of the voyager reflects Hawaiian values and practices.</p>	<p>Journal entries describe the role of the voyager and interpret how the behavior of the voyager reflects Hawaiian cultural values and practices.</p>	<p>Journal entries describe the role of the voyager but do not interpret how the behavior of the voyager reflects Hawaiian cultural values and practices.</p>	<p>Journal entries do not describe the role of the voyager or interpret how the behavior of the voyager reflects Hawaiian cultural values and practices.</p>





# Where Are the “Kūpuna” Islands?

**Where are the “kūpuna” islands—Northwestern Hawaiian Islands (NWHI)—located?  
How would you compare the major physical characteristics of the different NWHI?**

## Hawai‘i DOE Standard Benchmarks

### Grade 4

**Social Studies 7:** Geography: World in Spatial Terms

Assessed:

- **SS.4.7.2** Collect, organize, and analyze data to interpret and construct geographic representations.

Practiced:

- **SS.4.7.1** Identify the major geographic characteristics and demographics of the pre-contact Hawaiian archipelago, including its relative location to other major land masses.

### Grade 5

**Math 4:** Measurement: Fluency with Measurement

- **MA.5.4.3** Use map scales to measure the distance between locations and make simple scale drawings.

## Key Concepts

- The NWHI include an ecosystem of coral reefs, atolls, small islands, seamounts, banks, and shoals that stretch 1,200 miles northwest of the main Hawaiian Islands.
- The NWHI include 3 types of islands:
  - 1) Nihoa, Necker, and Gardner Pinnacles are islands with volcanic basalt cliffs.
  - 2) Laysan and Lisianski are coral islands with fringing reefs.
  - 3) French Frigate Shoals, Maro Reef, Midway, and Kure are atolls.

## Activity at a Glance

Groups of students collaborate to create a large wall map of the Hawaiian Islands archipelago that includes the NWHI. Grade 4: Groups of students present geographic data about one of the NWHI to their classmates and display the information on the map. Grade 5: Students use map scales to measure the distance between islands and create a map of the archipelago.

## Time

3 - 4 class periods

## Assessment

Students:

- Write journal reflections that compare the major differences in the physical characteristics of the “kūpuna” islands as one travels to the northwest from the main islands.
- Complete individual maps of the Hawaiian Islands archipelago.
- Use map scales to measure the distance between islands and record this on their maps. (Grade 5)



## Hawai'i DOE Rubric

Advanced	Proficient	Partially Proficient	Novice
Social Studies Grade 4			
Collect, organize, and analyze data to interpret and construct geographic representations, with accuracy.	Collect, organize, and analyze data to interpret and construct geographic representations, with no significant errors.	Collect, organize, and analyze data to interpret and construct geographic representations, with a few significant errors.	Collect, organize, and analyze data to interpret and construct geographic representations, with significant errors.
Math Grade 5			
Use map scales to measure the distance between locations and make simple scale drawings, with accuracy.	Use map scales to measure the distance between locations and make simple scale drawings, with no significant errors.	Use map scales to measure the distance between locations and make simple scale drawings, with few significant errors.	Use map scales to measure the distance between locations and make simple scale drawings, with many significant errors.

### Vocabulary

archipelago – a chain or cluster of islands surrounded by open sea

atoll – a ring-shaped coral reef enclosing a lagoon

basalt – hard and dark volcanic rock formed by the cooling of lava at or near the Earth's surface

fringing reef – coral reef that grows in shallow water and slopes sharply toward the sea floor

“kūpuna” – Hawaiian word for “elder.” The NWHI have been recently referred to as the “kūpuna” islands.

latitude – imaginary circles around the Earth, parallel to the equator

longitude – imaginary circles on the surface of the Earth passing through the North and South poles at right angles to the equator

### Materials

- student journal cover and assessment pages (provided in Unit Overview)
- student journals 1 - 2 (provided)
- map of the Hawaiian Islands archipelago (provided)
- “kūpuna” islands cards (provided)
- island location sheet (provided)
- Navigating Change video segment – “The Voyage” (provided)
- rulers/pencils and colored pens
- large sheets of blue paper or a tarp (to create wall-size map)
- string (for latitude and longitude lines)
- card stock paper to make island cut-outs
- tape, push pins, or staples

### Advance Preparation

- Prepare a large wall in the classroom to become a map of the Islands. Cover the wall with large sheets of blue paper or use a blue tarp. If you have projection capability from your computer, project the map of the Hawaiian Islands archipelago onto the wall. (The Hawaiian Islands Archipelago map is provided on the Navigating Change CD).
- Make cut-outs of the main Hawaiian Islands to place on the wall map during the activity. If there is not enough wall space available, consider developing a large map on the floor. (A floor map could be enhanced with three-dimensional objects, such as figurines of marine animals placed around the islands.)



- Duplicate journal pages 1 - 2 for each student and the “kūpuna” islands cards (one for each group of two or three students).
- If desired, make a few copies of the “Fascinating Facts about the NWHI” provided in the Appendix for Unit 1. Make a copy of the student journal and assessment pages provided in the Unit Overview.

### Teacher Background Information

The Northwestern Hawaiian Islands (NWHI), also known recently as the “kūpuna” islands, are within the northern three quarters of the Hawaiian archipelago. The islands or atolls we see above water are a small portion of the entire marine and island ecosystem now protected and managed as the Papahānaumokuākea Marine National Monument. It’s interesting to note that these islands represent only one-tenth of one percent of all emergent land in the archipelago (Rauzon, 2001). Below the islands and atolls is a world of reefs, shoals, and seamounts. This huge region encompasses over 139,793 square miles and stretches 1,200 miles northwest of the main Hawaiian Islands. The 10 most stable and visible islands in the NWHI vary from islands with high basalt cliffs, to low islands, to sandy atolls. Skirting along the fringing reefs of the atolls are many small islands, sometimes called islets, that shift and change with storm surges and wave action. Millions of seabirds,

thousands of marine species, endangered land birds, monk seals, and green sea turtles are dependent upon these islands and surrounding reefs. The Hawaiian Islands are part of a long line of underwater volcanoes. According to the hot spot theory, a hot spot located under the oceanic plate spews out hot molten rock, creating volcanoes. These undersea volcanoes eventually reach the surface of the ocean, creating islands. These islands continue to grow as long as the lava continues to flow. The Pacific plate moves slowly over the hot spot, creating new islands. The older volcanic islands are slowly sinking and eroding away. Eventually these high rock islands become atolls, or rings of coral. The Northwestern Hawaiian Islands include three types of islands: Nihoa, Necker, and Gardner Pinnacles are volcanic basalt; Laysan and Lisianski are coral islands with fringing reefs; and French Frigate Shoals, Maro Reef, Pearl and Hermes Reef, Midway, and Kure are atolls.

### Teaching Suggestions

- 1. Distribute the student journal and assessment pages (from the Unit Introduction) and introduce the unit.**
  - Review the projects and assignments and discuss the journals that students will be producing. Set a deadline for the culminating project and review the sample rubric.
- 2. Challenge students to draw a map of the Hawaiian archipelago that includes all of the islands that they know.**
  - Check their maps to assess their awareness of our island geography.
  - Ask if anyone included an island beyond Ni‘ihau.
- 3. Introduce the idea of taking a voyage to discover the islands, reefs, and atolls that are found beyond Kau‘i and Ni‘ihau.**
  - Draw a large “K,” “W,” and “L” on the board to represent what students “Know,” “Want to know,” and what they will “Learn” about these islands.
  - Ask students to record what they know of any of the islands that make up the NWHI under the “K” and what they want to know under the “W.”
  - Introduce the idea that these are the “kūpuna” islands and discuss how these older islands might look.
- 4. Show students the Navigating Change video segment: “The Voyage.”**
  - Discuss what students notice about the differences between the NWHI and the main Hawaiian Islands.
  - Add some of the things they have learned under the “L” on the board.



- 5. Show students the ocean wall you have created to map the Hawaiian Islands archipelago.**
- Project the map of the islands onto the wall and review the names of the islands as you place the main island cut-outs on the map.
  - Have students check the map against the maps they created.

**Main Islands:** Hawai'i, Kaho'olawe, Maui, Lāna'i, Moloka'i, O'ahu, Kaua'i, Ni'ihau

**“Kūpuna” islands (NWHI):**

Nihoa

Mokumanamana (Necker)

French Frigate Shoals (Kānemiloha'i)

Gardner Pinnacles (Pūhāhonu)

Maro Reef (Ko'anako'a)

Laysan (Kauō)

Lisianski (Papa'āpoho)

Pearl and Hermes Atoll (Holoikauaua)

Midway Atoll (Pihemanu)

Kure Atoll (Mokupāpapa)

- 6. Use the projected map to review latitude and longitude.**

- Have students attach strings on the ocean wall map to mark from 155° to 180° West longitude and from 20° to 30° North latitude.

- 7. Divide the class into groups of two to three students for the mapping activity.**

- Give each group a “kūpuna” islands card and an island location sheet. Ask students to identify key geographic data and complete the following tasks:

Group tasks:

- On their cards, create a to-scale cut-out of the island for the wall map. (Students can trace these from the projected map.)
- Design a way to display key geographic data and interesting facts about the island on the map.
- Share information on their cards with the class, including the meaning of the Hawaiian name of the island. (If desired, distribute the Fascinating Facts from the Appendix and encourage students to research the Internet for additional information about their island. An excellent site is: <http://www.hawaiianatolls.org/about/index/php>.)

- 8. Ask groups to present their islands to the class.**

- Turn off the projection of the map on the ocean wall map.
- Ask each group to present their island and place it on the map using the latitude and longitude “address.”
- Use push pins or tape so the islands can be relocated if necessary.

- 9. Check to see if islands are correctly placed on the wall map.**

- Project the guide map and see if the groups found the correct island “addresses.” Have groups move any islands that are at the wrong address.

- 10. Distribute student journals 1 and 2 and review them with students.**

- Have students plot the islands on the grid using the latitude and longitude addresses.
- Challenge Grade 5 students to use the map scale to measure the distance between the islands and record those approximate measurements in their journals.





### 11. Complete the “L” on the K-W-L chart.

- Have students record what they have learned about the NWHI under the “L” on the board and give them an opportunity to form new questions and place them under the “W.”
- Ask students to complete journal 2 with a summary of what they have discovered about the “kūpuna” islands. (Note that the geology activity that follows in this unit addresses how the islands form and change as they age.)

### Extended Activities

Have students use clay, paper mâché, or other materials to collaborate on creating a large three-dimensional model of the Hawaiian Islands archipelago. Students could look for rocks that resemble the shape of their islands and use these on the model.

Challenge each group to learn more about their assigned island. Have them research their island and add information about the flora and fauna and any interesting facts they can find. Include surrounding reefs and islands and any sea animals found primarily on or around their island. Place illustrations or cut-outs onto the large wall map near their island. See Unit 2 Land to Sea for more information about island flora and fauna. Students may want to check out the following web sites for more information.

- <http://www.navigatingchange.org>
- <http://www.hawaiianatolls.org>
- <http://www.pvs-hawaii.com> (Polynesian Voyaging Society)

### References

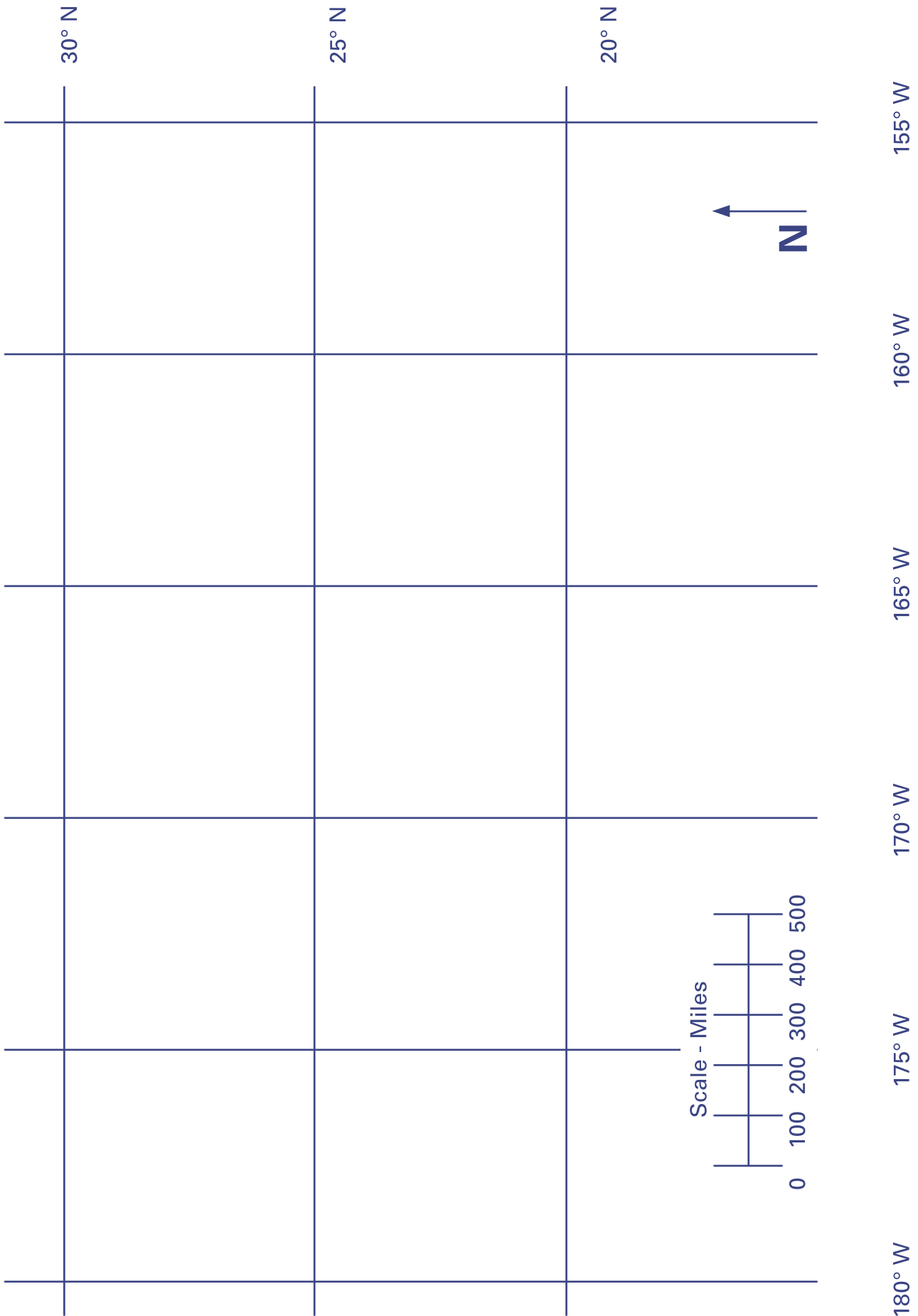
Maragos, J. and D. Gulko (Eds.). (2002). *Coral Reef Ecosystems of the Northwestern Hawaiian Islands: Interim Results Emphasizing the 2000 Surveys*. Honolulu, HI: U.S. Fish and Wildlife Service and the Hawai'i Department of Land and Natural Resources.

Rauzon, M.J. (2001). *Isles of Refuge: Wildlife and History of the Northwestern Hawaiian Islands*. Honolulu, HI: University of Hawai'i Press.



