



Human Impact

Photo by Polynesian Voyaging Society

Nānā ka maka; hana ka lima.

Observe with the eyes; work with the hands.
Just watching isn't enough. Pitch in and help!
— Mary Kawena Pukui, *'Ōlelo No'eau* 2267

Human Impact



Teacher Background Information

How is it that so much 'ōpala (rubbish) has made its way onto our beaches and into the sea? Are we destined to live with multi-colored sand beaches sprinkled with the broken down plastic bits of our disposable consumerism? What has led to this staggering volume of discarded nets, lines, and plastic trash that takes such a devastating toll on our reefs and marine life? Something is desperately wrong. It is our kuleana (responsibility) to mālama 'āina (care for the land and sea).

Source of Marine Debris

Marine debris originates on land and at sea. Land-based human debris is rubbish that is blown or washed into the ocean from beach litter, landfills, storm drains, streams, and rivers. These land-based activities contributed most of the debris found in a five-year national study conducted by The Ocean Conservancy (Sheavly, 2007). This study, which was conducted from 2001- 2006 by 600 volunteers monitoring marine debris in 21 coastal states, allowed the Ocean Conservancy to set a nationwide scientific baseline of the marine debris problem. The general findings of the study were that general-source marine debris that comes from both land-based and ocean-based activities increased by more than 5 percent each year in the U.S. Hawai'i was the only location to demonstrate a significant decrease in all debris during the period of the study (Sheavly, 2007).

In a 2002 international study of marine debris, 8.2 million pounds of debris were collected. The debris included more than 1 million cigarette butts, 440,000 food wrappers or containers, 220,000 bottles, 32,000 pieces of fishing line, and 8,000 tires (TOC, 2002).

Marine debris that originates at sea comes from commercial fishing and shipping passenger slips, recreational boaters and fishers, and from off-shore oil rigs. In the NWHI, the majority of marine debris comes from the sea. Interestingly, the two most

common nets found in the NWHI marine debris (by weight) are trawling nets and monofilament gill nets. Yet these types of fisheries don't occur here (Maragos & Gulko, 2002). Where do the nets come from? The islands are situated to trap debris that drifts with the slow-moving North Pacific gyre, which is the current that circles in the North Pacific Ocean. Studies have shown that marine debris in the North Pacific is likely to end up in the convergence zone of the subtropical North Pacific. This zone migrates with the seasons, and in the winter months shifts south to the NWHI where debris accumulates. In El Niño winters, the zone shifts farther south to the main Hawaiian Islands and deposits marine debris on some of our reefs and beaches (Maragos & Gulko, 2002).

As the instructional activities in this unit illustrate, marine debris is much more than unsightly litter. It causes serious damage to coral reefs as nets and lines drag across coral and marine animals become entangled or ingest debris. Monk seals, turtles, and seabirds that become entangled in the drifting nets and lines may drown, or eventually die of starvation, predation, or infection due to tightening lines on their bodies. Plastic materials that are mistaken as food and ingested by marine animals may accumulate and block their intestines causing death by starvation.

Other Pollutants

A less visible threat to the health of our oceans is water pollution from materials that we apply to the land, wash down our driveways, drain into our wastewater



Between 1996 and 2003, 364 tons of marine debris were removed from the NWHI (NOAA, 2003).



treatment facilities, or release into the air. These include household and industrial hazardous wastes, pesticides and fertilizers, and automotive fluids and gases. These types of pollutants, which enter the ocean from our watersheds, are referred to as non-point source pollutants. They are dispersed in the environment from so many sources that it is difficult to pinpoint where they originate. This brings the issue home to each of us as we consider how our consumer actions and other habits have an impact on the land and sea. Raising awareness about how these substances end up in the ocean and what we can do to pitch in and reduce this pollution is the focus of the third instructional activity in this unit.

Seeking Solutions

Early Hawaiians managed the land and water resources within ahupua'a—land divisions that typically ran from the mountains to the sea. People farming and fishing within the ahupua'a recognized the connection of mountain forests to the coral reefs in the sea. A healthy reef required a healthy forest. Wai (fresh water) was considered sacred. It was essential for all life on land and nutrients from the streams enriched the reef. Returning to a sense of reverence for the environment that sustains us is a critical need as we witness the deterioration of our 'āina (land). Realizing the connections between the land and sea and how our actions on land affect the reef, we can learn from the past to mālama (care for) our environment today.

Government and nonprofit agencies are involved in a multi-agency partnership to remove marine debris from the NWHI. In 2003, 16 people worked for 4 months to remove 122 tons of derelict fishing gear from the islands (NOAA, 2003). This kind of cooperation is essential to undertaking such a monumental task. But if each of us looks

within the realm of our daily lives, there is much that individuals can do to reduce marine debris and water pollution. Not buying bottled water or using cloth bats instead of plastic ones helps lighten our impact on the planet's resources and awakens others to some alternative choices we can make. Picking up litter, recycling, reducing use of disposable products, opting not to purchase products with excessive packaging, volunteering for stream and beach clean-ups, substituting hazardous chemicals with alternative products, and fertilizing our lawns and gardens organically are all steps we can take to make our island home a healthier place now and for the future.

References

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- S.B. Sheavly. 2007. *National Marine Debris Monitoring Program: Final Program Report, Data Analysis and Summary*. Prepared for U.S. Environmental Protection Agency by Ocean Conservancy, Grant Number X83053401-02. 76 pp.



Unit 4 Essential Question: How do our actions on land affect marine life and what can we do to mālama the marine environment?

Hawai'i DOE Standards, GLOs & Nā Honua Maui Ola	Focus Questions & Activities	Key Concepts	DOE Benchmarks
<p>Grade 4: Social Studies 6: Cultural Anthropology Cultural Systems and Practices</p> <p>Social Studies 8: Economics Economic Interdependence</p> <p>Grade 5: Language Arts 1: Reading: Conventions and Skills Locating Sources/ Gathering Information</p> <p>Language Arts 2: Reading: Reading Comprehension Understanding Text Structures</p> <p>Nā Honua Maui Ola 10 - 7 Recognize and identify the healthy cultural behaviors that are practiced and promoted within the environment.</p>	<p>What can we learn from Hawaiian values and practices that will help our guide our interactions with the land and sea today?</p> <p>ACTIVITY 1 The Ahupua'a</p>	<ul style="list-style-type: none"> • Early Hawaiian practices and the tools and materials Hawaiians used had much less of an impact on the environment than practices and tools of our modern society. • Early Hawaiian fishing practices allowed for more sustainable use of fisheries than modern-day practices. • The Hawaiian ahupua'a system reflects the Hawaiian value of mālama 'āina. 	<p>SS.4.6.2 Describe how individuals or groups deal with conflict, cooperation, and interdependence within the ahupua'a</p> <p>SS.4.8.1 Describe the economic interdependence among those living in the ahupua'a.</p> <p>LA.5.1.2 Use a variety of grade-appropriate print and online resources to research a topic.</p> <p>LA.5.2.1 Use organizational patterns (e.g., compare and contrast, proposition and support) to access information.</p>
<p>Science 2: The Scientific Process: Nature of Science and Society Unifying Concepts and Themes</p> <p>Math 1: Numbers and Operations: Number Sense - Numbers and Number Systems</p> <p>Nā Honua Maui Ola 15 - 4 Participate in conservation and recycling practices and activities.</p>	<p>How does human debris have a negative impact on marine life, and what can we do to solve this problem?</p> <p>ACTIVITY 2 Singing the 'Ōpala Blues</p>	<ul style="list-style-type: none"> • Marine debris comes from: 1) the land, as rubbish that drifts on air currents and washes into the ocean from storm drains, landfills, and beaches; and 2) the ocean, as fishing lines, nets, and other materials discarded by ships, boats, and fishers. • Discarded fishing nets and lines damage coral reefs and entangle seabirds, monk seals, turtles, and other marine life. • Discarded plastics can be mistaken for food and limit the amount of digestible material in an animal's stomach, causing death by starvation. • We can help to solve the problem of marine debris by reducing consumption of plastic disposable goods, reusing or recycling the products we do buy, and preventing fishing lines and nets from becoming waste. 	<p>SC.4.2.1 Describe how the use of technology has influenced the economy, demography, and environment of Hawai'i.</p> <p>SC.5.2.1 Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world.</p> <p>MA.4.1.3 Identify equivalent forms of commonly used fractions and decimals.</p> <p>MA.5.1.1 Represent percent and ratio using pictures or objects.</p>





