Wai Ola: The Water of Life

Grade 4

ʻŌhiʻa Project / Exploring the Islands

Essential Question

- What can we learn from traditional Hawaiian *kalo* (taro) farming methods about using natural resources wisely?

Hawaiʻi DOE Content Standards and Performance Indicators

Science/Historical Perspectives: *Mālama i ka ʻĀina*: Sustainability

- Sustaining food supply: The student identifies agricultural methods used in Hawaiʻi to increase food production and their impact on humans and the environment.
- Conservation of resources: The student examines why there is a need to conserve natural resources.

Key Concepts

- Within an *ahupuaʻa* (traditional Hawaiian land/water management unit) were the resources needed to sustain life and grow the staple Hawaiian crop, *kalo*.
- To grow their staple crop, *kalo*, Hawaiians used agricultural technology, involving extensive *ʻauwai* system that diverted water back to the stream.
- The amount of water given to a *kalo* farmer within the ahupuaʻa depended upon his cooperation in building and maintaining the *ʻauwai* (irrigation canals).

Activity at a Glance

Students play a water game that emphasizes the importance of water and its manner of distribution in old Hawaiʻi.

DOE/MGF *Exploring the Islands* Telecast, "Wai Ola: Water of Life"

Eric Enos, Education Director of the Cultural Learning Center at Kaʻala shares his knowledge of *kalo* cultivation, its importance in Hawaiian culture, and demonstrates how to make poi with students from Kapolei Elementary School. During the program students draw the *kalo* plant and label its parts.

Assessment

Students:

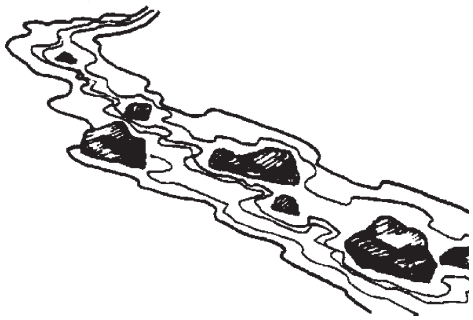
- Draw a diagram of the ahupuaʻa; on one side of the stream illustrate traditional Hawaiian land use and water management using labels and descriptions. (The other side of the

stream should be left blank for the next activity, "Water Watchers," where students will illustrate modern land use and water management.)

- Illustrate and/or describe the process involved in planting, cultivating, harvesting, and preparing *kalo*.
- Write a reflective journal entry from one of the following prompts:
  - Prompt A: You are attending a meeting with the *ho'oponopono* council of the ahupua'a. Your task is to gather information on how Hawaiians managed and used land and water to sustain the food supply. The information will help your classmates complete an activity on "Reduce, Reuse, Recycle." What questions would you ask the council about the *'auwai* and *lo'i* and why? Include an illustration, labels and a description.
  - Prompt B: You have been chosen by the *ali'i* (chief) to select the best site of the *lo'i*. What would you look for and why?
  - Prompt C: Farmer Kekoa states his problem to the ho'oponopono council, "My *kalo* yield in the past year is half of what is used to be. I need your help." What questions would you ask farmer Kekoa about his *lo'i*? Suggest possible causes and solutions that would help farmer Kekoa solve his problem.
  - Prompt D: I love to visit the stream as it goes from the mountain to the ocean. Some of the good things I see happening to the stream that make me happy are.... Some of the bad things happening to the stream that make me sad are....
  - Prompt E: I can *mālama* (care for) streams and conserve *wai* (fresh water) by....

Time

two–three class periods



Materials

'auwai game cards (provided)
scissors
large sheet of cardboard
blue construction paper
timer or watch
drawing paper (for each student)
Video program: *"Ka Wai:* Source of Life,"
Nā Ki'i Hana No'eau Hawai'i, ETV No. 12
(optional, available from DOE Teleschool)

Preparation

Fold up the sides of a large sheet of cardboard to represent an *'auwai* or irrigation canal. Cut 50 large water drop shapes (about 15 cm, or 6 in.) out of blue construction paper and place them in the *'auwai*. (These may also be used for the next activity, "Water Watchers.") Copy and cut the game cards.

Vocabulary

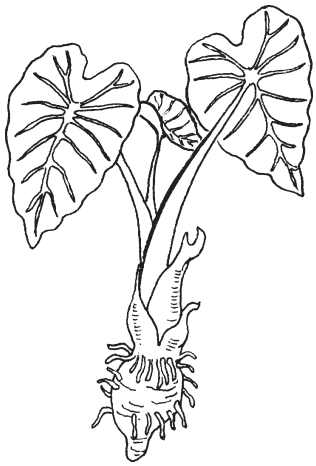
kalo, *makua*, *keiki*, *ʻohā*, *hā*, *ʻohana*, *piko*, *lau*, *lūʻau*, Hāloa, *loʻi*, *ʻauwai*

Teacher Background

The early Polynesian settlers of the Hawaiian Islands identified water with wealth. *Wai* is the Hawaiian word for fresh water; *waiwai* means prosperity. *Ola* means life; *wai ola* is the water of life. The Hawaiians believed that all the land and the water belonged to the gods. The highest chief, *aliʻi nui*, acted for the gods and ruled the land. Land use was governed in sections called *ahupuaʻa*, which usually extended from the upland summit peaks or ridge crests down to the outer edge of the reef. Within the ahupuaʻa boundaries, the *makaʻāinana* (commoners) had most of the resources they needed for survival—fish from streams and reefs, fresh water and land to grow *kalo* and other crops, and forests for wood and medicinal herbs. The only resource people could not use freely within the ahupuaʻa was water. The rights to use water were overseen by a chief—the *konohiki*. When ahupuaʻa were combined to create a *moku* (district), the konohiki was responsible to the *aliʻi ʻai moku.*

At a prominent place where two ahupuaʻa met, there was an *ahu* (collection of stones) on which an image or offering of a pig (*puaʻa*) was placed. During the Makahiki season, the ancient festival that began when the constellation of Makaliʻi rose at sunset, people placed offerings of fish, food crops, or forest bird feathers at the ahu for the touring aliʻi.