## Central Pacific Map Grid

Name \_\_\_\_\_ Date \_\_\_\_\_



## New Discoveries

**Name**

**Date**

---

What have you discovered about the “kūpuna” islands? Define the vocabulary words below. Then use the words as you write a short story about the islands.

archipelago –

atoll –

basalt –

fringing reef –

kūpuna –

latitude –

longitude –

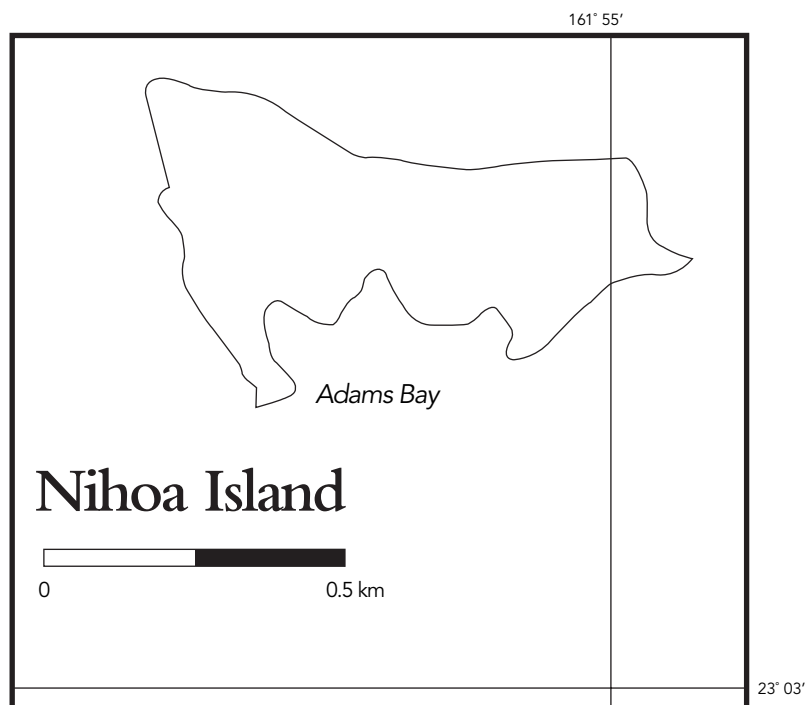
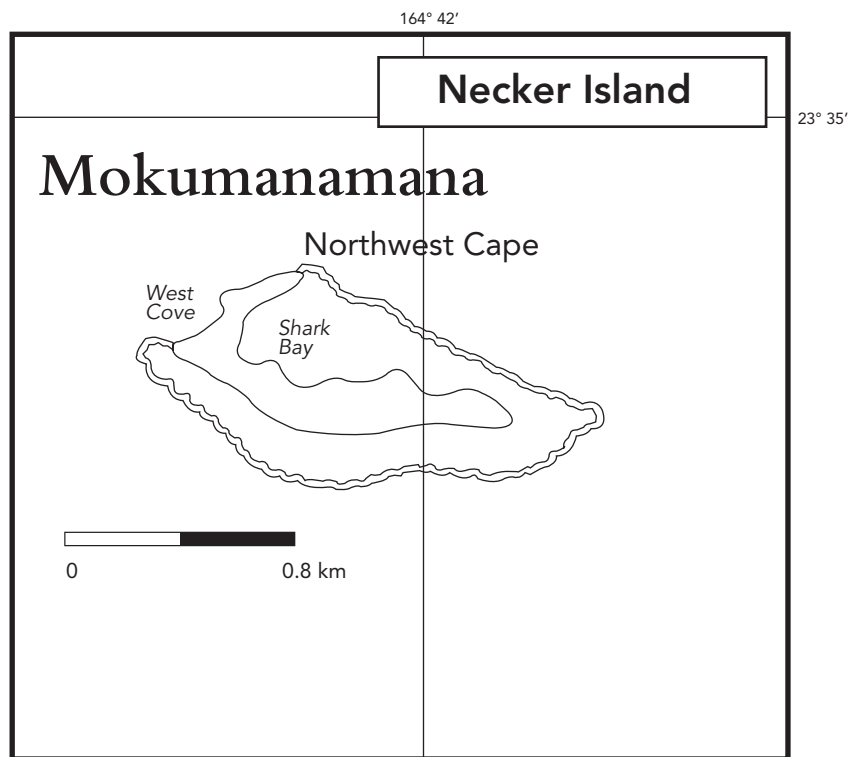
On the back of this page, use the vocabulary words to write a short story about the “kūpuna” islands. Imagine that you were sailing to the northwest past each island. Describe some of the physical characteristics and other qualities that make each island so special.



Island Location Sheet	Age (million years)	Location (approximate latitude & longitude)
Hawai`i	0 – 0.40	19.5°N, 155.4°W
Maui	0.75 – 1.32	20.8°N, 156.4°W
Kaho`olawe	1.03	20.7°N, 156.5°W
Lāna`i	1.28	21.0°N, 156.9°W
Moloka`i	1.90	21.2°N, 157.1°W
O`ahu	3.70	21.6°N, 158.1°W
Kaua`i	5.10	22.2°N, 159.5°W
Lehua	4.89	22.0°N, 160.1°W
Ni`ihau	4.89	21.9°N, 160.2°W
Kaula	4.89	21.7°N, 160.6°W
Nihoa Island	7.20	23.1°N, 161.8°W
Mokumanamana (Necker Island)	10.30	23.6°N, 164.6°W
French Frigate Shoals (Kānemiloha`i)	12:00	23.7°N, 166.2°W
Gardner Pinnacles (Pūhāhonu)	12.30	25.0°N, 168.0°W
Maro Reef (Ko`anako`a)		25.4°N, 170.4°W
Laysan Island (Kauō)	19.90	25.7°N, 171.7°W
Lisianski Island (Papa`āpoho)		26.1°N, 174.0°W
Pearl & Hermes Atoll (Holoikauaua)	20.60	27.5°N, 175.6°W
Midway Atoll (Pihemanu)	27.70	28.3°N, 177.0°W
Kure Atoll (Mokupāpapa)	27.70	28.4°N, 178.4°W



# “Kūpuna” Island Cards



## Mokumanamana Necker Island

### The Land

- Necker is shaped like a fishhook.
- It has basalt rocks and steep sea cliffs reaching up to 276 feet above the sea.
- This dry, volcanic island is less than one mile long and 1/5 mile wide, but at one time was the size of O‘ahu.
- There is a healthy native plant community that includes native weevils and trapdoor spiders.
- 60,000 birds of 16 species nest here each year.

### The Sea

- Large offshore areas are home to manta rays and gray reef sharks.
- There are more than 385,000 acres of coral reef.
- Shark Bay has sea urchins, lobsters and sea cucumbers.
- It's the first island in the NWHI where table corals are found.

### The People

- Hawaiians visited here before Nihoa was settled.
- Many shrines are found on the island. They are found on the kua (spine) of the island and were used for religious and possibly navigational purposes.
- The shrines found here are very similar to those found in the Marquesas Islands to the south.



## Nihoa Island

### The Land

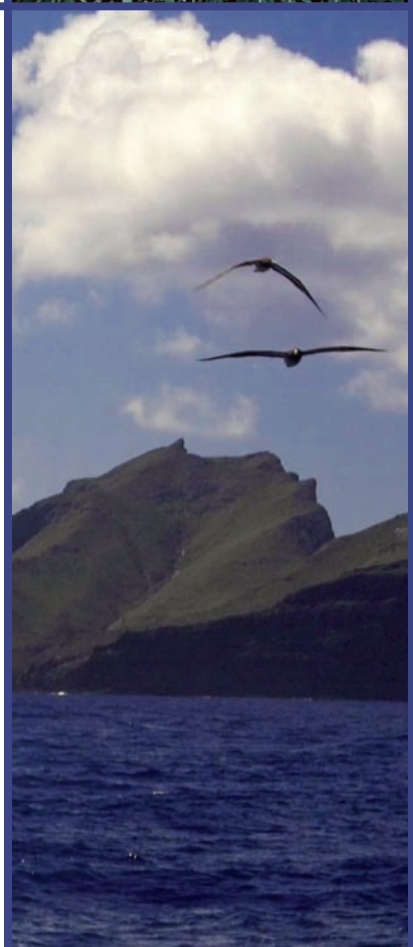
- It's the largest volcanic island in the NWHI chain, with basalt rocks and 900-foot craggy cliffs.
- Native plants and animals include Nihoa finches, Nihoa miller birds, Nihoa palms, land snails, and giant crickets.
- This island has the only remaining intact example of a native Hawaiian coastal scrub community.

### The Sea

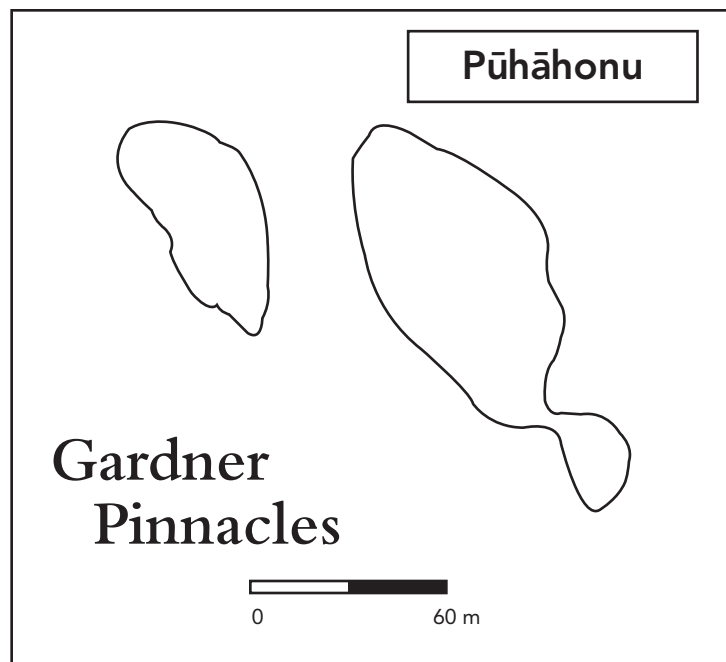
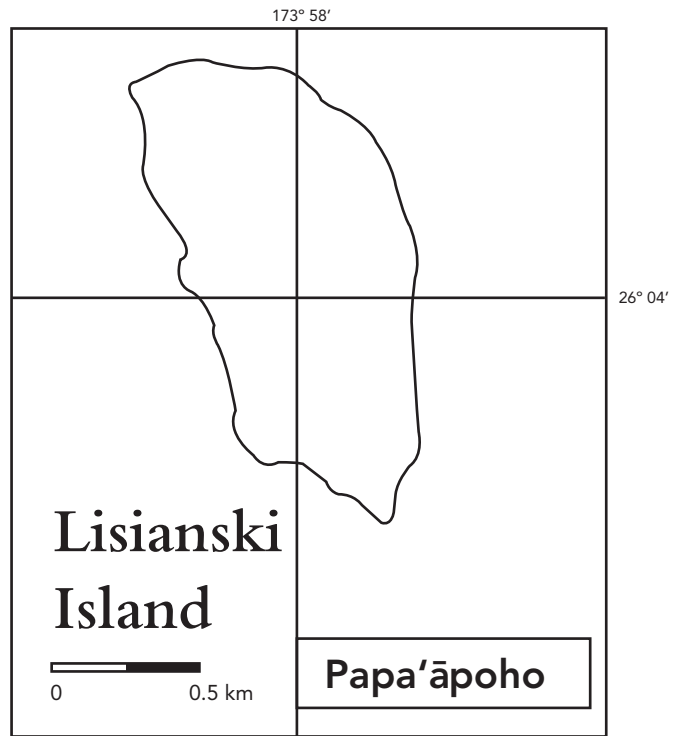
- There are not as many varieties of coral found here compared to atolls since there are not as many habitat types, and currents are strong.
- Fish not common in the main Hawaiian Islands but common in the NWHI are first seen here.

### The People

- The island was inhabited by as many as 175 Hawaiians sometime between 1000 and 1700 A.D.
- Many archeological features, including house and religious sites and sweet potato terraces, are found here.
- Hawaiians may have regularly visited Nihoa from Ni‘ihau and Kaua‘i on fishing expeditions.
- Nihoa literally means “firmly set” which could refer to the people who came to the island under such rough conditions.



# “Kūpuna” Island Cards



## **Papa`āpoho (island with a flat depression) Lisianski**

### The Land

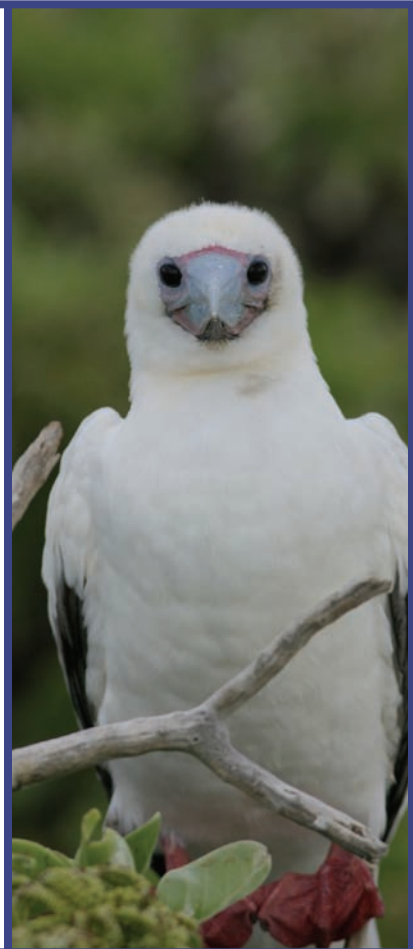
- Lisianski is a coral island with fringing reef.
- It is the third largest island in NWHI island chain with 395 land acres.
- A sand dune is the highest point at 40 feet tall.
- It has the only grove of *Pisonia* trees in the Hawaiian archipelago.
- It is home to the largest percentage of all Bonin petrels nesting in Hawai'i.

### The Sea

- Neva Shoal surrounds the island. It is a huge reef that extends outward 106 miles and is named for the Russian ship *Neva* that hit the reef in 1805.
- 24 species of stony coral have been found here.
- Large numbers of monk seals find a home here.
- Lobe corals grow in huge undersea mounds 40 feet tall.

### The People

- In the early 1900s hunters collected many bird feathers, killing over a million birds. Public concern led to federal protection of the NWHI.
- Introduced mice and rabbits ate much of the native plants in the early 1900s.



## **Pūhāhonu (surfacing of a sea turtle for air) Gardner Pinnacles**

### The Land

- The two volcanic peaks are the oldest high islands in the Hawaiian chain.
- The peaks are covered with guano from the many birds that roost here.
- The island is only 5 acres with 2 basaltic volcanic peaks.
- It's a nesting site for 12 species of tropical seabirds.
- A particular native plant is the island's only established vegetation.

### The Sea

- The surrounding reef is 600,000 acres but doesn't have as much coral as Maro Reef.
- It is the home of the giant 'opihi—largest of the Hawaiian limpets.
- Many species of fish have been seen here and there are more corals than at Nihoa and Necker.