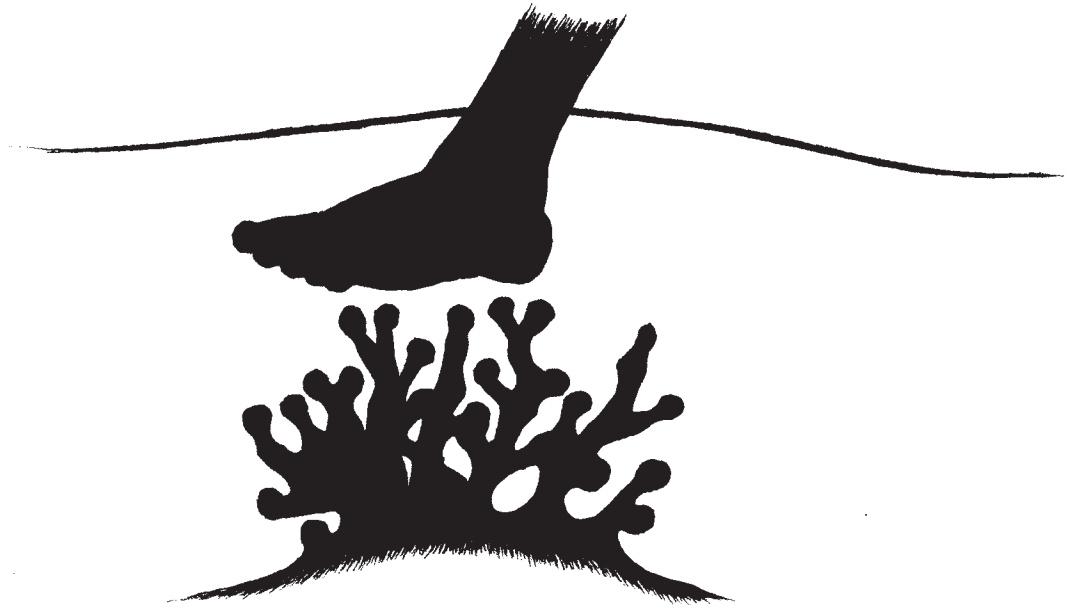
Human Impact

Grades 4 - 5 Unit Map

Hawai'i DOE Standards, GLOs, & Nā Honua Maui Ola	Focus Questions & Activities	Key Concepts	DOE Benchmarks
<p>Science 1: The Scientific Process: Scientific Investigation</p> <p>Language Arts 5: Writing: Rhetoric - Meaning</p> <p>Nā Honua Maui Ola 15 - 3 Teach others about the concept of mālama through example.</p>	<p>What do the contents of a bolus reveal about seabirds and human impact on seabird habitat?</p> <p>ACTIVITY 3 What's for Dinner?</p>	<ul style="list-style-type: none"> Indigestible material found in a bolus regurgitated by seabird provides clues to human impact on the marine environment. We can all make a difference by using fewer disposable plastic items, such as water bottles and shopping bags, picking up rubbish in our environment, and teaching others about the dangers of marine debris. 	<p>SC.4.1.1 Describe a testable hypothesis and an experimental procedure.</p> <p>SC.5.1.2 Formulate and defend conclusions based on evidence.</p> <p>LA.4.5.1 Use appropriate facts and interesting details that develop the intended meaning and anticipate the needs of the audience.</p> <p>LA.5.5.2 Use significant details and relevant information to develop meaning.</p>
<p>Science 1: The Scientific Process: Scientific Investigation</p> <p>Language Arts 7: Oral Communication: Rhetoric Meaning</p> <p>GLO 2: Community Contributor GLO 5 Effective Communicator</p>	<p>How do products we use on land affect our ocean and beaches? How effective are some alternative products that have less impact on the environment?</p> <p>ACTIVITY 4 From the Land to the Sea</p>	<ul style="list-style-type: none"> Detergents, oils, paints, and other materials that we wash down our driveways can end up in storm drains and in the ocean. Household cleaners and chemicals that we wash down drains can also end up in the sea from cesspools and overloaded wastewater treatment plants. Fertilizers and pesticides that we apply to our lawns and gardens can percolate down to groundwater and/or end up in our streams and ocean. We can prevent these (non-point source) pollutants from entering our environment where they have a negative impact on our health and the health of other species. 	<p>SC.4.1.1 Describe a testable hypothesis and an experimental procedure.</p> <p>SC.5.1.2 Formulate and defend conclusions based on evidence.</p> <p>LA.4.7.1 Use prior knowledge, input from others, and text resources to develop ideas for speaking.</p> <p>LA.5.7.1 Combine ideas from prior knowledge, input from others, and text resources to elaborate on and support ideas.</p>

Student Journal

Unit 4 – Human Impact



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Just watching isn't enough. Pitch in and help!
—Mary Kawena Pukui, 'Ōlelo No'eau 2267

Student's Name: _____

School: _____

Date started: _____

Date ended: _____



Student Assessment Overview

Unit 4 Essential Question: How do our actions on land affect marine life and what can we do to mālama the marine environment?

Nā Honua Maui Ola (Hawaiian Guidelines) in this unit

- Participate in conservation and recycling practices and activities.
- Recognize and identify the healthy cultural behaviors that are practiced and promoted within the environment (kōkua, reciprocity, aloha ‘āina, mālama ‘āina).
- Teach others about the concept of mālama through example.

General Learner Outcomes (GLOs) in this unit

- GLO 2: Cooperate with and help and encourage others in group situations.
- GLO 5: Listen to, interpret, and use information effectively

How you will be graded for this unit:

Individual Journal

It is your responsibility (kuleana) 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
<p>1. The Ahupua‘a – Standards: Gr. 4 Social Studies 6 and 8; Gr. 5 Language Arts 1 and 2 Journal 19: Comparing and contrasting tools and materials from old Hawai‘i with modern day</p>	
<p>2. Singing the ‘Ōpala Blues – Standards: Gr. 4 - 5 Science 2 and Math 1 Journal 20: Keeping track of disposables you use in one day</p>	
<p>3. What’s for Dinner? – Standards: Gr. 4 - 5 Science 1 and Language Arts 5 Journal 21: Science lab report - investigating a bolus</p>	
<p>4. From the Land to the Sea – Standards: Gr. 4 - 5 Science 1 and Language Arts 7 Journal 22: Science lab report - trying alternative products Journal 23: Building vocabulary</p>	



Unit Culminating Activities

Group Project – Due Date: _____

Your Challenge: Design a way to reduce the impact of a product on the marine environment. You may use displays and projects created during the unit to help share what you have learned with others. The product you choose should be something that can have a negative impact on marine life, such as a disposable plastic item, fertilizer, pesticide or cleaning product. Work in teams to develop a creative way to mālama (care for) the environment. Then present your project to other classes in the school.

Team presentations should include:

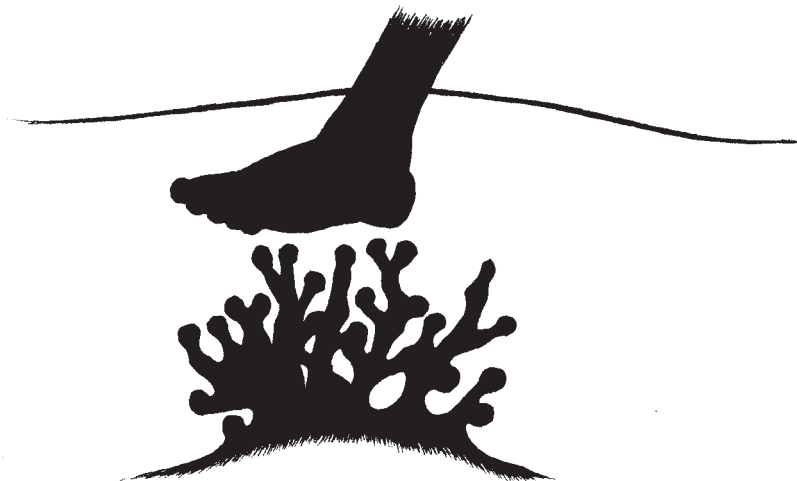
- New vocabulary learned in this unit.
- A description of the problem you are trying to solve and how your actions have helped the environment.
- An explanation of how your project promotes Hawaiian values such as kōkua (helping), reciprocity (sharing) aloha ‘āina (love of the land), mālama ‘āina (caring for the land)
- Visual aids such as photographs, video, or drawings
- Models or demonstrations to show how your project will reduce impact on the environment (Gr. 5).