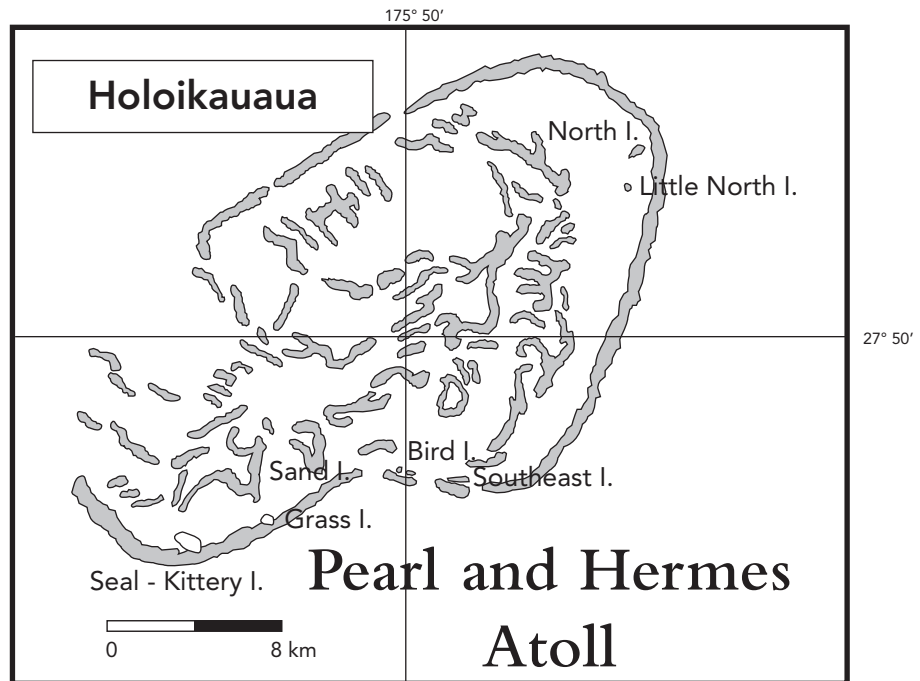
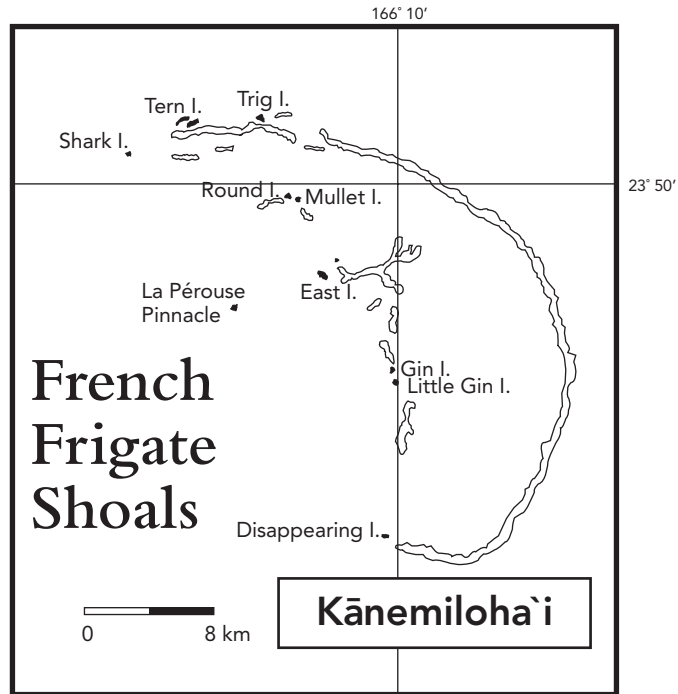
### The People

- The rough seas around the island make landing very difficult except under the most calm sea conditions.
- Since it's difficult to land on the island, harmful invasive plants or animals have not been introduced here.





# “Kūpuna” Island Cards



## Kānemiloha‘i French Frigate Shoals

### The Land

- This c-shaped atoll is the first atoll to the NW of the main Hawaiian Islands.
- The atoll has 9 sandy islets.
- It's the only atoll with basalt pinnacles above water, representing the last of the former high island.

### The Sea

- This is the largest coral reef area with the highest coral diversity in the NWHI. It is also home to many sponges, worms, snails, lobsters, crabs, shrimp, clams, oysters, sea urchins, and seastars.
- This atoll has the largest population of monk seals in the NWHI.
- More than 90% of all Hawaiian green sea turtles are hatched on these islands.
- More than 150 species of algae, including red, green, and brown types, are found here.
- There is a large shark population.

### The People

- Tern Island was enlarged to create a military base during World War II.
- The U.S. Fish and Wildlife Service has a research station here.



## Holoikauaua Pearl and Hermes Atoll

### The Land

- This large atoll is primarily underwater with 7 small islets. The atoll is fringed with shoals and islets open to the ocean.
- Monk seals, seabirds, and sea turtles rest on the tiny coral islets.

### The Sea

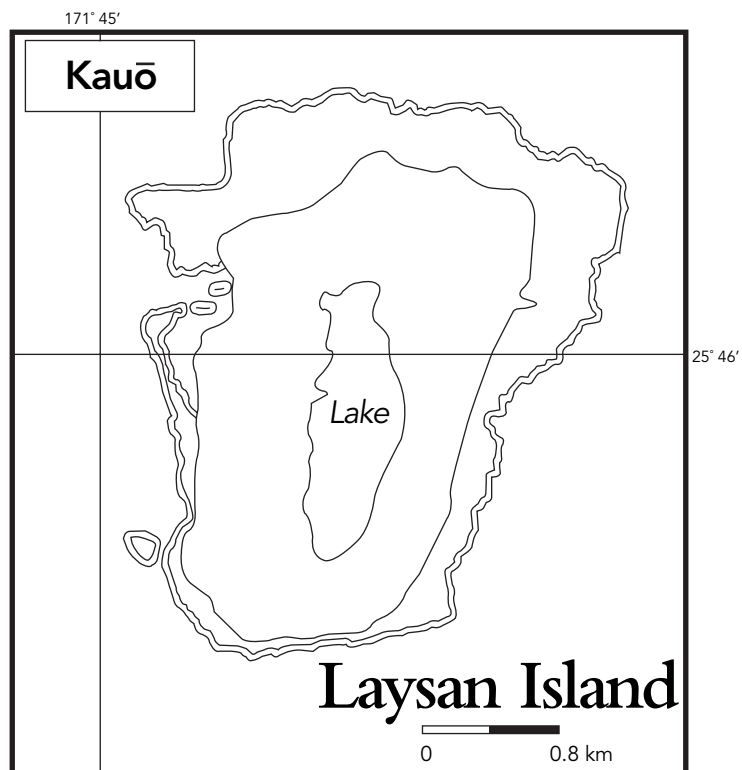
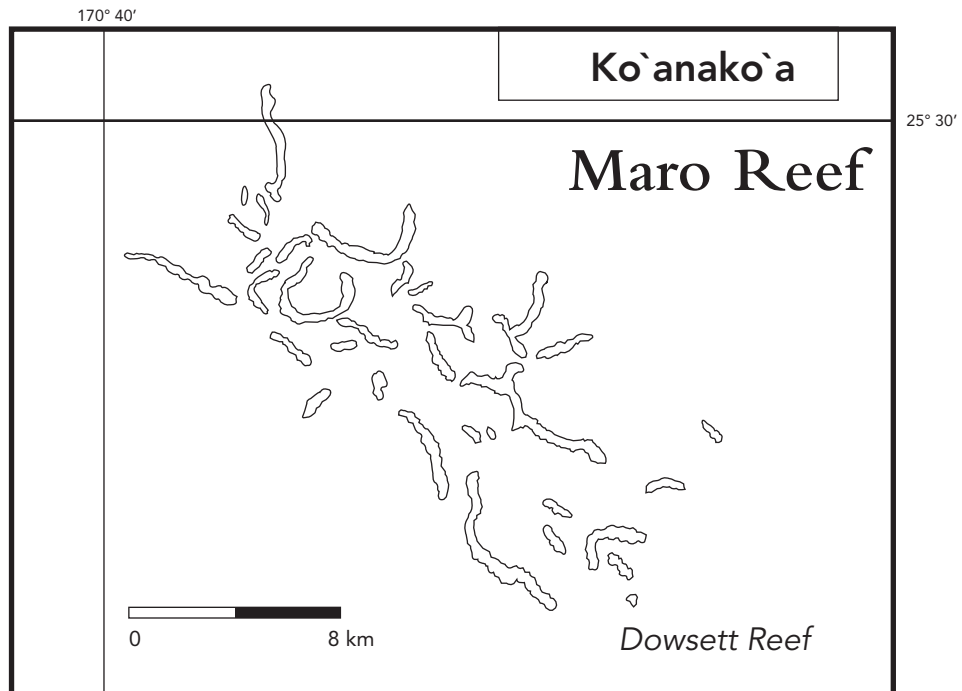
- Many species of coral and the highest number of fish in the NWHI are found in the different coral reef habitats.
- Spinner dolphins mate here.
- There are a variety of sponges—possibly 7 new species were collected in 2000.
- The atoll is home to the black-lipped oyster that was once abundant here.

### The People

- People collected oysters and used their shells for making buttons. The oysters were nearly gone in less than 10 years.
- Verbasina, an aggressive non-native plant, has spread over the island. It crowds out native species and has destroyed the Laysan finch habitat.



# “Kūpuna” Island Cards



## **Nalukākala, Ko‘anako‘a (Describes surf that froths over shallow reefs) Maro Reef**

### The Land

- This submerged atoll has less than one acre of land above water during very low tide.

### The Sea

- This is the largest known coral reef in the NWHI (one-half million acres).
- The reef is very rich with as many as 37 species of stony corals.
- There are many Galapagos sharks and the water is often murky.
- Half of all fish species recorded here are endemic to the Hawaiian archipelago.

### The People

- The reef is very difficult to navigate so it has not been thoroughly explored.
- Captain Joseph Allen of the ship *Maro* claimed he found the reef in 1820.



## **Kauō (egg representing island's shape and abundant bird life) Laysan**

### The Land

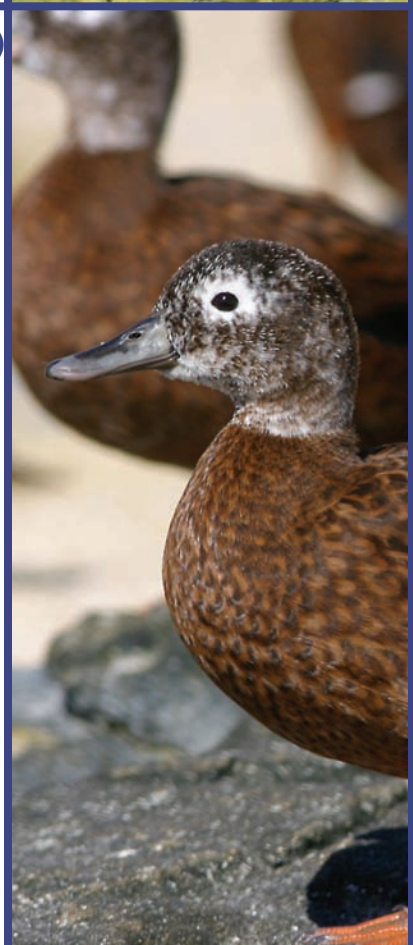
- This is a low-lying sandy island with a very salty lake (15% salinity) in the middle.
- About two million birds nest here, including frigate birds, terns, albatross, and shearwaters.
- The endangered Laysan finch and Laysan duck make their home here.
- The Laysan millerbird, Laysan rail, and Laysan redbird (honey-creeper) became extinct when their habitat was damaged.

### The Sea

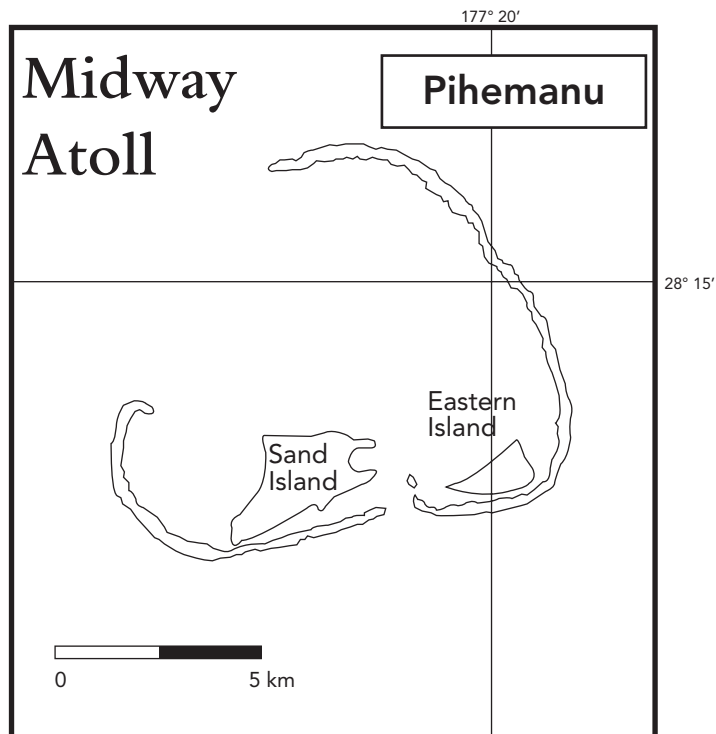
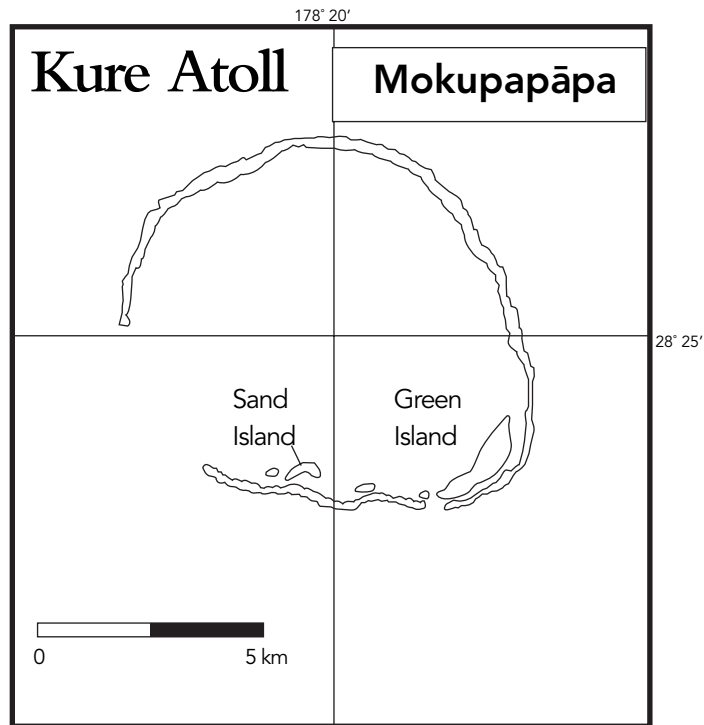
- Monk seals, turtles, and sharks swim in waters around the island.
- Most of the shallow water coral reefs are found in a small bay off the southwest side of the island.

### The People

- In the early 1900s people began mining for guano (bird excrement used for fertilizer) and harvesting bird feathers and eggs. They also released rabbits and guinea pigs, which destroyed many native plants.
- The U.S. Fish and Wildlife Service has worked hard to restore the native plants to the island. Biologists live in a remote island camp that has solar panels and composting toilets.



# “Kūpuna” Island Cards



## Mokupāpapa Kure Atoll

### The Land

- Kure is a nearly circular, classic atoll enclosing 200 acres of land.
- It is the northernmost coral atoll in the world.
- Rough winter storms occur here.

### The Sea

- Large schools of dolphins, jacks, sharks, goat fish, and Hawaiian grouper make the reef their home.
- Many corals, echinoderms, crustaceans, and mollusks are found here.
- Large numbers of macroalgae, green sea turtles, monk seals, and seabirds live here too.

### The People

- Very aggressive alien plants have been introduced to the atoll.
- Kure is managed as a wildlife sanctuary by the State of Hawai'i, Department of Land and Natural Resources.
- Some of Hawai'i's oldest known shipwrecks are found at Kure, including the wreck of a whaling ship from the mid-1800s.
- In 1993, rats were eradicated from Kure Atoll.



## Pihemanu (loud din of birds) Midway Atoll

### The Land

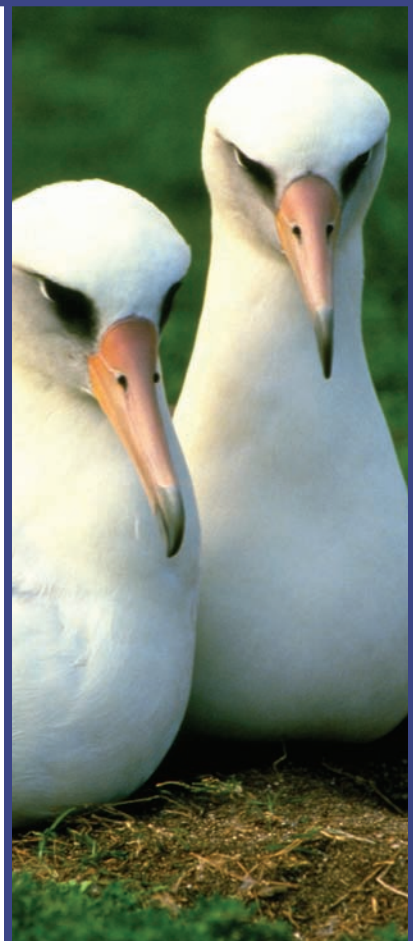
- Midway is a classic shallow water atoll with 3 small islets.
- It has the world's largest colony of Laysan albatross and is now home to the Laysan duck.
- Two million birds use the 3 small islets for habitat.

### The Sea

- The coral reefs here are more than 1,300 feet thick.
- The atoll is an important habitat for monk seals.
- Several species of fish common to Midway are also common to Japan's coral reefs.
- Spinner dolphins rest in the lagoon during the day and feed outside the atoll at night.

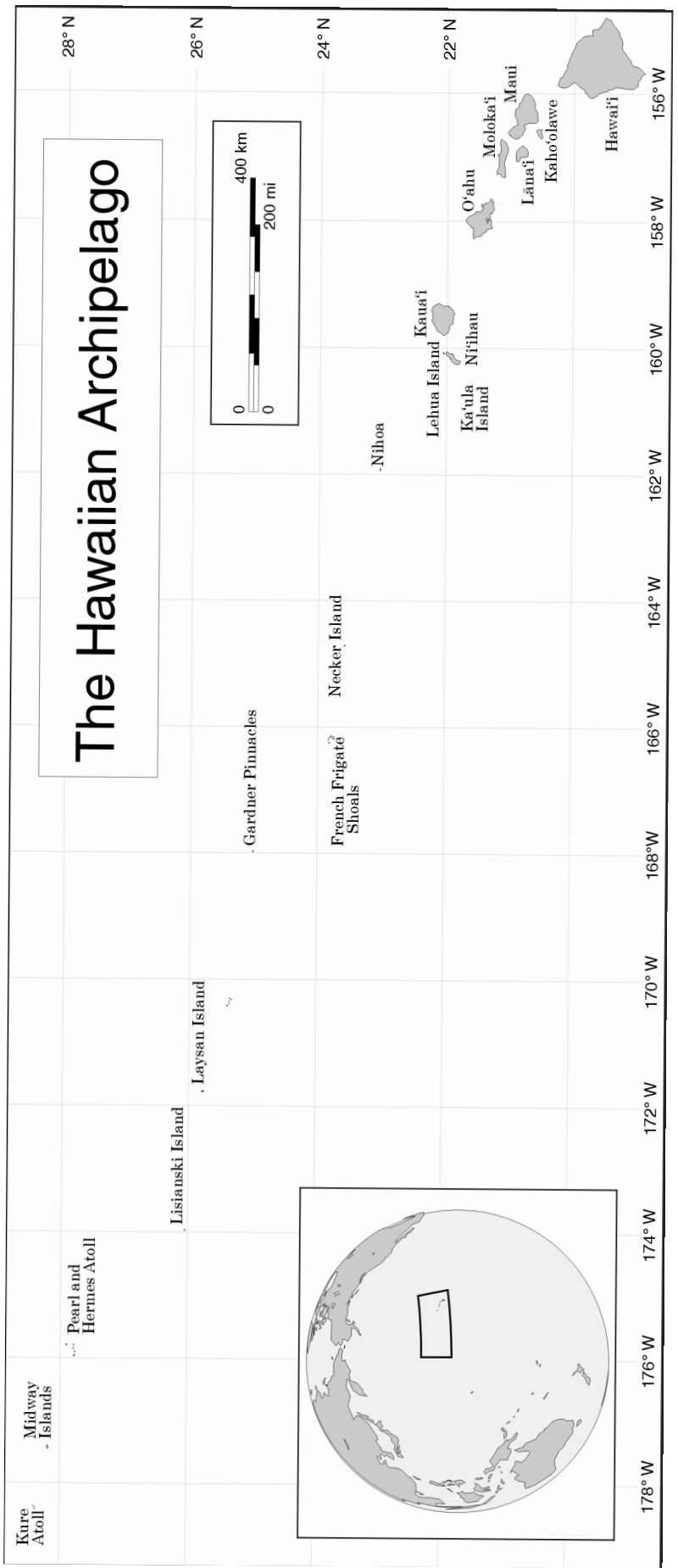
### The People

- A cable company, the first permanent Western settlement in the NWHI, brought topsoil, plants and canaries to Midway in 1903.
- With U.S. Navy help, biologists eradicated all the rats.
- The atoll was the site of a major World War II battle.
- People enlarged Sand Island to create a naval base during the late 1950s and 30% of the island is still paved.
- Volunteers and biologists live here to take care of the wildlife.
- Midway became a National Wildlife Refuge in 1988. It has an airport, houses, and research and visitor facilities.



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# Papahānaumokuākea

**What is the significance of the story of Papahānaumoku and Wākea? Why is the Papahānaumokuākea Marine National Monument considered a sacred and significant area?**

## Hawai'i DOE Standard Benchmarks

### Grade 4

**Social Studies 3:** History: Pre-Contact Hawai'i History - Events in Hawaiian History

- **SS.4.3.10** Describe how significant people, including those of legend (including Papa and Wākea, Pele, and Pa'ao) affected pre-contact Hawai'i.

**Fine Arts 1:** Visual Arts - How the Arts Shape and Reflect Culture

- **FA.4.1.4** Explain how art reflects, life, culture, attitudes, and beliefs of the artist.

### Grade 5

**Fine Arts 1:** Visual Arts - How the Arts are Communicated

- **FA.5.1.4** Explain how an original artwork demonstrates a concept or idea from another discipline.

### Grades 4 - 5

**Language Arts: Writing:** Conventions and Skills - Range of Writing

- **LA.4.4.1 and LA.5.4.1** Write in a variety of grade appropriate formats for a variety of purposes and audiences such as responses to literature and pieces to reflect on learning.

### Nā Honua Maui Ola 8 - 4

Engage in activities independently or collaboratively with community members to perpetuate traditional ways of knowing, learning, teaching, and leading to sustain cultural knowledge and resources within the learning community.

- Learners apply the cultural and traditional knowledge of the past to the present.

## Key Concepts

- Papahānaumoku and Wākea are honored and highly recognized ancestors of Native Hawaiian people. Their union resulted in the creation, or birthing of the Hawaiian Islands.
- The Monument is home to ancient Hawaiian cultural sites and it's a place where Native Hawaiians can reconnect to their ancestors and their gods.
- The Monument is one of the largest protected marine area in the world; it provides a safe haven for unique plants and animals and its protection today ensures its healthy future for generations to come.

## Activity at a Glance

Students read the mo'olelo (story) about Papahānaumoku and Wākea and write a journal response about its significance. Students each create one page of an illustrated class book about the Papahānaumokuākea Marine National Monument and share their book with other classes.

## Time

3 - 4 class periods

## Assessment

Students:

- Write a journal page that describes the significance of Papahānaumoku and Wākea in Hawaiian culture.
- Create a book page with an illustration and text about the significance of the Papahānaumokuākea Marine National Monument.
- Describe how their artwork demonstrates the cultural or scientific significance of Papahānaumokuākea.



## Hawai'i DOE Rubric

Advanced	Proficient	Partially Proficient	Novice
Social Studies Grade 4			
Describe, with clear and precise detail, how significant people, including those of legend, affected pre-contact Hawai'i.	Describe, with detail, how significant people, including those of legend, affected pre-contact Hawai'i.	Describe, with minimal detail, how significant people, including those of legend, affected pre-contact Hawai'i.	Ineffectively describe how significant people, including those of legend, affected pre-contact Hawai'i.
Fine Arts Grade 4			
Analyze, using specific examples, how art reflects life, culture, attitudes, and beliefs of the artist.	Explain how art reflects life, culture, attitudes, and beliefs of the artist.	List ways that art reflects life, culture, attitudes, and beliefs of the artist.	Recognize that art can reflect the life, culture, attitudes, and beliefs of the artist.
Fine Arts Grade 5			
Analyze, using evidence, how an original artwork demonstrates a concept or idea from another discipline.	Explain how an original artwork demonstrates a concept or idea from another discipline.	Name the concept or idea from another discipline an original artwork is intended to demonstrate.	Recognize that artwork can demonstrate a concept or idea from another discipline.
Language Arts Grades 4 - 5			
Insightfully adapt writing to grade- appropriate formats for a variety of purposes and audiences.	Adapt writing to grade- appropriate formats for a variety of purposes and audiences.	Write with some adaptation to grade- appropriate formats for a variety of purposes and audiences.	Write with little adaptation to grade- appropriate formats for a variety of purposes and audiences.

## Vocabulary

hānau - birth

laulima - cooperation

Papahānaumoku - the Hawaiian goddess that gave birth to many of the islands; sometimes referred to as the earth mother

moku - small island or large land division

wahi pana - places of great cultural significance and practice

Wākea - the Hawaiian god that fathered the islands; sometimes referred to as the sky father

## Materials

- student journals 3 - 4 (provided)
- student reading (provided)
- "Safe Haven" DVD (provided)
- colored markers, paints, pastels or other art materials

## Advance Preparation

- Preview the "Safe Haven" DVD and prepare to show it to students.
- Duplicate the student reading and journal pages for each student.



## Teacher Background Information

Native Hawaiian culture is living—it is the expression of a people that continues to evolve in great part through the perpetuation of a rich, oral tradition. Genealogies are still spoken through oli (chant) and mele (song), as are histories, natural resource management knowledge, philosophies, and medicinal and spiritual knowledge.

The longest recorded traditional Hawaiian chant, the Kumulipo (Source of deep darkness), is the history of how all life forms came and evolved from Papahānaumokuākea, beginning with the coral polyp – the building block for all life. Thus, the genealogy of Papahānaumokuākea tells the story of Native Hawaiians’ ancestral connection with the gods who created those coral polyps, the North-western Hawaiian Islands or Kūpuna (respected elders) Islands, and everything else in the archipelago, including Native Hawaiians.

Papahānaumokuākea is considered a sacred area, from which Native Hawaiians believe all life springs, and to which spirits return to after death. There are many wahi pana (places of great cultural significance and practice), which, like a lei, are strung together throughout the expanse of the ten main atolls and islands. Papahānaumokuākea is also a place for Native Hawaiian cultural practitioners of today to reconnect with their ancestors and gods, who they believe are manifested in nature, as with the Polynesian deity Kanaloa, who they believe is embodied by the vast expansive ocean, and can take the form of all life within it.

### A Name of Honor

The name Papahānaumokuākea (pronounced Pa-pa-hah-now-mo-koo-ah-keh-ah) comes from an ancient Hawaiian tradition concerning the genealogy and formation of the Hawaiian Islands, and a deep honoring of the dualisms of life. Papahānaumoku is a mother figure personified by the earth and Wākea is a father figure personified in the expansive sky; the two are honored and highly recognized ancestors of Native Hawaiian people. Their union resulted in the creation, or birthing, of the entire Hawaiian archipelago—thus the naming of the monument is to honor and preserve these names, to strengthen Hawai‘i’s cultural foundation and to ground Hawaiians to an important part of their history.

Taken apart, “Papa” (earth mother), “hānau” (birth), “moku” (small island or large land division), and “ākea” (wide) bespeak a fertile woman giving birth to a wide stretch of islands beneath a benevolent sky. Taken as one long name, Papahānaumokuākea can be seen as a symbol of hope and regeneration for the Kūpuna Islands and the main Hawaiian Islands. And through the mana (spiritual power) of Papahānaumokuākea’s name, one that encourages abundance and the procreative forces of earth, sea, and sky, the Native Hawaiian people hope that the cultural, spiritual and physical health of their people will grow as well.

*Source: <http://www.hawaiiireef.noaa.gov/about/Name.html>*

## Teaching Suggestions

### 1. Introduce students to Papahānaumoku and Wākea.

- Distribute the student reading and have students take turns reading parts of it aloud.
- Discuss the significance of the mo‘olelo (story).

#### Discussion Questions

- What does this story reveal about Hawaiian beliefs about the origin of the Islands?
- Why was Papahānaumoku upset when the plover told her about Wākea?
- Why are Papahānaumoku and Wākea so significant in Hawaiian culture?

### 2. Introduce the Papahānaumokuākea Marine National Monument to students.

- Write the name, Papahānaumokuākea, on the board and help students to pronounce it and understand what the different parts of the name mean (see Teacher Background Information).
- Ask students to relate the monument’s name to the story about the gods and discuss the significance of the name.



- Introduce the term “wahi pana” - place of great cultural significance and discuss why the monument is such a special place.
  - Distribute **student journal - 3** and ask students to complete it with their reflections about Papahānaumoku and Wākea.
- 3. Introduce the class book project about the national monument.**
- Have students generate some ideas about what should be included in their book. Suggest that they combine ideas from lesson 1 and from new sources such as the “Safe Haven” DVD.
- 4. Ask students to take notes for their book as they view the “Safe Haven” DVD (approximately 5 minutes in length).**
- If needed, have students view the program more than once so that they can take adequate notes.
  - Ask students what makes the monument such a special place. List their responses on chart paper or on the board and have students categorize them. Their responses might include:
    - The monument is home to ancient Hawaiian cultural sites and it’s a place where Native Hawaiians can reconnect to their ancestors and their gods.
    - It is the largest remote reef ecosystem on the planet.
    - Approximately one-quarter of all the plants and animals in the monument are unique (endemic) to that place.
    - It is the largest protected marine area in the world.
    - It is a vast wilderness that is being protected for people today and generations to come.
- 5. Distribute and review student journal - 4 and begin working on books.**
- Discuss making sections for the book around categories, such as cultural significance, plants and animals, location, and protection.
  - Ask students to choose a section of the book they would like to work on and have each section team meet to discuss how they will work together and what each student’s contribution will be.
  - Ask students to complete **journal - 4**. Review their sketches and plans.
  - Use the photo CD provided with this teacher’s guide as a source of photographs to help students with their illustrations.
  - Also refer students to the Papahānaumokuākea web site: <http://www.hawaiiireef.noaa.gov/welcome.html>. for additional information about the monument.
- 6. Complete the book and share it with others.**
- Review student group’s sections of the book and oversee its completion.
  - Ask for volunteers to construct a cover and a title page for the book.
  - Have students share the book with other classes in the school. They could read it to younger students and display it in the school library.
- 7. Discuss students’ artwork and their completed project.**
- Ask students to describe how their artwork demonstrates the cultural or scientific significance of Papahānaumokuākea.
  - Discuss the value of laulima (cooperation) and what students found most rewarding and challenging as they worked together on this project.

## Extended Activity

Challenge students to conduct additional research about the Papahānaumokuākea Marine National Monument. Have them visit the web site: <http://www.hawaiiireef.noaa.gov/welcome.html> and download the Citizen’s Guide. Ask them to identify the government agencies that cooperatively manage the Monument and what they are doing to care for the resources.



## Papahānaumoku and Wākea

By Kimo Armitage

Papahānaumoku and Wākea are among the descendants of Pō. Papahānaumoku is a glorious woman, and she attracts the attention of Wākea, a magnificent man.