We will review a rubric to guide you as you develop your presentation.

Individual Project - Due Date: _____

Write a report that summarizes your group's project. The report should:

- Answer the unit essential question.
- Use at least five new vocabulary words you have learned in this unit.
- Include the problem your group tried to solve and the action you took to solve the problem.
- Describe how well you think your project worked.





Unit 4 Culminating Activity Rubric: Self Assessment - Grade 4

Team Names _____

Student Name _____

Date _____

Total Points _____

Unit Essential Question: How do our actions on land affect marine life and what can we do to mālama the marine environment?

DOE Benchmarks, GLOs, & Nā Honua Maui Ola	Kūlia (Exceeds Standard)	Mākaukau (Meets Standard)	‘Ano Mākaukau (Almost at Standard)	Mākaukau ‘Ole (Below Standard)
Science 2: The Scientific Process: Nature of Science, Science, Technology, and Society Did your team explain how your project would affect people, the economy, and the environment? Points ____	We clearly explained how our project would affect people, the economy and the environment.	Our project described how the use of a product has affected our environment. We also described how the product affects people and the economy.	Our project gave examples of how the use of a product has affected our environment. We also gave an example of how the product affects people and the economy.	We recognize that the use of the product we chose affects the environment, people, and the economy. But our project didn't clearly show this.
Nā Honua Maui Ola 15 – 3 Did you set an example of how to mālama the environment? Points ____	Our project taught others about ways to mālama the environment. We provided excellent examples of taking actions to care for our island.	Our project taught others about a way to take action and mālama the environment.	We had ideas about ways to mālama the environment, but our project didn't clearly explain the ideas.	Our project did not clearly show others about ways to mālama the environment
GLO 5 Effective Communicator Did you speak clearly, make eye contact, and use your new vocabulary? Points ____	Our team organized and presented information very clearly to our audience. We used our new vocabulary and made eye contact with the audience.	Our team organized and presented information clearly to our audience.	Our team needed to work on organizing our information. We need to communicate more clearly to our audience.	Our team presentation was not clear to the audience because we weren't organized or clear about the purpose of our presentation.
Did you use good visual aids? Points ____	The excellent visual aids we used helped to share our message.	Our visual aids were a good way to teach others.	Our visual aids could have been much better.	We did not use visual aids.

Unit 4 Culminating Activity Rubric: Self Assessment - Grade 5

Team Names _____

Student Name _____

Date _____

Total Points _____

Unit Essential Question: How do our actions on land affect marine life and what can we do to mālama the marine environment?

DOE Benchmarks, GLOs, & Nā Honua Maui Ola	Kūlia (Exceeds Standard)	Mākaukau (Meets Standard)	‘Ano Mākaukau (Almost at Standard)	Mākaukau ‘Ole (Below Standard)
Science 2: The Scientific Process: Nature of Science Unifying Concepts and Themes Did you create a model or demonstration that shows how to reduce the impact of a product on the environment? Points _____	Our team’s model or demonstration was a very effective way to show how to reduce the impact of a product on the environment.	Our team’s model or demonstration was an effective way to show how to reduce the impact of a product on the environment.	Our team’s model or demonstration did not clearly show how to reduce the impact of a product on the environment.	Our team’s model or demonstration did not show how to reduce the impact of a product on the environment.
Nā Honua Maui Ola 15 – 3 Did you set an example of how to mālama the environment? Points _____	Our team’s project set an excellent example of how to mālama the environment.	Our project taught others about a way to take action and mālama the environment.	We had ideas about ways to mālama the environment, but our project didn’t clearly explain the ideas.	Our project did not clearly show others about ways to mālama the environment.
GLO 5 Effective Communicator Did you communicate the purpose of your presentation, speak clearly, make eye contact, and use your new vocabulary? Points _____	Our team understood the purpose of our presentation, and organized and presented information very clearly to our audience.	Our team understood the purpose of our presentation, and organized and presented information clearly to our audience.	Our team understood the purpose of our presentation, but we needed to work on organizing our information to communicate more clearly to our audience.	Our team presentation was not clear to the audience because we weren’t organized or clear about the purpose of our presentation.
Did you use good visual aids? Points _____	The visual aids we used enhanced our project message.	Our visual aids were a good way to teach others.	Our visual aids could have been much better.	We did not use visual aids.



The Ahupua‘a

What can we learn from Hawaiian values and practices to guide the way we live today?

Hawai‘i DOE Standard Benchmarks

Grade 4

Social Studies 6: Cultural Anthropology – Cultural Systems and Practices

- **SS.4.6.2** Describe how individuals or groups deal with conflict, cooperation, and interdependence within the ahupua‘a.

Social Studies 8: Economics – Economic Interdependence

- **SS.4.8.1** Describe the economic interdependence among those living in the ahupua‘a.

Grade 5

Language Arts 1: Reading: Conventions and Skills - Locating Sources/ Gathering Information

- **LA.5.1.2** Use a variety of grade-appropriate print and online resources to research a topic.

Language Arts 2: Reading: Reading Comprehension - Understanding Text Structures

- **LA.5.2.1** Use organizational patterns (e.g., compare and contrast, proposition and support) to access information.

Nā Honua Maui Ola 10 - 7

Support lifelong aloha for Hawaiian language, history, culture, and values to perpetuate the unique cultural heritage of Hawai‘i.

- Learners recognize and identify the healthy cultural behaviors that are practiced and promoted within the environment (kōkua, reciprocity, aloha ‘āina, mālama ‘āina).

Key Concepts

- Early Hawaiian practices and the tools and materials Hawaiians used had much less of an impact on the environment than practices and tools of our modern society.
- Early Hawaiian fishing practices allowed for more sustainable use of fisheries than modern-day practices.
- The Hawaiian ahupua‘a system reflects the Hawaiian value of mālama ‘āina.

Activity at a Glance

Students research how people used tools and materials to meet their needs in old Hawai‘i. They work in hui (groups) to conduct research, create drawings, and present their findings to their classmates. Their combined drawings make a large ahupua‘a mural. Students then compare packaging, products, and practices of today with those of early Hawaiians, and write a letter to a grandparent or special person in their lives to describe what they are doing to mālama ‘āina (care for the land).

Time

2 - 3 class periods



Assessment

Students:

- Complete an illustration that shows how early Hawaiians met their survival needs, including the type of materials used and practices of exchanging and sharing resources.
- Write a descriptive summary that compares practices that demonstrated mālama ‘āina in old Hawai‘i compared to modern times.
- Complete a journal comparing and contrasting materials and products used in old Hawai‘i with those used today.
- Describe ways to demonstrate mālama ‘āina in our interactions with the environment today.

Hawai‘i DOE Rubric

Advanced	Proficient	Partially Proficient	Novice
Social Studies Grade 4			
Describe, with clear and precise detail, how individuals or groups deal with conflict, cooperation, and interdependence within the ahupua'a	Describe, with detail, how individuals or groups deal with conflict, cooperation, and interdependence within the ahupua'a	Describe, with minimal detail, how individuals or groups deal with conflict, cooperation, and interdependence within the ahupua'a	Ineffectively describe how individuals or groups deal with conflict, cooperation, and interdependence within the ahupua'a
Describe, with clear and precise detail, the economic interdependence among those living in the ahupua'a	Describe, with detail, the economic interdependence among those living in the ahupua'a	Describe, with minimal detail, the economic interdependence among those living in the ahupua'a	Ineffectively describe the economic interdependence among those living in the ahupua'a
Language Arts Grade 5			
Use substantive information from an extensive variety of grade-appropriate print and online resources to thoroughly research a topic	Use relevant information from a variety of grade-appropriate print and online resources to research a topic	Use some relevant information from a few grade-appropriate print and online resources to research a topic	Use very little relevant information from grade-appropriate print and online resources to research a topic
Use organizational patterns to access complex information, in a highly effective way	Use organizational patterns to access information	Use some organizational patterns to access information or use them in a way that accesses limited information	Use very few organizational patterns to access information or use them in a way that does not access information

Vocabulary

ahupua'a – traditional Hawaiian land division usually extending from mountain summits to the outer edge of the reef