Papahānaumoku means “Papa who gives birth to islands,” a name she aptly deserves because the first child born from her union with Wākea is the island of Hawai‘i.

Papahānaumoku and Wākea are inseparable, and they spend entire days and nights together. Soon the next child born to them is Maui, who is followed by Kaho‘olawe. Kaho‘olawe is also known as Kanaloa because he is born in the shape of a porpoise.

Although Papahānaumoku and Wākea are still married and love each other deeply, Papahānaumoku one day decides to travel to Kapakapakaua, a place in Tahiti. A lonely Wākea seeks the comfort of another woman and meets the beautiful Ka‘ula. Ka‘ula and Wākea have a child whom they name Lāna‘ika‘ula, a red island.

Wākea meets another woman named Hina. He lives with her and has another child that is born an island. Molokainuihina. Wākea lives with Hina and Ka‘ula. Papahānaumoku learns of her husband’s two new wives.

Papahānaumoku is in Tahiti when she hears the shrill cry of a plover named Laukaula, who is making his yearly journey to warmer weather. Laukaula tells Papahānaumoku about Wākea and his two new wives, and Papahānaumoku is furious with jealousy. She sails immediately from Tahiti and confronts her husband. Wākea cannot deny his two new wives and his two new children, so Papahānaumoku decides to make him jealous by finding a new love of her own.

Papahānaumoku meets a very young and virile man, Lua. They live together as man and wife, and she soon gives birth to another island, O‘ahualua. Yet Papahānaumoku cannot deny the love she still feels for Wākea and Wākea cannot deny the love he still has for Papahānaumoku. They abandon their lovers and reconcile their love for each other. Soon Kamawaeluanihoku, also known as Kaua‘i, is born, followed by the next child, Ni‘ihau.

This is how the Hawaiian Islands were created. For a while, all is calm as Papahānaumoku and Wākea care for their island children.

Reprinted with permission from: Armitage, K. (2005). *Akua Hawai‘i: Hawaiian Gods and Their Stories*. Honolulu, HI: Bishop Museum Press.





Name \_\_\_\_\_ Date \_\_\_\_\_

## Creating a Class Book About Papahānaumokuākea

Laulima! Work together with classmates to create a class book about the Papahānaumokuākea Marine National Monument.

1. List your ideas about what makes this national monument sacred and significant and share them with the class.
  
2. Categorize the class list into sections for your class book.
3. Chose a section of the book to work on: \_\_\_\_\_
4. Meet with other students who will work on the book section with you. Complete a plan for your group's book section:
  - a) Summarize the content your group's section of the book will cover.

b) Sketch your page (including your text) in the box. Share it with your group and your teacher. Then carefully create the page on a separate sheet.

5. Make your book! Combine your finished page with others in your group. Then combine all of the sections to create a class book.
6. Share your book with others to spread the word about what makes the Papahānaumokuākea Marine National Monument such a special place.







# Volcanoes on Stage

## How does a Hawaiian volcano change as it ages?

### Hawai'i DOE Standard Benchmarks

#### Grade 4

**Science 8: Physical Earth and Space Sciences:** Earth and Space Science - Forces That Shape the Earth

- **SC.8.4.1** Describe how slow processes sometimes shape and reshape the surface of the Earth.
- **SC.8.4.2** Describe how fast processes (e.g., volcanoes, earthquakes) sometimes shape and reshape the surface of the Earth.

#### Grade 5

**Science 2: The Scientific Process:** Nature of Science - Unifying Concepts and Themes

- **SC.5.2.1** Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world.

#### Grades 4 - 5

**Language Arts 4: Writing:** Conventions and Skills - Range of Writing

- **LA.4.4.1** and **LA.5.4.1** Write in a variety of grade-appropriate formats for a variety of purposes and audiences, such as narratives that follow a plot and describe a setting and characters or pieces to reflect on learning and solve problems.

### Key Concepts

- Most Hawaiian volcanoes go through 10 stages beginning with the deep submarine stage and ending with a guyot.
- Stream/water, wind, and wave action on high islands will eventually erode all volcanic rock.
- The high volcanic islands slowly sink and erode away, and corals continue to grow, eventually forming atolls.

### Activity at a Glance

Groups of students produce story boards and scripts that creatively depict the stages of Hawaiian volcanoes.

### Time

3 - 4 class periods

### Assessment

Students create scripts and story boards to:

- Describe how the surface of the Earth is shaped and reshaped through slow processes (e.g., waves, wind, water, ice).
- Describe how fast processes have shaped and reshaped the Hawaiian Islands.



## Hawai'i DOE Rubric

Advanced	Proficient	Partially Proficient	Novice
Science Grade 4			
Use evidence to explain how slow processes have shaped and reshaped the surface of the Earth.	Describe how the shaping and reshaping of the Earth's land surface is sometimes due to slow processes.	Provide examples of the shaping and reshaping of the Earth's land surface due to slow processes.	Recognize that the shaping and reshaping of the Earth's land surface is sometimes due to slow processes.
Use evidence to explain how fast processes have shaped and reshaped the surface of the Earth.	Describe how the shaping and reshaping of the Earth's land surface is sometimes due to fast processes.	Provide examples of the shaping and reshaping of the Earth's land surface due to fast processes.	Recognize that the shaping and reshaping of the Earth's land surface is sometimes due to fast processes.
Science Grade 5			
Consistently select and use models and simulations to effectively represent and investigate features of objects, events, and processes in the real world	Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world	With assistance, use models or simulations to represent features of objects, events, or processes in the real world	Recognize examples of models or simulations that can be used to represent features of objects, events, or processes
Language Arts Grades 4 - 5			
Insightfully adapt writing to grade-appropriate formats for a variety of purposes and audiences.	Adapt writing to grade-appropriate formats for a variety of purposes and audiences.	Write with some adaptation to grade-appropriate formats for a variety of purposes and audiences.	Write with little adaptation to grade-appropriate formats for a variety of purposes and audiences.

Source: Adapted with permission from: 'Ōhi'a Project © Bishop Museum/Moanalua Gardens Foundation

## Vocabulary

shield-building – formation of a gently sloping volcano in the shape of a flattened dome that is built almost exclusively of lava flows

caldera - a volcanic crater more than one mile in diameter formed by the collapse of the volcano's summit

capping – stage in the evolution of a typical Hawaiian volcano during which rocks build a steeply, sloping cap on the main shield of the volcano. Eruptions are less frequent, but more explosive. The summit caldera may be buried.

erosion – wearing away of the land by the action of water, wind, or ice

secondary activity – also referred to as “rejuvenation”; renewed volcanic activity that sometimes occurs after the bulk of the island is formed and the volcano has experienced considerable erosion

atoll – a ring-shaped coral reef or string of coral islands, usually enclosing a shallow lagoon

guyot – a flat-topped submerged seamount

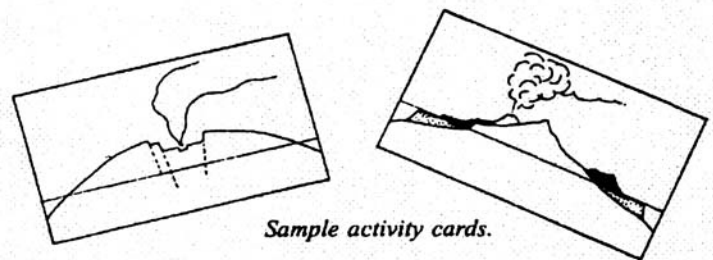
Definitions adapted from: <http://volcano.und.nodak.edu/vwdocs>, [www.soton.ac.uk/~engenvir/glossary.html](http://www.soton.ac.uk/~engenvir/glossary.html), and [www.nationalgeographic.com/wildworld/glossary.html](http://www.nationalgeographic.com/wildworld/glossary.html)

## Materials

- volcanic stage picture cards (provided)
- stage description cards (provided)
- student journals 5 - 6 (provided)
- maps of the Hawaiian Islands



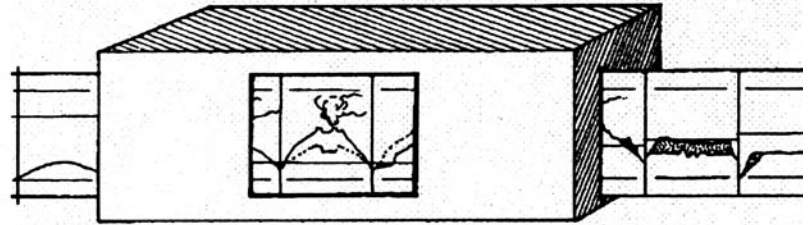
- scissors
- color markers
- staplers
- shoe box
- 2 large sheets of oak tag board
- glue or rubber cement
- transparent tape
- 9x12 sheet of construction paper for each student



*Sample activity cards.*

## Advance Preparation

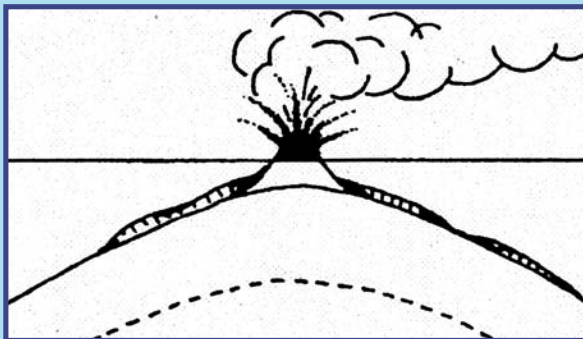
- Make a story board viewing box. Cut a narrow slit on each side of a shoe box or use a poster board. The slits should be slightly taller than the cards. Cut window in the front of the box large enough for one activity card to show through and at the same level as the slits on the sides of the box.
- Create a story board by cutting out and gluing the volcanic stage picture cards (in correct sequence beginning with the submarine stage) onto a strip of oak tag. Allow a 15 cm (6 in) space at the beginning of the story board as a leader. (See illustration of story board viewing box above.)
- Copy student journals 5 - 6 for each student.
- Copy the volcanic stage picture cards and stage description cards pages for each student. Make an extra copy of the picture cards for your demonstration and for each student group's demonstration.



*Story board viewing box.*

## Teacher Background Information

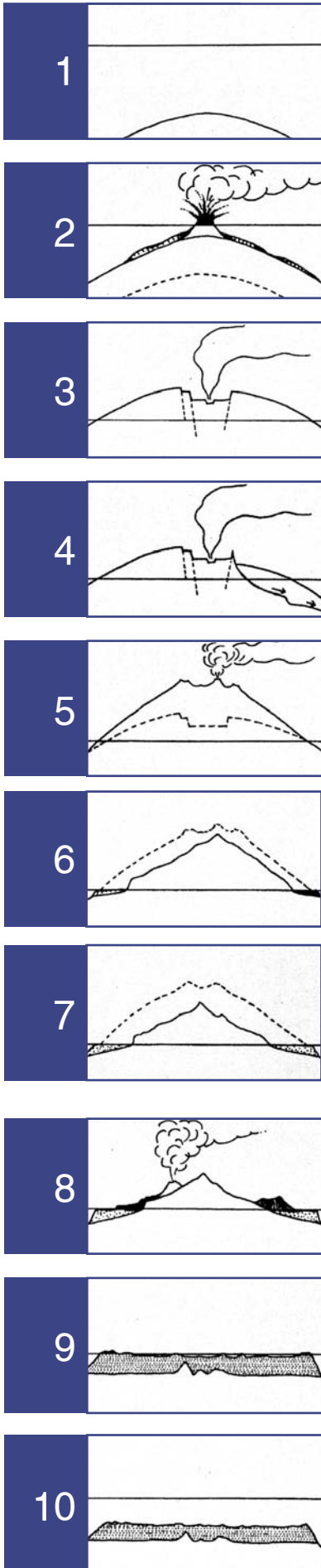
### Island Ages



Compared to the 4.5 billion year-old Earth, the Hawaiian Islands are very young. Kaua'i emerged above the ocean surface only about 5 million years ago. Kure, the oldest island in the Northwestern Hawaiian Islands, is about 27.7 million years old. Beyond Kure is a chain of seamounts beneath the ocean surface. The oldest Emperor Seamount may have been a high volcanic island approximately 75 million years ago.

The approximate ages of volcanoes on the main Hawaiian Islands are listed on the student journal sheet that accompanies this activity. The youngest of the volcanoes, Lō'ihi also known as Kama'eahu, is still approximately 950 m (3,000 ft) below sea level. It will most likely be thousands of years before Lō'ihi emerges to form the next Hawaiian island.





## Volcanic Stages

Most Hawaiian volcanoes progress through a series of stages, including shield-building, cap formation, erosion, and rejuvenation. Hawaiian volcanoes typically pass through ten stages, although the erosion, reef growth, and rejuvenation, or secondary activity phases, occur simultaneously. Present landforms provide examples of these stages.

### Stages

### Examples in present landforms

- |                                      |   |
|--------------------------------------|---|
| 1. Deep submarine                    | Lō'ihi (Kama'ehu)   |
| 2. Shallow submarine                 | Lō'ihi in thousands of years                                    |
| 3. Shield-building                   | Kīlauea and Mauna Loa   |
| 4. Landslide                         | Kīlauea? and landslide remnants on ocean floor                  |
| 5. Capping                           | Mauna Kea   |
| 6. Erosion                           | Kohala, W. Maui, E. Moloka'i, Ko'olau, Wai'anae, Kaua'i, Lāna'i |
| 7. Reef growth                       | W. Maui, E. Moloka'i, Ko'olau, Wai'anae, Kaua'i, Lāna'i         |
| 8. Rejuvenation (secondary activity) | W. Maui, E. Maui, Haleakalā, Ko'olau, E. Moloka'i, Kaua'i       |
| 9. Atoll                             | Kure Atoll, Midway (NWHI)                                       |
| 10. Guyot                            | many of the Emperor Seamounts                                   |

Hawaiian volcanoes do not necessarily go through all of these stages. The capping stage was skipped on the W. Moloka'i, Lāna'i, and Kaho'olawe volcanoes, and W. Moloka'i and Lāna'i have not experienced rejuvenation even though younger volcanoes have passed into this stage. Volcanic stages can be compared to young, middle-aged, or elderly people. A volcano has reached old age when the shield stops building and continues to erode. At this point, the volcano's smooth shield shape begins to "wrinkle" as streams cut into the shield's surface. It will continue to erode as the volcano matures.

From the study of Lō'ihi, scientists have discovered that a caldera may form when the volcano is still in the deep submarine stage and may be present throughout the shield-building stage as magma repeatedly withdraws and returns. A caldera is a crater more than 1.6 km (1 mi) in diameter that forms when the summit of a shield volcano collapses. During the main active shield-building stage, a caldera repeatedly collapses as magma withdraws, and refills as eruptions occur within it. However, some of our shield volcanoes have no visible caldera. Any evidence of calderas on the W. Moloka'i volcano or Hualālai on Hawai'i has been obscured by erosion or burial.



## Landslide Stage

Until a few years ago it was believed that erosion from rain and wave action was the primary destructive force in the aging of our Hawaiian volcanoes. Recent discoveries from sonar views of the sea floor around our islands have shed some fascinating new light on our volcanic past.

Recent sonar “pictures” have revealed vast talus (broken rock) deposits off shore of most of the high sea cliffs in the Hawaiian chain. These deposits, frequently at 5,488 meters (18,000 ft) depth in the trenches that parallel the island chain, are the result of great landslides that carried away up to a third of the above-sea-level mass of some of our shield volcanoes. Most of these slides probably occurred early in the final stages of the shield’s building and, in some cases, capping phase. (For more information about these giant landslides, visit the Moanalua Gardens Foundation web site at [mgf-hawaii.com](http://mgf-hawaii.com).)

## Capping Stage

The capping stage may occur when a volcano begins to move off the hot spot. At this time, less frequent and more explosive eruptions produce ash or cinder cones and viscous, slow-moving lava that builds up a steep-sided bumpy cap on top of the volcano. The viscous, alkalic capping lava is due to the nature of the hot spot. If you consider the hot spot as a cylindrical body of hot mantle material, rising due to buoyancy, the central part rises faster and the outside material rises more slowly. The faster the mantle material rises, the more it experiences rapid decompression and the greater the amount of melting that occurs. This produces the tholeiitic composition of the main shield-building stage lavas. On the edges of the hot spot, the material rises more slowly, melts to a lesser degree, and produces small volumes of alkalic lavas. These are the lavas that produce the bumpy surface of Mauna Kea on the island of Hawai‘i, which exemplifies this stage of a shield volcano.

As a volcano moves away from the hot spot, it progresses through a series of stages including erosion and reef growth and, sometimes, rejuvenation.

## Rejuvenation (Secondary Activity) Stage

Rejuvenation (renewed volcanic activity) sometimes occurs after the bulk of the island is formed and the volcano has experienced considerable erosion. Cones produced during this secondary activity are similar to the cones built along rift zones during shield building. Well-known examples of rejuvenation include Lē‘ahi (Diamond Head) Crater and Hanauma Bay on O‘ahu, and Kilohana Shield on Kaua‘i.

Scientists are unsure why older, eroding volcanoes become active again. The rejuvenation typically occurs after the plate has carried a volcano approximately 150 km (90 mi) away from the hot spot.

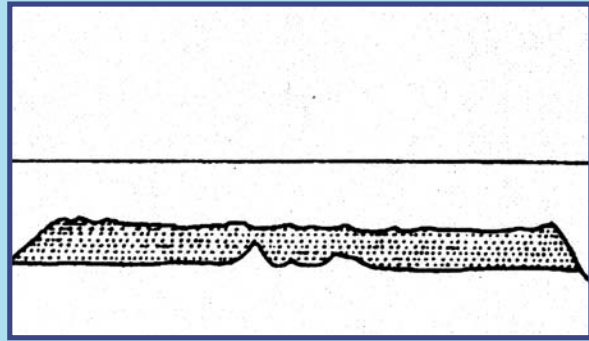
## Weathering and Erosion

Shield building ceases as a volcano moves off the hot spot, and weathering and erosion continue the slow process of wearing the island down. Erosion is the gradual wearing away of earth by water, wind, and ice. Hawaiian shield volcanoes are composed primarily of basalt, which is easily broken down by roots, wind, and rain. Streams are the primary source of erosion in Hawai‘i. Over millions of years, streams carve valleys out of the slopes of shield volcanoes and gradually carry bits of rock to the sea. Stream action, combined with the forces of waves, wind, and the gradual sinking of the islands, eventually reduces shield volcanoes to small lava remnants, like Mokumanamana (Necker Island) in the northwestern part of the island chain.



## The Final Stages

Gradually all traces of basalt are submerged beneath the sea and an island becomes an atoll—a lagoon with a fringing reef. But the island's story is not complete until the land is submerged beneath the sea. The movement of the plate eventually carries the atoll into colder water where the coral cannot survive. When the coral dies, only a guyot (a flat-topped submerged seamount) remains of the former high volcanic island.



## Teaching Suggestions

- 1. Introduce local landforms to students and ask them how they think these craters, cliffs, or cones were formed.**
  - Ask students to think like a detective and make a list of questions they would ask or observations they would make to discover the life history of a landform such as Diamond Head. For example: What is it made of? If it is layered, which layers came first, i.e., which layers are older? What has happened to it since it was formed?
  - Discuss possible ways these features were formed.
- 2. Ask students to guess the age of their home island. Write their guesses on the board.**
  - To help them put the age of the island into perspective, compare the age of the Earth (4.5 billion years) to a nine-month school year. With this scale, each one million years would be equal to 1 hour and 24 minutes.
  - Refer to the student data sheet and ask students to compute an average age for the island and use the “school-year” scale to figure how old their island would be. (O’ahu would be 4-5 hours old.)
- 3. Discuss the age of the main Hawaiian Islands compared to the age of the Earth.**
  - Help students to understand that the Islands are relatively young and that their growth through volcanic eruptions is a fast process.
  - Compare this to the relatively slow processes (subsidence and erosion) that cause the islands to gradually decrease in size.
  - Conduct a discussion about the island stages using the following questions:  
Discussion Questions
    - Do you think islands have a life cycle like living things do? What processes cause them to grow up? What processes cause them to age and decrease in size?
    - Where is the youngest of the Hawaiian volcanoes forming? (On the ocean floor south of Hawai’i Island.)
    - What is the difference in age between Mauna Kea, which is 400,000 years old, and the oldest volcano that is still above sea level—Kure Atoll, which is about 30 million years old? What are the slow processes that changed Kure from a tall volcano to a flat atoll?
- 4. Distribute the student activity sheet of 10 volcanic stages cards.**
  - Have students cut the picture cards out and arrange them in the order that they believe shows the stages of the youngest to the oldest volcano. (See Extended Activities for information about the *Exploring the Islands* telecast that supports this activity.)



**5. Distribute the stage description activity sheet to students.**

- Have students cut the cards out and try to match them to the pictures of the volcanic stages.
- Challenge students to use these descriptions to check their sequence of the volcanic picture cards.
- Check students' arrangement of the cards and then work with them to arrange the stages in the correct sequence.

**6. Set up the viewing box and explain the process for putting “volcanoes on stage.”**

- Place the story board viewing box in front of the class. Demonstrate how the sample story board was made and pull it through the opening in the box.
- Emphasize the correct sequence of the cards to reinforce students' work to arrange their cards.

**7. Distribute student journal - 5 and review the tasks with students.**

- Working individually or in groups, have students pick one volcano to be the subject of their story board.
- Use a map of the Hawaiian Islands (or the one provided on their sheet) and have students locate their volcano on the map. Note: A large colorful map of the Hawaiian Islands that shows the topography of the volcanoes and the ocean floor can be viewed online at: <http://soundwaves.usgs.gov/2006/01/bathyLG.jpg>.
- For additional background information on each island, refer students to pages 1-12 from *The Hawaiians of Old* (Dunford, Betty. 1987. *The Hawaiians of Old*. Bess Press, Honolulu, HI).

**8. Help students working in groups to divide up tasks.**

- Students can select tasks such as researching, script writing, illustrating and presenting.
- Remind students that all story boards should depict current stages of volcanoes accurately but creative art and writing skills should be encouraged!
- Help students to see how storytelling - having a volcano take on a “personality” as it matures from infancy through adolescence, maturity and old age - is one way to help us learn about geology and practice creative writing.

**9. Ask students to put their volcanoes on stage and present their story boards to the class.**

- Presenters can omit the volcano's name and see if others can determine the identity.
- Discuss each group's presentation and compare the stories of the different volcanoes.

**10. Distribute and review student journal - 6 and have students complete the assessment activity.**

- Challenge students to work individually to define new vocabulary words and use the words in their stories about how a volcano changes as it ages.
- Give a 9” x 12” sheet of construction paper to each student. Have students glue the volcanic stage cards in order from youngest to oldest on the large sheet.
- Ask students to label each stage and write a descriptive sentence under each picture. Their descriptions should distinguish between the relatively fast processes describing how the volcanoes formed, and the slow processes describing how waves, wind and water have changed the surface of the volcanoes over time.



## Extended Activities

Tune into the *Exploring the Islands* Telecast: “Volcanoes on Stage” to provide students with additional information to support this activity. During the telecast, students from Liholiho Elementary School visit the southeast shoreline of O‘ahu where they meet an “old volcano” who shares stories about his life with them. Students model the stages of a Hawaiian shield volcano in sand and put on a volcano skit about the “life” of a shield volcano. Dr. Alex Malahoff dives in a submersible craft over Lō‘ihi, Hawai‘i’s youngest volcano, and looks through the eye of a camera to see strange geologic formations, steaming vents, and living things new to science. In class, students sequence volcanic stages cards as the show progresses. For information about air dates and ordering a tape of the program, see the DOE Teleschool Web site at: <http://www.mgf-hawaii.com/HTML/Television/distancelearning.html>

Read the book, *How Much Is a Million?* (Schwartz, David M. 1985. *How Much Is a Million?* Lothrop, Lee and Shepard Books.) Compare the ages of the Islands to the examples in the book.

Have students use the activity cards to make volcano flip booklets.

Each group of students could use creative dramatics to demonstrate the stages of a volcano on one of the Islands. Using hand and arm motions, students could demonstrate magma rising and a shield shape being created. They could drop arms to depict the collapse of the caldera and then create a bumpy cap with their hands. They could sink to the floor as erosion occurs and another group of students could “swim” to the island and join hands to form a coral reef around it.

Students could develop a time line depicting the ages of the main Hawaiian Islands. The time line could be created with string and a paper tag label for each island. Students will need to experiment with various scales until they can represent millions of years in a manageable space! If a scale of 1 m equals 100,000 years were used, a time line including Kaua‘i would stretch 47 m (154 ft)! The time line could be laid out in the schoolyard or in the cafeteria and shared with other classes.





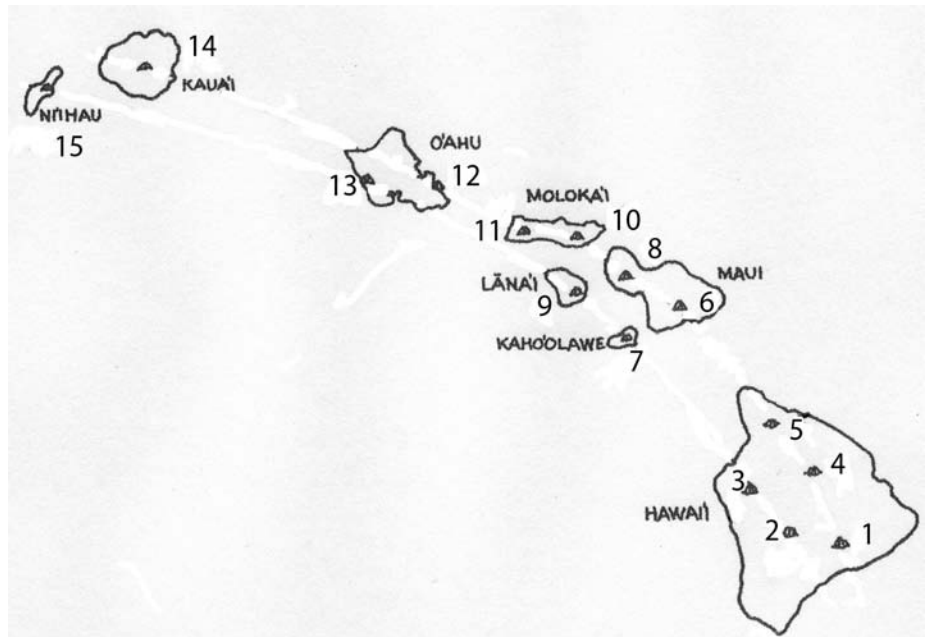
Some of the volcanoes in Hawai'i have not exactly followed the stages as shown in the volcanic stages cards. The W. Moloka'i volcano skipped the capping stage. And even though younger volcanoes have had secondary activity, Lāna'i and W. Moloka'i have not!

Volcano	Approximate Age (millions of years)	Current Stage
Lō'ihi (Kama'ehu)	still forming	submarine
1. Kīlauea	still forming	shield building
2. Mauna Loa	still forming	shield building
3. Hualālai	may still be forming	capping
4. Mauna Kea	0.4	capping
5. Kohala	0.5	capping
6. E. Maui (Haleakalā)	0.7	rejuvenation (secondary activity)
7. Kaho'olawe	1.0	rejuvenation (secondary activity)
8. W. Maui	1.0	rejuvenation (secondary activity)
9. Lāna'i	1.5	erosion
10. E. Moloka'i	1.5	rejuvenation (secondary activity)
11. W. Moloka'i	2.0	erosion
12. Ko'olau	2.5	rejuvenation (secondary activity)
13. Wai'anae	3.5	rejuvenation (secondary activity)
14. Kaua'i	4.7	rejuvenation (secondary activity)
15. Ni'ihau	4.9	rejuvenation (secondary activity)
16. Nihoa (not on map)	7.2	erosion
17. Midway (not on map)	27.7	atoll

1. Locate the island your group has selected on the map. Match the number of the volcano in the list above to the number on the map.