‘āina – land, sea, heavens; “that which feeds”

kōkua – help, assist

biodegradable – capable of being broken down by natural processes

kapu – taboo; prohibition

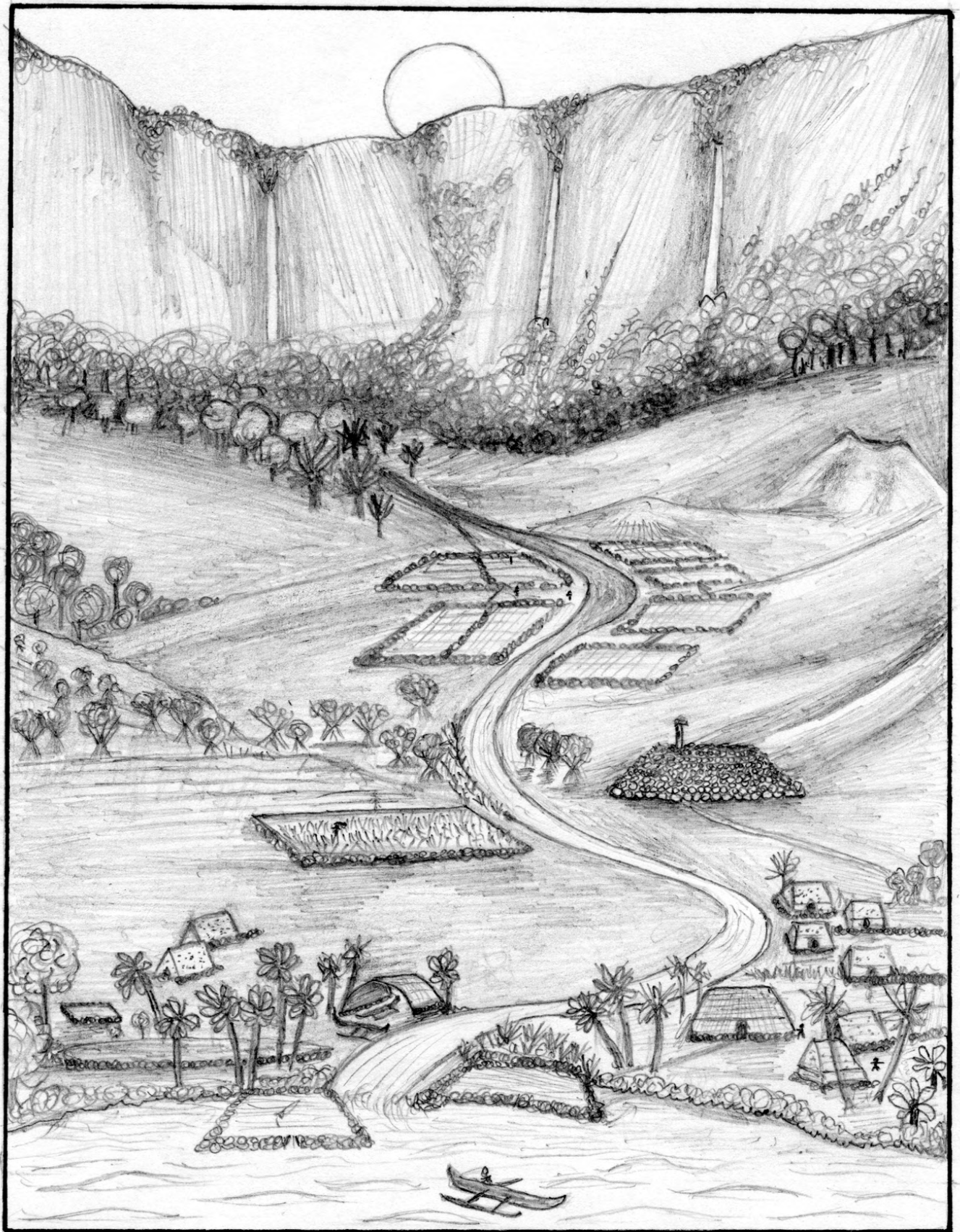
lawai'a – fisher

mālama ‘āina – care for the land

mahai'ai – farmer



The Ahupua'a



Materials

- student journal and assessment pages (provided in Unit Introduction)
- student journal - 19 (provided)
- student reading (provided)
- ahupua'a activity cards (provided)
- reference materials about early Hawaiian life (see list at end of this activity)
- a gourd or lauhala basket
- plastic bag
- drawing paper and/or oak tag
- colored markers
- tape or push pins
- large sheet of butcher paper
- ahupua'a poster (available from Kamehameha Schools Press)

Advance Preparation

- Draw a large outline of an ahupua'a on butcher paper (see illustration on the previous page) or use an ahupua'a poster.
- Copy the student journal and assessment pages from the Unit Introduction for each student.
- Make a copy of the student journal - 19 and the student reading for each student.
- Copy the ahupua'a activity cards and cut them out to distribute one to each hui (group).
- Gather some of the suggested references.

Teacher Background Information

Hawaiian ahupua'a are traditional land units that usually extend from the mountain summits to the outer edge of the reef. Within the ahupua'a, people had access to most of the resources they needed for their survival. They worked together as a community, sharing what they fished and farmed and creating the tools and implements that supported these endeavors. Wai (fresh water) was considered sacred, and reverence for the land and all forms of life was expressed through mālama 'āina (caring for the land).

It was common practice to harvest only what was needed and to offer pule (prayers) that expressed aloha 'āina. Ali'i (chiefs) imposed kapu (prohibition) on fishing during spawning seasons to ensure that populations of fish would be replenished. Young men trained for years to become knowledgeable in the life history, behavior, and ecology of the fishes before they were allowed to fish (Birkeland & Friedlander, 2001).

As Hawaiian populations grew, agriculture intensified. Extensive irrigation systems were constructed to grow wetland kalo (taro) and in more arid valleys, dryland cultivation was expanded for kalo and sweet potato.

Intensified agriculture to meet human needs inevitably leads to human impact on the environment. Clearing of steep slopes in Hawai'i led to loss of some native species as well as soil erosion and sedimentation in lower valleys (Cuddihy and Stone, 1990).

Human impact on the 'āina has intensified with the arrival of people from other parts of the world and the development that has accompanied continued population growth. Today, we import a variety of products and resources, many of which end up in our landfills or on our beaches and roadsides. In our increasingly urbanized ways of life, we tend to lose touch with the land and sea that sustain us. Food comes from the supermarket and water at the turn of a tap. A sense of connection to place can be easily lost as we travel miles out of our home environments and often insulate ourselves from neighbors as we communicate across the Internet and seek entertainment from computer games and televisions. The many luxuries that we enjoy in our modern world come with costs that go beyond the price tag. Today we struggle with overflowing landfills, illegal dumping, marine debris, polluted and overfished waters, and a need to reconnect with our communities and the 'āina in a meaningful way.



Looking to the past, we see ways to carry forward Hawaiian values and practices that bring us closer to the land and sea, and closer together in communities within ahupua'a. Mālama 'āina is a guiding light that shines toward a brighter, sustainable future if we choose to follow it.

Note: If you need assistance identifying the ahupua'a where your community is located, ahupua'a maps for each of the main Islands are available from the Let's Go Voyaging Teacher's Guide. See Resources listed at the end of this activity.



Hōkūle'a Crewmembers mālama Laysan Island
Photo by Polynesian Voyaging Society

Teaching Suggestions

1. Distribute the student journal and assessment pages to introduce students to the unit.

- Introduce the essential question for 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. Introduce students to the ahupua'a.

- Show students the large outline drawing you have prepared to introduce students to the Hawaiian ahupua'a. Find out what students know about this traditional Hawaiian land division.
- Have students read the mo'olelo of Keahiakahoe and discuss life in the ahupua'a in old Hawai'i.

Discussion Questions:

- Who is the lawai'a in the story and what was his role?
- Who is the mahi'ai in the story and what did he produce in the ahupua'a?
- What did Lo'e do to help gather food in the ahupua'a?
- How did the members of this 'ohana laulima (cooperate) with one another?
- What was their conflict? How was it resolved?

3. Ask students to imagine that they were living in the ahupua'a in the story and discuss the "jobs" that they may have had and the tools they might have used.

Discussion Questions:

- Where do you get the resources needed for food, shelter, and clothing?
- What kinds of tools do you have to farm, fish, and make clothing?
- How did children help their families to meet their needs?

4. Divide the class into six hui (groups) and distribute an ahupua'a activity card to each group.

- Review the tasks on the cards and show students the reference materials you have gathered to help them in their research and the drawing paper and markers available for their work.
- Set a date for their hui to present findings to the class and add their drawings to the large ahupua'a drawing.

5. Distribute student journal - 19 to each student before the hui present to the class.

- As each hui presents its findings, ask students to fill in the journal page with information about the materials used in early Hawai'i. If they are not familiar with the process of taking notes, review how to listen and record key ideas.
- Have students post their drawings within the large ahupua'a you have outlined.



6. Next to the ahupua‘a illustration make a list of all the raw materials that were needed (i.e., wood, feathers, stone, shells, plant fibers).

- Conduct a discussion about these materials and about life in old Hawai‘i.

Discussion Questions:

- What do all of these materials have in common? (They are made from natural materials.)
- What was used to carry or “package” things that they used? (Gourds, lauhala baskets, ti leaves)
- Display the items you have brought and discuss how natural products are different from the packaging we use today.
 - What would happen to the items when they were worn out? (They would decompose and become part of the soil.)
 - Do you think any of these materials polluted the stream and ocean? (No. Early impact on the environment may have resulted from other causes such as soil erosion after clearing large areas of forested land to make way for crops.)
 - How is conservation and the value of mālama ‘āina practiced within the ahupua‘a? (Kapu on fishing during spawning; offering pule (prayers) before harvesting; taking from nature only what is needed.)

7. Ask each group to brainstorm a list of modern-day products that would compare to the materials used in old Hawai‘i.

- Have students fill those items in on their journal sheets in the column labeled “Some Examples Today.”
- Discuss their ideas and make a list on the board of the raw materials that are used to make these products (i.e., wood, plastics, rubber, metals, etc.) and find some of these materials in the classroom.
- Have students compare and contrast these raw materials with the materials used in early Hawai‘i.

Discussion Questions:

- What do the modern products and tools have in common? (Many are manufactured from human-made substances; many are heavily packaged in plastic and Styrofoam.)
- How else are they different from the products and tools created in old Hawai‘i? (Many products are shipped here instead of being locally made, and many are non-biodegradable.)
- What kinds of products do we use today that were not available in old Hawai‘i? (Electronic equipment, vehicles, books, plastic toys, chemicals for cleaning, fertilizers, pesticides, processed foods, disposable diapers, utensils etc.)
- What happens to our products when we throw them away? (They get buried in landfills, incinerated, or [hopefully] recycled into something to be used again.)
Which of our modern-day products pollute the streams and ocean?

8. Compare and contrast practices that demonstrate Hawaiian values in old Hawai‘i with actions we could take in our ahupua‘a today.

- Ask students to share examples of practices from old Hawai‘i that demonstrate the following values:
 - mālama ‘āina (care for the land)
 - kōkua (assist, help)
 - reciprocity
 - aloha ‘āina (love for the land)
 - laulima (working together)
- Have students come up with practices we can implement today in our ahupua‘a to demonstrate these values. Some examples are to: help grow gardens, assist people in need, share what we have with others, buy items that are not in heavy packaging, refuse bags if we don’t need them, and to choose locally made products when possible.

9. Ask students to write a letter to a grandparent or other special person in their lives that describes what the students are doing to mālama ‘āina.



Extended Activities

Invite a kupuna (elder) to come and speak to the class about Hawaiian conservation practices and early kapu (taboo) related to harvesting natural resources. Ask students to create a list of these practices and place it next to the ahupua'a illustration.

Take a class field trip to Bishop Museum where students can learn more about the implements and clothing items used in old Hawai'i.

Have students conduct an experiment to determine how long it takes various items to decompose. Students could bury a few items within the top layer of soil on the school grounds and dig the items up after a month to see how much has decomposed. Some rates of decomposition are provided on the last page of this activity.

Introduce students to activities provided in *Aloha 'Āina: A Teacher's Guide to the Ahupua'a*, produced by the Pacific American Foundation. The grade 4 unit focuses on fishponds and lo'i kalo (taro patches) and explores the ahupua'a in depth. The unit is available online from the Pacific American Foundation's web site at: www.thepaf.org.

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Resource

Lucas, K. & O'Connor, M. (1999). *Let's Go Voyaging Teacher's Guide*. Honolulu, HI: Moanalua Gardens Foundation. (Ahupua'a maps are included in the teacher's guide and can be downloaded from the Moanalua Gardens Foundation web site. See <http://www.mgf-hawaii.com/>. Click on Resources to locate the guide.)



Ka Mo'olelo o Keahiakahoe

Long ago, in old Hawai'i, food and supplies were exchanged between people of the uplands and people of the sea. In the Hawaiian language, you might hear people say, "Ko kula 'uka, ko kula kai" when they talk about this exchange system. This is because families depended on resources from both the mountains and the sea, and they shared with each other.

Kahoe, Pahu and Lo'e lived in the ahupua'a of Kāne'ōhe on the island of O'ahu. Kahoe was a great mahi'ai (farmer), who lived in Hā'īku Valley. He worked hard in his lo'i kalo (taro patch), and he always shared the poi he made. Pahu was an awesome lawai'a (fisher), who lived at Pu'u Pahu, a hill on the shore of Kāne'ōhe Bay. Lo'e, their sister, lived on an island called Moku o Lo'e. [Today the island is known as Coconut Island or the Hawai'i Institute of Marine Biology (HIMB)]. She trapped fish in her 'umu and collected shellfish and seaweed, or limu. Kahoe, Pahu and Lo'e lived happily together, taking care of one another. Every day the three would share their poi, fish and limu with one another.

One day, as Lo'e was collecting limu along the beaches of Moku o Lo'e, she watched as Pahu brought in a large catch of ulua. "Ulua! Mmmmm. What a delicious big fish!" thought Lo'e. (Ulua likes rocky, deep water. Sometimes the big ulua swims towards the shallows where you can fish it from shore.)

That same day, Pahu, brought only bait-fish to share with the 'ohana (family). Lo'e wondered why Pahu did not bring his prized catch of ulua, and she told her brother Kahoe what she had seen. Kahoe was upset, for he always gave huge helpings of poi to Pahu.

Soon a famine (shortage of food) came upon this area, and the people had little to eat. Kahoe was prepared with an abundance of poi. Pahu, on the other hand, searched and searched for food. He watched the sky for smoke, because that was a sign that people were cooking food. (Many of the people cooked their food at night so no strangers would approach them during this time when foods were scarce.)

One day during the famine, Pahu stood looking up to Kahoe's area and saw the smoke of the fire dancing in the sky. He knew that Kahoe had food. Lo'e saw her brother Pahu and said, "So, standing with eyes gazing at Kahoe's fire?" Pahu, knowing his past misdeed, had nothing to reply.

Reprinted from *Aloha 'Āina, A Teacher's Guide to the Ahupua'a*. Pacific American Foundation. Mo'olelo adapted by Norbert Larsen from:

Kaipo'i Kellings, 2006. Personal communication.

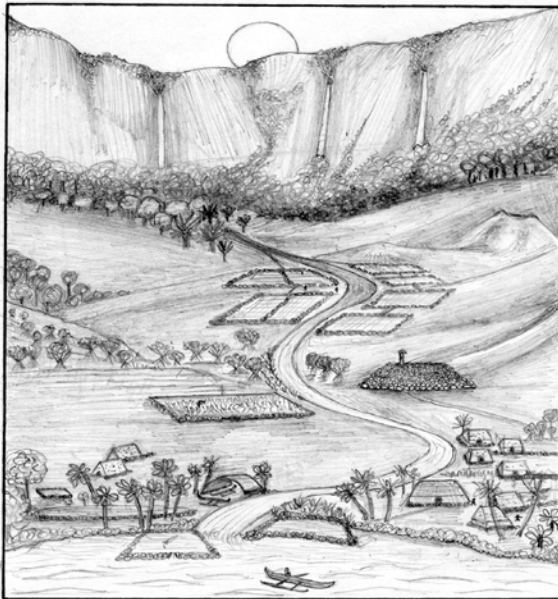
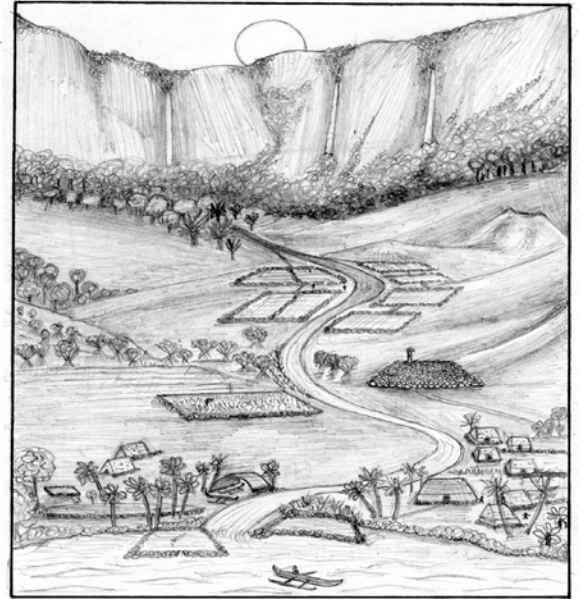
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Ahupua'a Activity Cards