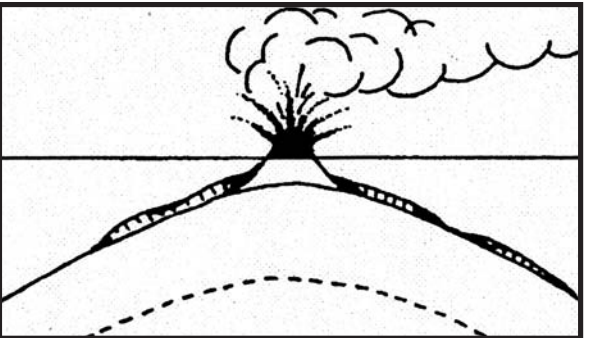
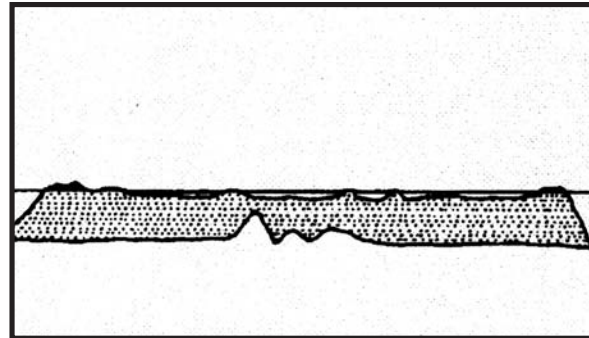
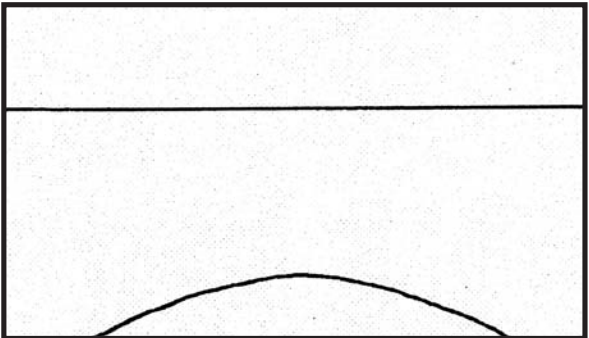
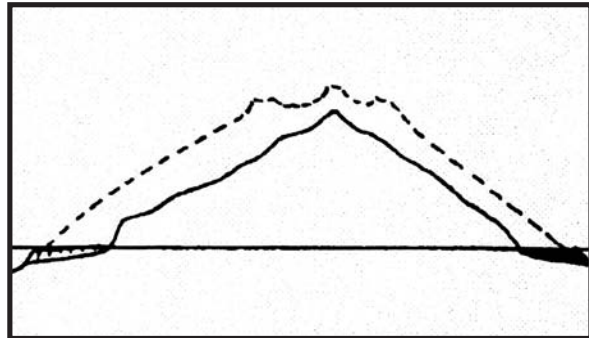
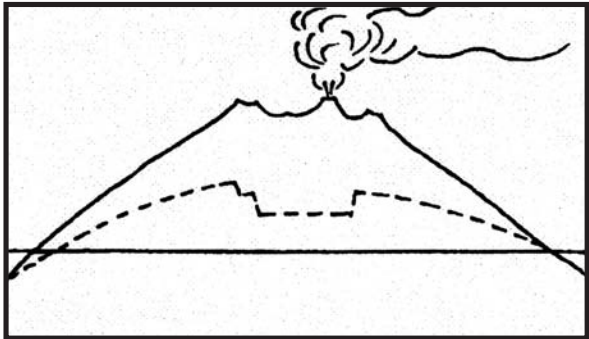
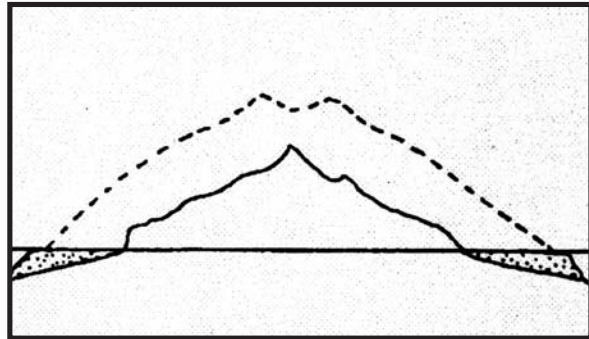
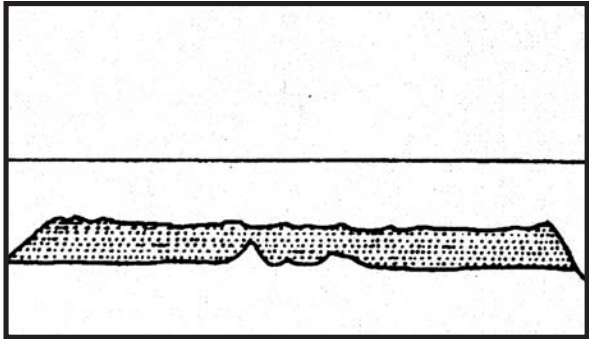
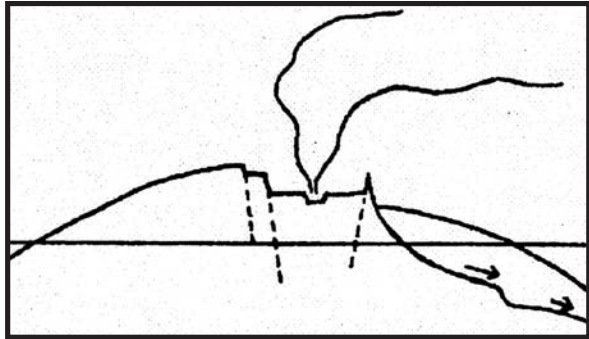
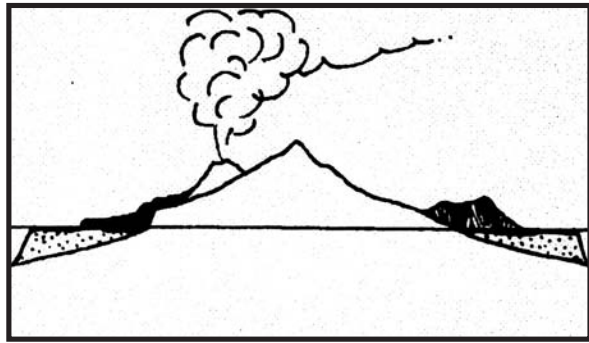
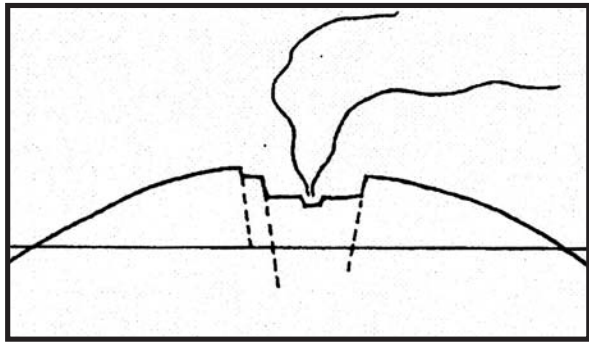
2. Make a paper story board showing the stages of one of the volcanoes on your chosen island.

3. Be creative with your story! You could try comparing the volcano to a human. Is your volcano in infancy, childhood, adolescence (teenage), middle or old age? Give the volcano a personality and write a script that will give your classmates clues to the volcano's identity.



# Volcanoes on Stage

# Volcanic Stage Picture Cards



Source: 'Ōhi'a Project © Bishop Museum/Moanalua Gardens Foundation



# Volcanoes on Stage

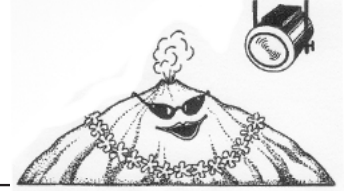
# Stage Description Cards

Cut out these cards and match them to the volcanic stage picture cards.

<p>Deep Submarine Stage - the youngest stage in a volcano's life when it is still deep below the ocean surface. Our youngest volcano, Lō'ihī, is still in this stage. It is about 3,000 feet below sea level.</p>	<p>Erosion Stage - this is the stage when the island begins to show its age. It wrinkles! These "wrinkles" form when streams cut valleys into the volcano's surface. Water, wind and waves all wear down the volcano, carrying bits of rock and soil out to sea. The volcano also gradually sinks, which makes it appear smaller.</p>
<p>Shallow Submarine Stage - this is second stage in a volcano's life. Lō'ihī will be in this stage thousands of years from now. When it breaks through the ocean surface, it will be the next main Hawaiian island!</p>	<p>Reef Growth Stage - this is the stage where coral reefs build up around the island. The reefs provide homes for marine plants and animals and they help to protect our shorelines from wave erosion.</p>
<p>Shield-building Stage - this is the stage when the volcano is still pretty young. It is above sea level and may have a caldera. The caldera is a crater more than a mile in diameter. It forms when the summit of the volcano collapses. Which Hawaiian volcanoes are in this active stage now?</p>	<p>Rejuvenation Stage - is a stage when the volcano comes back to life. The volcano erupts again after being dormant. These eruptions can produce fantastic cones like Lē'ahi (Diamond Head) Crater! Not all volcanoes will go through this stage.</p>
<p>Landslide Stage - this is a very exciting stage! Scientists have discovered huge deposits of broken rock on the ocean floor around our islands. These deposits are from massive landslides. The landslides can take away as much as a third of a volcano!</p>	<p>Atoll Stage - is a stage when the volcano is in old age. At this stage all of the basalt rock is beneath the sea. What remains is an atoll--a lagoon with a fringing reef.</p>
<p>Capping Stage - this stage may happen when the Pacific Plate moves the volcano away from the hot spot. It doesn't erupt as much and the eruptions are more explosive! These eruptions produce ash or cinder cones. The lavas are slow moving and they build up a steep-sided bumpy cap.</p>	<p>Guyot Stage - is the last stage in the volcano's life. By this time, the Pacific Plate has carried the old volcano into colder water. The coral cannot survive. When the coral dies, all that is left is a guyot (a flat-topped submerged seamount).</p>



## New Discoveries



Name \_\_\_\_\_ Date \_\_\_\_\_

1. What have you discovered about how Hawaiian volcanoes change as they age? Define the vocabulary words below.

shield-building –

caldera –

capping –

erosion –

secondary activity – also referred to as “rejuvenation”

atoll –

guyot –

2. On the back of this page, write a short story about a volcano’s life. Describe the stages that the volcano goes through from birth to old age. Use your new vocabulary words in your story.

3. On a large sheet of paper, glue the volcano stage picture cards in order from the youngest to the oldest stage. Write a caption beneath each picture to describe that volcanic stage. Identify which stage represent fast processes and which stages represent slow processes.



# Wayfinding

**What do wayfinding and voyaging reveal about Hawaiian culture and the ability to navigate to distant islands?**

## Hawai'i DOE Standard Benchmarks

### Grade 4

**Social Studies 6: Cultural Anthropology:** Systems, Dynamics, and Inquiry - Cultural Systems and Practices

- **SS.4.6.1** Explain how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.

### Grades 4 - 5

**Language Arts 4: Writing:** Conventions and Skills - Range of Writing

- **LA.4.4.1** and **LA.5.4.1** Write in a variety of grade-appropriate formats for a variety of purposes and audiences, such as pieces to reflect on learning and solve problems.

## Nā Honua Maui Ola 1 - 8

Incorporate cultural traditions, language, history, and values in meaningful holistic processes to nourish the emotional, physical, mental/intellectual, social, and spiritual well-being of the learning community that promote healthy maui (life, spirit) and mana (divine power).

- Learners are able to understand and appreciate the importance of Hawaiian cultural traditions, language, history, and values.

## General Learner Outcome

**Community Contributor:** The understanding that it is essential for human beings to work together

- **GLO 2** Cooperates with and helps and encourages others in group situations.

## Key Concepts

- Pacific navigators have a close relationship to the natural world and are highly skilled at wayfinding—the art of using stars, ocean swells, clouds, winds, and seabirds to navigate to distant islands.
- Practicing Hawaiian values such as laulima (working together), kuleana (taking responsibility), and mālama (caring) is essential to successful voyaging.

## Activity at a Glance

Students read about voyaging and play a game in which they become voyagers on a canoe trying to reach a distant island.

## Time

3 class periods

## Assessment

Students:

- Illustrate a traditional voyaging canoe and the wayfinding clues that the ho'okele (navigator) uses to find distant islands.
- Write a journal reflection describing: a) how the canoe, traditional wayfinding, and values are elements of Hawaiian culture and b) how voyaging contributes to the preservation of culture.
- Write journal entries for each day of an imaginary journey to the NWHI and answer the unit essential question (Unit Culminating Activity).



## Hawai‘i DOE Rubric

Advanced	Proficient	Partially Proficient	Novice
Social Studies Grade 4			
Analyze how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.	Explain how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.	Explain that language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.	Explain, with assistance, how language, traditional lore, music, dance, artifacts, traditional practices, beliefs, values, and behaviors are elements of culture and contribute to the preservation of culture.
Language Arts Grades 4 - 5			
Insightfully adapt writing to grade-appropriate formats for a variety of purposes and audiences.	Adapt writing to grade-appropriate formats for a variety of purposes and audiences.	Write with some adaptation to grade-appropriate formats for a variety of purposes and audiences.	Write with little adaptation to grade-appropriate formats for a variety of purposes and audiences.

## Vocabulary

ho‘okele – navigator

kuleana – responsibility

laulima – working together

mālama – to care for

navigate – to steer a course

wayfinding – the art of navigating without instruments, using clues in the environment

## Materials

- Navigating Change video segment: “The Voyage” (provided)
- 2 student readings (provided)
- chance cards (provided)
- canoe cut-out (provided)
- Student Assessment Overview (provided in Unit Introduction)
- culminating activity rubrics (provided in Unit Introduction)
- student journal - 7
- box of paper clips or other small tokens
- index cards (2 for each student)
- drawing paper
- scissors
- colored markers

## Advance Preparation

- Make a copy of student journal - 7 for each student.
- Make a copy of the student readings on voyaging and the canoe cut-out for each student.
- Copy, cut, and laminate the chance cards.
- Copy the culminating activity rubrics from the Unit Introduction.



## Teacher Background Information

Pacific navigators are highly skilled at wayfinding—the art of navigating without instruments. Having perfected this art, they were able to guide voyaging canoes across vast distances in the Pacific, using only their minds and a keen sense of nature to guide them. At night, wayfinding involves knowing the patterns of stars and using the stars and the moon as a map to stay on a course. During the day, the navigator observes the ocean swells at sunrise and sunset and uses the swells to guide the canoe when the sun is too high in the sky to provide direction. Navigators are in tune with the stars, the winds, the swells, the moon, and the habits of seabirds. The amazing long distance voyages that have been carried out by Pacific islanders testify to the outstanding achievements of the ho’okele (navigators) and the voyagers

who sailed the wa’a kaulua (double-hulled canoes).

The voyagers on a canoe each have a kuleana (responsibility) that is vital to the success of the voyage (see student reading “Kuleana of Hōkūle‘a Crewmembers”). During a voyage, crewmembers become an ‘ohana (family) living together in very close quarters with limited resources. They laulima (work together) and mālama (care for) each other and the canoe. The assessment activity for this lesson asks students to consider the importance of these values for surviving on canoes as well as for living on islands. Like voyagers on a canoe, islanders have finite resources and we need to work together to care for those resources and for one another. As students continue on the voyage of Navigating Change they will explore ways to make this vision a reality.

## Teaching Suggestions

### 1. Show the first Navigating Change video segment, “The Voyage.”

- Discuss what students learned from the video.

#### Discussion Questions:

- How are the NWHI different from the main Hawaiian Islands?
- What was the purpose of the Hōkūle‘a voyage to the “kūpuna” islands?
- What do you think it might be like to be part of the crew on a voyage?
- How do you think Hawaiian navigators find distant islands using only clues in nature?

### 2. Distribute the “Wayfinding” reading to each student.

- Have students take turns reading aloud.
- Discuss the reading.

#### Discussion Questions

- How are voyaging canoes and wayfinding an important part of Hawaiian culture?
- What do you think are the most important clues that a navigator uses in wayfinding? Why?
- How do voyagers help one another during a voyage?

### 3. Ask students to develop game cards based on the student reading.

- Distribute index cards and ask each student to develop two questions related to the main content of the reading (one on wayfinding and one on life on board). To be sure that all content is covered, consider dividing the class into groups and assigning sections of the reading to each group to cover.
- Have them write a question and the answer on each card and include their name so that you can assess their comprehension of the material.
- Explain that these cards will be collected the following day and used as voyaging cards in a wayfinding game with the class.
- Ask students to place their wayfinding questions in one pile and their life on board questions in another pile. Sort through the questions and remove duplicates.

### 4. Conduct the wayfinding game (see instructions at the end of this activity).



## 5. Discuss what students learned from the game.

### Discussion Questions

- What was the most challenging part of the voyage?
- How were the chance cards similar to what might really happen on a voyage?
- If you sailed 1,200 miles northwest of the main Hawaiian Islands where would you end up? (Kure atoll at the end of the NWHI chain)

## 6. Distribute the reading, “Kuleana of Hōkūle‘a Crewmembers” and journal - 7.

- Assign the reading as homework and ask students to complete the reflection and drawing assessment activities on **student journal - 7**.

## 7. Ask students to share some of their writing and illustrations.

- Discuss how students would compare living on a canoe with living on an island.
- Ask students to identify the values that are important to successful voyaging (e.g., mālama, kuleana, laulima). Summarize how values and practices related to wayfinding and voyaging are an important part of Hawaiian culture.

## 8. Have students complete their culminating projects to answer the unit essential question.

- Review the criteria for the unit project in the Student Assessment Overview (provided in the Unit Introduction).
- Review the rubric provided to guide students in completing their projects.
- When projects are completed, encourage students to share their journals with their classmates and compare what they “saw” on their imaginary voyages.

**Unit Culminating Activity:** Students take an imaginary journey on a canoe from their island to Kure. They write a journal entry about each day of the voyage. Their journals should:

- Answer the unit essential question.
- Identify their role on the canoe.
- Include a map showing the route the canoe sails, including each island the canoe passes.
- Describe each island the canoe passes and how the island has aged from waves, wind, and water.
- Explain how Hawaiian values and practices guide their actions on the canoe.

## Extended Activities

Take the students on a field trip through the Hawai‘i Maritime Center on O‘ahu or to the halau wa‘a of the voyaging canoe on your island to learn more about voyaging. For information contact:

- Nā Kalai Wa‘a Moku o Hawai‘i, Kamuela, Hawai‘i 808/885-9500
- ‘Aha Pūnana Leo, Hilo, Hawai‘i 808/966-5453 Chad Kalepa Bertelman, Maile Enos
- Hui o Wa‘a Kaulua, Lāhaina, Maui 808/667-4050
- Hawai‘i Maritime Center: <http://www.bishopmuseum.org/exhibits/hmc/hmc.html> 808/523-6151.
- Polynesian Voyaging Society, Honolulu 808/536-8405
- Friends of Hōkūle‘a and Hawai‘iloa, Honolulu 808/843-8414
- Nā Kalai Wa‘a Moku o Kaua‘i, Līhu‘e, Kaua‘i 808/245-8555 Dennis Chun

Challenge students to use a measuring tape and chalk to draw an outline of the *Hōkūle‘a* voyaging canoe on a large outdoor surface (basketball court or playground). The canoe is 17’6” wide and 62’4” long. Have them outline the deck, which is located on top of the hulls and is about 9’ by 50’. (See picture of the canoe on the Student Reading provided with this activity.) Ask 12 students to assemble on the deck and imagine spending an entire voyage in such a small area. Discuss the values that would be critical to working together in the confined space of the canoe.

## Reference

Pukui, Mary Kawena. (1983) *‘Ōlelo No‘eau: Hawaiian Proverbs and Poetical Sayings*. Honolulu, HI: Bernice P. Bishop Museum Special Publication No. 71. Bishop Museum Press.





# Wayfinding Game Instructions

**Objective:** To reach an imaginary island 1,200 miles away before the food supplies run out on the canoe.

## Game Materials

- voyaging cards (created by students)
- chance cards (provided)
- canoe cut-outs (created by students)
- box of paper clips or other small tokens

## Introduction

Invite students to go on an imaginary voyage to find a distant island 1,200 miles to the northwest. Their canoes should travel 200 miles per day if they are able to find their way (by answering voyaging questions correctly). On board each of their canoes they have enough food and water for an 8-day voyage (2 extra days). Each turn represents a day, so they have 8 turns to reach their destination before their water and food run out.

## Pre-game Preparation

- Select voyaging cards from those that students have created (eliminate cards that ask for the same information).
- Give the voyaging canoe cut-out sheet, scissors and markers to groups and ask each to create a cut-out of their voyaging canoe and give it a name.
- Draw a voyaging line on the board to represent 1,200 miles. Mark the line with six 200-mile increments to indicate a voyaging “day.”

## To Play

1. Voyagers tape their canoes to the board at the beginning of the voyaging line. The canoes will be sailing along the line (the course) to find the island 1,200 miles away.
2. Voyagers take turns answering a question on a voyaging card. (Teacher draws and reads card to class.) The crew consults and agrees on an answer within 60 seconds. If a correct answer is given, the canoe travels 200 miles along the voyaging line.
3. If a canoe crew answers a question incorrectly, they fail to find their way and will not move forward. In addition, they must draw a chance card and follow the directions on the card.
4. Each canoe crew receives 8 food/water tokens (paperclips or other items). Each token represents food and water supply for one day. Once a turn is taken, a day is over and the crew hands in one token. If all food and water tokens are used before the canoe reaches the island at the end of the 1,200-mile course, the canoe is out of the game.

## To Complete the Voyage

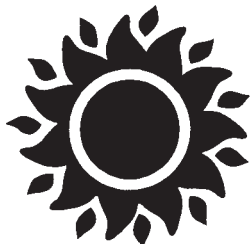
If the voyagers “sail” 1,200 miles (answer at least 6 voyaging cards correctly) before they run out of food and water, they reach the island and successfully complete the voyage!



## SKY

**Sun:** The sun rises in the east and sets in the west. The path the sun creates on the water at sunrise and sunset helps the navigator establish direction.

*Ulu o ka lā.*  
The sun grows.



Said of the light of sunrise just as the sun's rim touches the horizon. The morning sun is used for navigation to determine the primary direction of east. 'Ōlelo No'eau 2870

**Stars:** Most stars rise in the east and set in the west. Navigators use stars to establish direction.

**High clouds:** High clouds that stay in one place are a clue to locate an island. The clouds build up over a high island and stay there. When there are no islands nearby, the clouds move with the direction of the wind.

**Cloud colors:** When a cloud has a light green color on its underside it could be a clue that land is near. Clouds reflect the light green color of shallow water around an island. Low islands can be seen at sea from about 7 to 10 miles away.

## WIND

Winds affect speed and direction. Navigators estimate the speed of the wind. They also figure out the direction that the wind is coming from to help them stay on course.

## SEA

**Ocean swells:** Ocean swells are usually powered by prevailing winds and can be used to determine direction. When the pitch and roll of the canoe changes, it means the canoe is changing direction.

**Small waves:** When swells come in contact with land they are reflected back out to sea.

This creates turbulence or small waves coming from a particular direction that hit the canoe. This is a clue that land is near.

**Water colors:** Deep water is usually blue. A greenish color water indicates reefs and shallow water.



*Ke kai lipolipo polihua a Kāne.*  
The dark-blue ocean of Kāne.

The deep sea out of sight of land. 'Ōlelo No'eau No. 1729

## ANIMALS

**Seabirds:** Seabirds such as the manu-o-Kū (white tern) and the noio (noddy tern) fly out to sea during the day to catch fish. They return to land to rest in the evening. By following the direction that the birds fly in the evening, navigators can aim toward land. These birds are usually seen when the canoe is within 100 miles of the island. If voyagers spot the 'iwa bird it's not a sure sign that land is near. The young nomadic 'iwa birds will stay at sea for long periods of time. The 'iwa can help the navigator to predict the weather before heading out to sea as it prefers favorable wind conditions to be able to lift and soar.



*Lele ka 'iwa mālie kai ko'o.*  
When the frigate bird flies out to sea, the rough sea will grow calm.

A weather sign. 'Ōlelo No'eau No. 1979

**Floaters:** Other signs of land are driftwood, seaweed, animal life, or rubbish in the sea. When voyagers get close to land, the amount of "floaters" in the water increases.



## VOYAGING ON HŌKŪLE‘A

Hawaiians ceased long-distance, open-ocean voyaging centuries ago, so there were no examples of actual ancient voyaging canoes as models for the voyaging canoe Hōkūle‘a. Hawaiian artist Herb Kāne based the design of Hōkūle‘a on drawings of canoes made by artists and draftsmen employed by Captain Cook and other early explorers of the Pacific. Hōkūle‘a is much smaller than the 100-foot-plus Polynesian canoes seen by early European visitors. It was completed in 1975. It has:

- two 62-foot hulls
- eight ‘iako (crossbeams) joining the two hulls
- one pola (deck platform) lashed to the crossbeams between the two hulls
- rails along the decking
- two masts

### Hōkūle‘a: Star of Joy

The canoe was named for the star Hōkūle‘a (Arcturus), the brightest star in the northern hemisphere. “Hōkūle‘a” means “star of joy” or “clear star.” This star is the zenith star of Hawai‘i, which means it passes directly overhead in the night sky. It is a fitting name for the canoe, for the star may have been a guide star for navigators returning to the Islands from long voyages to the South Pacific.



## Daily Living Aboard Hōkūle‘a

“Once you go on the canoe, because it’s so small (40 square feet), you try to make it like one family.” —Snake Ah Hee, a 30-year veteran crewmember of Hōkūle‘a.



**Sleeping Quarters:** Sleeping quarters are tight. Individual spaces measure about six feet in length and three feet across. The sleeping areas are on both sides of the deck and are covered with canvas. Usually two crewmembers are assigned to each bunk. One person sleeps while the other stands watch. Personal belongings are stowed here. Each crewmember is allowed one 48-quart cooler. Beds are simply a board placed over the coolers, covered by a sleeping pad.

**Bathroom Facilities:** Going to the bathroom involves strapping a safety harness over your shoulders, hooking the harness to a safety line, and then leaning overboard to relieve yourself. Bathing is done either forward or aft of the canoe. Forward, you sit in a net slung between the two canoe hulls. Aft, you bathe in an open compartment, pulling saltwater up in a five-gallon bucket. You use a special sea soap, which makes bathing in saltwater refreshing. Because the canoe is so small, privacy is limited. But all crewmembers respect the needs of others. A curtain provides privacy for those going to the bathroom and bathing.

**Cooking:** Cooking is done in the center of the canoe. The galley, or kitchen, is a two-burner propane gas stove in a metal box. Once fresh food runs out, most of the food on board comes

out of a box or can. Fresh fish caught by the crew adds to the food supply. Each voyage has a designated fisher, who puts his trolling lines out off the back of the canoe every morning. On long trips, food is much more than a source of nutrition. Mealtime is one of the few times during the day that the entire crew is together on deck. On long days, meals are a highlight. When the weather is cold and rainy, a hot meal can do wonders.

**Water:** The canoe carries bottled fresh water for cooking and drinking. On an estimated 30-day voyage the canoe will carry enough water for 40 days at sea. If water supplies become too low, the captain can order that water be rationed. Crewmembers also store rain water for cooking and bathing.

**Free Time:** When crewmembers are off watch they rest, read, write in their journals, wash laundry, make music, or simply relax and enjoy being out at sea. Time can pass slowly, although it usually doesn’t. Being away from home for a long time can cause homesickness, especially for the new crew members. Older crewmembers help them to get through these times.

*Sources: Adapted from Yadao, Elisa. “Daily Living aboard Hokule‘a.” Education Kit: Navigating Change. Hawai‘i: PREL, State of Hawai‘i Department of Education, Department of Land and Natural Resources, NOAA, U.S., Fish & Wildlife Service, and Bishop Museum.*



To ensure that the canoe sails safely and efficiently, each person has a kuleana (responsibility). Both men and women can hold the positions. In the event of bad weather or an emergency, all of the crewmembers are expected to work together. The crew members function like an ‘ohana (family).

All jobs on the canoe are important to the safe sailing of Hōkūle‘a. A crewmember’s most critical responsibility is to realize that everyone depends upon him/her to carry out assigned duties and to work well as part of a team.

## **Sailmaster**

The sailmaster carries the overall responsibility for the canoe and crew. The sailmaster serves primarily as an advisor. The sailmaster has the final say on the canoe’s sailing course and on all canoe operations. He or she consults with the navigators and captain.

## **Ho‘okele (Navigator)**

The navigator determines the canoe’s course, sets the sailing strategy, and determines the direction in which the crew will sail Hōkūle‘a. He or she must stay oriented at all times. This means that generally he or she is assigned no other duties aboard the canoe. In order to keep track of the canoe’s direction, the navigator stays awake 20 hours a day, sitting on a platform at the aft of the canoe. Much of the time, the navigator gives direction to the crew through the ship’s captain.

## **Captain**

The captain’s primary responsibility is safety. He or she ensures that a capable well-trained crew is on board and that the canoe is well maintained. The captain is responsible for training the crew and preparing the canoe for the voyage.

He or she makes sure that sails are mended, that Hōkūle‘a is cleaned and painted, and that the food, water, and safety gear are on board. At sea, the captain executes all sailing decisions. Once the navigator sets the sailing strategy, the captain directs the crew to hoist, drop, or change sails. The captain

coordinates activities with the escort vessel and provides a daily work schedule for the watch captains. The captain decides when and if to ration food and water.

## **Watch Captains**

The watch captains direct crewmembers and carry out instructions from the captain. The watch captain makes sure that his/her crew is up and on duty for its watch. He or she assigns steering positions to crew, goes through the safety checklist, and maintains a watch log. The watch captain is responsible for maintenance of the canoe during the watch, including cleaning up after meals. Additionally, the watch captain is responsible for monitoring the safety, health and morale of his/her crew.

## **Medical Officer**

The medical officer is a certified doctor that is aboard Hōkūle‘a for each long voyage. Her/his primary kuleana is the health of the crew. The medical officer makes sure that the canoe is equipped with all medications and medical supplies needed for a long journey. When the canoe is in foreign ports, the medical officer attends to the crew’s health and medical needs on shore.

## **Radio Operator**

The radio operator handles all radio transmissions between Hōkūle‘a and the escort vessel and between the canoe and land. He or she maintains an accurate log of all radio traffic, and is responsible for the upkeep of the radio equipment.



## **Carpenter**

A designated carpenter oversees all repairs done on the canoe. The carpenter also maintains the tool inventory.

## **Electrician**

An assigned electrician maintains all electrical systems.

## **Cook**

The cook plans the canoe's menus and does most of the cooking. The ability of the cook affects the crew since meals are the highlight of each day. Good nutrition is also important for maintaining the health of the crew.

## **Quartermaster**

The quartermaster has direct responsibility for loading food, water, and all needed supplies, and for maintaining Hōkūle'a's inventory. While this is not an onboard job, it is critical to the safe and efficient sailing of the canoe. Weight must be evenly distributed for efficient sailing.

## **Fisher**

Fishing off of the canoe is an important job. One crewmember is responsible for setting and bringing in fishing lines each day and for landing all catches. Fresh fish provide an important food source at sea.

## **Documentors**

Documentors keep historical records of the voyage by writing and recording video and audio taping.

## **Safety Officer**

The safety officer is responsible for all safety and emergency systems and equipment. Life jackets, life preservers, flares, and fire extinguishers are just some examples of the safety gear the canoe carries. In addition, all crewmembers must be trained in man-overboard and fire procedures.




Source: Adapted from Yadao, Elisa. "Daily Living aboard Hokule'a." Education Kit: Navigating Change. Hawai'i: PREL, State of Hawai'i Department of Education, Department of Land and Natural Resources, NOAA, U.S., Fish & Wildlife Service, and Bishop Museum.



Name \_\_\_\_\_ Date \_\_\_\_\_

## Wayfinding

Draw a picture of a traditional Hawaiian voyaging canoe. Include in your drawing at least three of the wayfinding clues that the ho'okele (navigator) uses to find distant islands. Label the clues.



Write a reflection describing:

- a) how the canoe, traditional wayfinding, and values are elements of Hawaiian culture
- b) how voyaging contributes to the preservation of culture.



# Chance Cards

<p><b>There is no wind today. Lose 100 miles on your voyage.</b></p>	<p><b>Winds are favorable today. Gain 100 miles.</b></p>
<p><b>Your fisher catches a large ahi. Receive an extra food/water token.</b></p>	<p><b>Your canoe hits a shallow reef. You damage one of your two hulls. Lose 100 miles on your voyage as you take time to repair it.</b></p>
<p><b>The mast on the canoe breaks in high wind. Lose 100 miles as you take time to repair it.</b></p>	<p><b>The quartermaster did an outstanding job at distributing the weight on the canoe. Gain 100 miles.</b></p>
<p><b>Man overboard! Lose 100 miles as the crew works to rescue the crewmember.</b></p>	<p><b>You come across a monk seal entangled in a fishing net. You stop to help. Lose 100 miles.</b></p>
<p><b>A fierce storm sets your canoe off course. Lose 100 miles.</b></p>	<p><b>High winds tore one of your sails. Lose 100 miles as you take time to repair it.</b></p>





# Chance Cards

<p>The ho'okele falls asleep. The canoe gets off course. Lose 100 miles on your voyage.</p>	<p>You have a clear starry night and good wind. Gain 100 miles.</p>
<p>You are approaching a heavy storm. The sailmaster suggests going around it for safety reasons. Your navigator agrees. Lose 100 miles to go around the storm.</p>	<p>You need to tack (follow a zig-zag course) as you sail into the wind. Lose 100 miles on your voyage.</p>
<p>Seabirds lead you to a good fishing area. Everyone works together to haul in a big tuna. Gain a food/water token.</p>	<p>You catch lots of rainwater to use in cooking. Gain a food/water token.</p>
<p>A huge wave knocks a food container overboard. Lose a food/water token.</p>	<p>Heavy fog! You lose sight of the stars and get a little off course. Lose 100 miles on your voyage.</p>
<p>A steering paddle breaks in heavy seas. Lose 100 miles as you repair it.</p>	<p>You see high clouds at a distance. You just discovered an uncharted island. You are off course! Lose 100 miles on your voyage.</p>