Clothing

- Find out how people made clothing in old Hawai'i.
- Draw a picture showing how people made clothing, including the plants and the tools that they used.
- Cut out your picture and place it where this activity would happen in the ahupua'a.
- Prepare a group presentation to share what your hui has learned with your classmates. Include how the value of mālama 'āina was evident in the Hawaiian way of life.

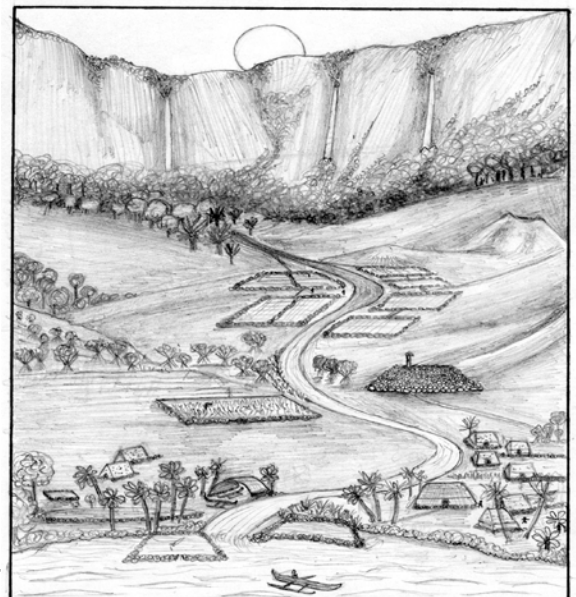


Shelters

- Find out how people built shelters in old Hawai'i.
- Draw a picture showing how people built shelters, including the plants and the tools that they used.
- Cut out your picture and place it where this activity would happen in the ahupua'a.
- Prepare a group presentation to share what your hui has learned with your classmates. Include how the value of mālama 'āina was evident in the Hawaiian way of life.

Fishing

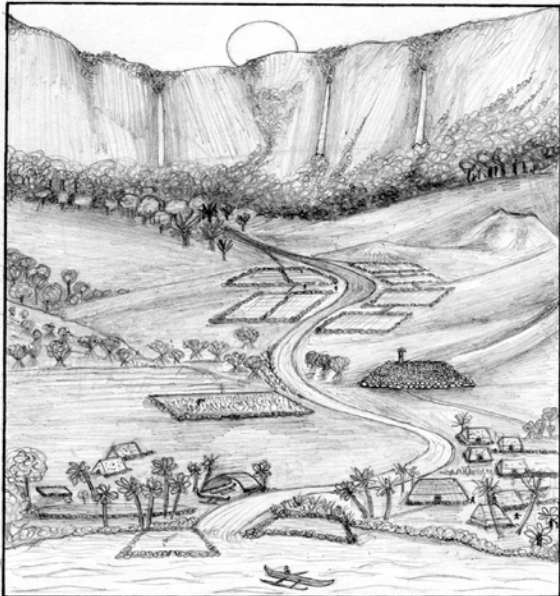
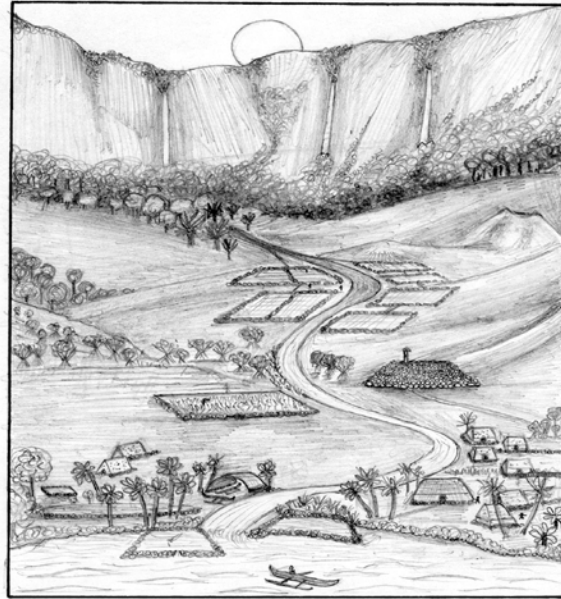
- Find out how people fished in old Hawai'i.
- Draw pictures showing how people fished, including the different kinds of tools that they used.
- Cut out your pictures and place them where these activities would happen in the ahupua'a.
- Prepare a group presentation to share what your hui has learned with your classmates. Include how the value of mālama 'āina was evident in the Hawaiian way of life.



Ahupua'a Activity Cards

Farming

- Find out how people farmed in old Hawai'i.
- Draw pictures showing how people farmed, including the different kinds of crops they grew and tools that they used.
- Cut out your pictures and place them where these activities would happen in the ahupua'a.
- Prepare a group presentation to share what your hui has learned with your classmates. Include how the value of mālama 'āina was evident in the Hawaiian way of life.

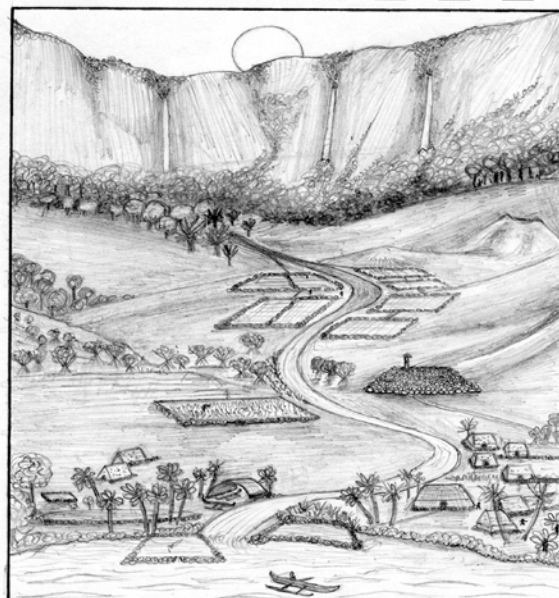


Cooking

- Find out how people cooked in old Hawai'i.
- Draw pictures showing how people prepared and cooked their food, including the different kinds of foods they ate and tools that they used.
- Cut out your pictures and place them where these activities would happen in the ahupua'a.
- Prepare a group presentation to share what your hui has learned with your classmates. Include how the value of mālama 'āina was evident in the Hawaiian way of life.

Recreation

- Find out what people did for recreation in old Hawai'i.
- Draw pictures showing people playing sports and other games. Include the kinds of tools that they used.
- Cut out your pictures and place them where these activities would happen in the ahupua'a.
- Prepare a group presentation to share what your hui has learned with your classmates. Include how the value of mālama 'āina was evident in the Hawaiian way of life.



Name		Date	
Materials & Products	In Old Hawai‘i	Some Examples Today	How are modern products different?
Clothing			
Shelters			
Tools for Fishing			



Name _____ Date _____

Materials & Products	In Old Hawai‘i	Some Examples Today	How are modern products different?
Tools for Farming			
Tools for Cooking			
Toys/ Recreation			



Materials & Products	In Old Hawai'i	Some Examples Today	How are modern products different?
Clothing	kapa made into: malo (loincloths) pā'ū (skirts) kihei (cloaks) lauhala sandals ti leaf capes feather capes and helmets (tools – kapa beaters, dyes, kapa boards)	t-shirts, shorts, pants, dresses, slippers, athletic shoes, socks, sweaters, jackets (tools – sewing machines)	<ul style="list-style-type: none"> Made from new human-made materials (nylon, polyester) People use more. Products are shipped to the islands. Packaging includes boxes, bags, cardboard, and plastic wrapping.
Shelters	pili grass (thatch) wood stones kapa lauhala mats	wood, glass, concrete, stone, bricks, plastic siding, tile, tar and other roofing shingles, carpeting, tiles, linoleum	<ul style="list-style-type: none"> Made from new human-made materials Houses are bigger and use many more products.
Tools for Fishing	wood and shell fishhooks cordage fishing line nets from cordage hala floats for nets cowry shell lures lauhala baskets 'ie'ie fish traps canoes (digging stick)	metal fishhooks nylon lines and nets fiberglass boats motors run with gas coolers with ice radios and other devices on boats plastic floats and lures	<ul style="list-style-type: none"> Made from new human-made materials Use fossil fuels Harvests are larger.
Tools for Farming	natural fertilizers stone adze baskets for harvesting stones for walls wooden drills for making tools	tractors, chemical products (fertilizers and pesticides), packaged seeds from many places, PVC pipes, plastic and rubber hoses, watering systems, chain saws	<ul style="list-style-type: none"> Made from new human-made materials Use fossil fuels Harvests are larger.
Tools for Cooking	stones ipu (gourds) 'opihi (limpet) shells wooden utensils	stoves, refrigerators, pots and pans, blenders, food processors, microwave ovens, toasters, dishwashers, plastic containers, dishes, glasses	<ul style="list-style-type: none"> Made from new human-made materials Use fossil fuels Use chemical soaps to clean
Toys/ Recreation	wooden surfboards ula maika (stone disks) coral and pebbles (for kōnane, a game similar to checkers)	balls, dolls, surfboards, flippers, tennis rackets, computers, electronic games, CD and DVD players, televisions, bicycles, scooters, books, paints	<ul style="list-style-type: none"> Made from new human-made materials (nylon, polyester) People use more. Products are shipped in. Packaging includes boxes, bags, cardboard, and plastic wrap.



How Long Will It Take to Break Down?

Glass bottle	1 million years
Monofilament fishing line	600 years
Plastic beverage bottle	450 years
Disposable diaper	450 years
Aluminum can	80 - 200 years
Foamed plastic buoy	80 years
Rubber boot sole	50 - 80 years
Foamed plastic cup	50 years
Tin can	50 years
Leather	50 years
Nylon fabric	30 - 40 years
Plastic film canister	20 - 30 years
Plastic bag	10 - 20 years
Cigarette filter	1 - 5 years
Wool sock	1 - 5 years
Plywood	1 - 3 years
Waxed milk carton	3 months
Apple core	2 months
Newspaper	6 weeks
Orange or banana peel	2 - 5 weeks
Paper towel	2 - 4 weeks

Information Source: US National Park Service; Mote Marine Lab, Sarasota, FL. Retrieved July 27, 2004 from, <http://sacoast.uwc.ac.za/education/resources/marinedebris/index.htm>. Pocket Guide to Marine Debris. (n.d.). The Ocean Conservancy and The U.S. Environmental Protection Agency.



How does human debris have a negative impact on marine life and what can we do to solve this problem?

Hawai‘i DOE Standard Benchmarks

Grades 4-5

Science 2: The Scientific Process: Science, Technology, and Society – Unifying Concepts and Themes

- **SC.4.2.1** Describe how the use of technology has influenced the economy, demography, and environment of Hawai‘i.
- **SC.5.2.1** Use models and/or simulations to represent and investigate features of objects, events, and processes in the real world.

Math 1: Numbers and Operations: Number Sense - Numbers and Number Systems

- **MA.4.1.3** Identify equivalent forms of commonly used fractions and decimals.
- **MA.5.1.1** Represent percent and ratio using pictures or objects.

Nā Honua Maui Ola 15 - 4

Engage in experiences that mālama the entire learning community and the environment to support learning and good practices of stewardship, resource sustainability, and spirituality.

- Learners participate in conservation and recycling practices and activities.

Key Concepts

- Marine debris comes from: 1) the land as rubbish that drifts on air currents and washes into the ocean from storm drains, landfills, and beaches; and 2) the ocean as fishing lines, nets, and other materials discarded by ships, boaters, and fishers.
- Discarded fishing nets and lines damage coral reefs and entangle seabirds, monk seals, turtles, and other marine life.
- Discarded plastics can be mistaken for food and limit the amount of digestible material an animal’s stomach, causing death by starvation.
- We can help to solve the problem of marine debris by reducing consumption of plastic disposable goods, reusing or recycling the products we do buy, and preventing fishing lines, nets, and other plastics from becoming waste in the ocean.

Activity at a Glance

Students participate in an entanglement demonstration and play a marine debris game. They use math skills to analyze the amount of “debris” collected during the game and to analyze their consumer habits related to use of disposable plastics. Grade 5 students develop models or simulations demonstrating how plastics affect the marine environment.

Time

3 – 4 class periods

Assessment

Students:

- Keep track of their use of disposable plastics for one day and analyze the fraction or percent of items that they recycle.



- Report to the class on their plastic consumption and how they implemented recycling and conservation practices.
- Develop a model or simulation to show how plastic affects the marine environment. Write a summary of the model or simulation and suggest solutions to reduce plastic waste in the ocean. (Gr. 5)

Hawai'i DOE Rubric

Advanced	Proficient	Partially Proficient	Novice
Science Grade 4			
Explain how the use of technology has influenced the economy, demography, and environment of Hawai'i and suggest ways to conserve the environment	Describe how the use of technology has influenced the economy, demography, and environment of Hawai'i	Give examples of how the use of technology has influenced the economy, demography, and environment of Hawai'i	Recognize that the use of technology has influenced the economy, demography, and environment of Hawai'i
Math Grade 4			
Consistently identify equivalent forms of commonly used fractions and decimals	Usually identify equivalent forms of commonly used fractions and decimals	Sometimes identify equivalent forms of commonly used fractions and decimals	Rarely identify equivalent forms of commonly used fractions and decimals
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
Math Grade 5			
Represent percent and ratio using pictures or objects, with accuracy	Represent percent and ratio using pictures or objects, with no significant errors	Represent percent and ratio using pictures or objects, with a few significant errors	Represent percent and ratio using pictures or objects, with many significant errors

Vocabulary

biodegradable – capable of being broken down by the action of microorganisms

non-biodegradable – not capable of being broken down by the action of microorganisms

marine debris – human-made solid material that is dumped or washed into the marine environment

‘ōpala – rubbish, trash

Materials

- photo CD (provided)
- student journal - 20 (provided)



- game cards (provided in Unit 2, Land to Sea Survival Shuffle activity)
- 6 clipboards
- box of rubber bands
- colored stickers (three different colors to represent different kinds of marine debris)
- samples of marine debris (pieces of plastic, disposable lighter, styrofoam popcorn, plastic six-pack rings, fishing net, and fishing lines)
- samples of biodegradable materials (cardboard, paper, banana peels)

Advance Preparation

- Use the game cards from the Land to Sea Survival Shuffle activity in Unit 2. In addition, prepare five more pages of food cards for each type of animal.
- Attach different color stickers to one-fourth of the food cards to represent marine debris. For example, blue = plastic lighters, red = food wrapper, yellow = fishing line (vary the amounts of stickers for each category.)
- Gather samples of marine debris and biodegradable items to display in the classroom.
- Preview the photographs on the photo CD provided with this guide.
- Make a copy of student journal - 20 for each student.

Teacher Background Information

A walk down the aisle of a supermarket or discount retailer reveals the vast array of plastic packaging and disposable plastic containers and products that are so prevalent in our society. In 1986, the U.S. produced six billion tons of disposable plastic packaging (Pacific Whale Foundation, 2004). A stroll along the beach reveals where too much of those plastics end up—in our marine environment. Since plastics are non-biodegradable, they persist in the environment for centuries. While wave action may cause the plastics to break into smaller and smaller pieces, even these small bits can accumulate in the intestines of seabirds.

Each year, millions of sea turtles, marine mammals, and seabirds ingest plastics that are mistaken as food or become entangled in marine debris (EPA, 2004). Plastic harms marine animals in a number of ways. They become entangled in discarded fishing lines, nets, and six-pack rings, or develop infections from the tightening material. Plastics that are mistaken for food clog the animals' intestines and may lead to death by starvation. In addition, toxic substances in marine debris may disrupt reproduction in marine animals or cause death.

Hawaiian Monk Seals

Marine debris is very hazardous for the endangered Hawaiian monk seal. Nets can entangle the seals and they may drown before

they can free themselves. The Northwestern Hawaiian Islands provide primary habitat for monk seal birthing and weaning, and each year seals, particularly weaned pups, are found entangled in nets and lines.



Seabirds

Seabirds become entangled in disposed nets, gear, and plastic trash such as soda rings. They also ingest disposable cigarette lighters and other small plastics. See the next instructional activity in this unit for photographs and additional information about the impact of debris on seabirds.

Green Sea Turtles

When they are active, Hawaiian green sea turtles must swim to the ocean surface to breathe every few minutes. When they are resting, they can remain underwater for as long as two and one



half hours without breathing. Turtles that become entangled and pulled down by nets struggle to get free and need to surface for air. Marine debris, like nets, cigarette lighters, plastic bags, and ballpoint pens can clog their digestive system and cause turtles to starve to death. Sea turtles may mistake discarded balloons as food, which

can then block their airways and cause death by suffocation.

See Unit 2, “Land to Sea Survival Shuffle,” for more information on the feeding behaviors of the animals featured in this instructional activity.

Teaching Suggestions

1. Conduct a demonstration of the impact of discarded nets and fishing line on turtles.

- Have students imagine that they are turtles swimming through the water and that their hands are turtle flippers.
- Give each student a rubber band. Ask students to place the rubber band around the pinky finger, across the back of the hand, and around the thumb.
- Explain that the rubber band is discarded fishing net that is pulling the turtle under water. Note that while the turtle is active, it must come to the surface every few minutes to breathe.
- Challenge the “turtles” to hold their breath while trying to remove the “net” without the use of their other “flipper.”



2. Discuss student reactions to the demonstration.

Discussion Questions:

- How difficult was it to remove the “net”?
 - How would a turtle become untangled in a net?
- ### 3. Show the images of marine debris on the photo CD provided.
- Discuss the types of ‘ōpala (trash) and materials that are entangling marine life—abandoned nets, fishing line, and six-pack rings.
- ### 4. Form teams and explain how to play the Singing the ‘Ōpala Blues game.
- Divide the class into six teams—two each of seabirds, turtles, and monk seals.
 - Distribute the animal cards for students in each team to wear around their necks.
 - Review the rules of the game (see **game instructions** provided at the end of this activity).
 - Appoint a recorder for each team and give those students a clipboard. Ask them to collect their team’s food cards at the end of each round of the game and place the cards on the clipboard.
 - Teams should give themselves a name and place the name on the clipboard to identify it.
- ### 5. Go outside to a cleared grassy area and play the game.
- Note: this is a modified version of the Land to Sea Survival Shuffle in Unit 2. This game focuses on marine debris, but the players (just like the marine animals) *don’t know* the marine debris is in the water. They won’t know what the color stickers mean until after the game.



6. Return to the classroom and debrief.

- After playing the game, have teams return to the classroom and count the number of food cards they retrieved.
- Ask students to count the number of cards they had with each color of sticker.
- Debrief and explain what each of those colors represents (fishing line, plastic lighters, and food wrappers).
- Discuss how not knowing which foods had marine debris mimics the feeding activity of these animals. (They don't know they are consuming plastic or other marine debris.)

7. Have teams report on their marine debris count and record these totals on the board.

- Make a chart on the board for each category of marine debris (fishing line, plastic lighters, and food wrappers) and have teams report on the total number of debris they had on their cards.
- Have teams subtract the number of cards with marine debris from their total food count.
- Ask teams for their totals and record these amounts on the chart on the board. Teams must have at least three food cards without marine debris for each animal on the team in order to survive.
- The team with the "healthiest" animals (those with the most food) is the winner!

8. Challenge students to calculate percentages or fractions of marine debris collected.

- Ask grade 4 students to figure out what fraction of their total cards had marine debris. Challenge them to express this amount in fractions and in decimals (i.e. $1/2 = 0.5$; $1/3 = 0.33$; $1/4 = 0.25$).
- Ask grade 5 students to arrange their cards to show the percentage of their total cards that had each type of marine debris. Challenge them to express these amounts in ratios for each type of debris.

9. Display biodegradable and plastic items and discuss marine debris.

- Display the biodegradable materials you collected earlier along with the plastic items that are often found as marine debris in the ocean.
- Lead a general discussion about how the technology that led to the development and use of plastics has affected the environment, people, and the economy.

Discussion Questions:

- What material is used to manufacture plastic? (It is manufactured from fossil fuels.)
- How does the use of plastics affect people? (Lightweight materials are used in medical devices, computers, food containers, etc. Disposable plastics are convenient for consumers.)
- How does the use of plastics affect the economy? (Jobs are created to manufacture and recycle plastics. Many plastic items are inexpensive for consumers. Lightweight materials used in vehicles can lower fuel consumption, etc.)
- How does the use of plastics affect the ocean environment? (Marine debris entangles wildlife and plastics are ingested by animals, which can lead to their death.)
- How do plastics and other forms of pollution get into the ocean?
- How is the plastic marine debris different from the biodegradable materials?

10. Distribute student journal - 20 and review it.

- Review the journal with students and challenge them to keep track of all of the disposable plastic items, including packaging on products, they use during one full day.

11. Ask students to share the total number of disposable plastic items they used in one day and the fraction or percentage of items they recycled, threw away or reused.

- Have students add the total number of disposables used by the class and compute the fraction or percentage of items recycled by the class as a whole.
- Discuss how they disposed of plastics, including ways that they reduced (used alternative products), reused, or recycled.



- 12. Have grade 5 students share their models or simulations showing the impact of marine debris with the class.**
- Have students critique the models and discuss ways that these can be used in the culminating activity for the unit.

Extended Activities

Have students create a song or songs for “Singing the ‘Ōpala Blues” and perform the song for others in the school.

Ask students to collect rubbish around the school and/or empty the rubbish can in the classroom. Sort the trash into piles (plastic, paper, rubber, metal, etc). Ask students to identify which items would most likely end up at the ocean and become marine debris. Which items float and which are blown in the wind? Place items in a bucket of water to see which float. How could the various items affect marine life? Could they become entangled in it? Could they swallow it? Which items could be recycled?

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U.S. Environmental Protection Agency. (2004). Marine Debris Abatement. Retrieved 7-13-04 from <http://www.epa.gov/owow/oceans/debris>

Other Sources of Information

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PEW Oceans Commission. (n.d.) Marine Pollution. Retrieved 7-14-04 from <http://www.pewoceans.org/inquiry/marine>

Kamehameha Schools has posted information about the impact of marine debris, particularly cigarette lighters, on the birds of Midway. <http://kms.kapalama.ksbe.edu/projects/2003/albatross/>



Name _____ Date _____

1. Keep track of all of the disposable plastic items, including packaging on products, that you use during one full day.

Disposable plastic stuff I used (list each item)	What I did with it... (place a check in the box)			
	threw it away	recycled it	reused it	other

2. Total number of items used: _____

3. Calculate the fraction (grade 4) or percentage (grade 5) of items you threw away, recycled or reused. Show your work below.

4. Share your totals with the class. Add your classmates totals to compute the fraction or percentage of items recycled for the whole class. Show your work on the back of this page.

Grade 5 Challenge: Develop a model or simulation that shows how plastic affects the marine environment. For example, simulate how animals can become entangled in debris, or develop a model that shows how plastics from land can be washed into the ocean.



Objective:

To find enough food for survival*

Game Set-up:

- Animal food cards are distributed randomly and widely around the playing area.
- Six teams of students (two each of monk seals, green sea turtles, and seabirds) wear identifying tags around their necks and search for food that is the same color as their tags.

To Play:

- At the signal, teams begin searching for food and collecting food cards.
- After 30 seconds, the teacher calls time. At that time, each team clips its food cards together and places them on a clipboard.
- Continue playing for two more 30-second rounds or until all food cards are gone.
- At the end of the third round, students collect all remaining cards from the playing area and hand them to the teacher.
- Return to the classroom and debrief.

* Students should play the game without knowing what the stickers on the food cards represent. These cards will be subtracted from their total food count. The winning team will be the one with the most food that does not have marine debris.