Kalo is a staple food plant of Hawaiians. The underground stem or corm of *kalo* is known as the *makua* (parent). Its offshoot is the *keiki* (child) known as the *ʻohā*. The word for family, *ʻohana,* shows the close relationship of Hawaiians to *kalo.* The origin of *kalo* is Hāloa the son of Wākea, the first man and ancestor of all Hawaiians. Hāloa was born a shapeless mass and buried next to Wākea's house. In that spot the first *kalo* plant grew.



Kalo cuttings (*huli*) are used for replanting. The harvested parts of the plant are the corm, which is cooked, mashed and eaten as *poi;* and the *hā* (stem) and *lau* or *lūʻau* (leaves), which are eaten as a vegetable. *Kalo* is usually grown in irrigated terraces known as *loʻi kalo*. The Hawaiians engineered an extensive system of irrigation to keep cool water flowing over their *kalo* crops. Some of the water in streams was diverted to the *loʻi kalo* through irrigation canals called *ʻauwai*. Water fed into individual *kalo* patches from this canal and then flowed back into the stream. Hawaiians planted other crops, such as *maiʻa* (banana) near the *loʻi kalo* so the plants could be watered along with the *kalo*.

The konohiki distributed water to each *ʻohana* according to how many men the farmer brought to build and maintain the *ʻauwai* and *loʻi*. The farmers were known as *mahiʻai* and only men were allowed to cultivate *kalo*.

In dry areas, growing *kalo* was more labor intensive. When it was not raining, crops were covered with a mulch of ferns and other plants to minimize evaporation and hold in precious water. When it rained, the mulch was removed to allow the moisture to penetrate the soil. Hawaiians living in dry areas had a much more difficult time obtaining fresh water. They collected fresh drinking water that seeped from the roofs of caves and flowed from springs that welled up in the sea. Some of these springs were found at the ocean's edge at low tide. Divers located these under sea springs and collected the water in gourds.

The steady flow of streams from the land to the sea is important for freshwater and marine organisms. Native stream organisms such as *ʻoʻopu* (gobies) or *ʻōpae* (shrimp or prawns) spend part of their lives as larvae in the sea and then return to streams where they mature. Marine algae and fish are nourished by the flow of nutrients from streams to the sea. Hawaiians took advantage of many of these stream-nourished coastal areas to harvest food and build fishponds. These areas of "sweet water" are still important fisheries today.

The vital connection between the land and sea has been disrupted in the last 200 years by a growing human population. The activities of people and feral animals in upland areas have muddied streams, killing some algae and stream life, and smothering reefs with eroded silt and mud. Some water uses, such as growing sugarcane or housing developments, divert a substantial amount of water from streams. Unlike the Hawaiian *kalo* irrigation system, however, modern diversion of water does not return water to a stream. Streams have also been lowered by residential water uses. When groundwater is tapped by wells, springs that feed into streams can dry up. The result is reduced streamflow and the loss of native stream life and productive marine fishing grounds. When streamflow is low, water stagnates in the *loʻi* and the *kalo* rot. In some areas, streams have completely dried up and *kalo* production has become no more than a memory of days gone by.

Teaching Suggestions

1. Divide the class into five family groups or *ʻohana*. Have students imagine that they are the first settlers in old Hawaiʻi. Ask them to describe where they would settle on the island (e.g., mountain crest, windward side, leeward side, rainforest, coastal area, near a stream) and the reasons for their chosen location.

2. Establish the importance of streams in early Hawaiʻi. Ask the *ʻohana* what they would do when their population grew and more and more people were competing for water, fish and other resources. Describe the system of ahupuaʻa.

3. If available, show the "Ka Wai: Water Source of Life" video on Hawaiian uses of water and discuss it with students. Ask them to identify the place names on their island that contain the word *wai*.

4. Watch the "Wai Ola: Water of Life" program from the *Exploring the Islands* series. Have drawing paper, pencils and erasers ready for students to draw and label the *kalo* plant during the program.

During the *Exploring the Islands* Telecast
"Wai Ola: Water of Life"

Mystery Minute Question for This Week

Of all food plants introduced by Polynesians, which would they have been able to plant and harvest first?

MindPower Minute Questions

- How did Hawaiians get water from the stream to their many *lo'i*?
- Why did Hawaiians pound *kalo*?

Student Activity

- Students draw and label the *kalo* plant.

Mahalo to . . .

Kapolei Elementary School for assisting with *Exploring the Islands*.
Teachers: Wendy Nakamura, Audrey Amona, Michelle Arase, Mrs. Cannon
Students: Avery Domingo, Ashleigh Freitas, Tyler Orian, Jodi Santiago

5. Play the *'auwai* game. See game instructions included with this activity. Ask each *'ohana* to choose a name for itself. Show students the *'auwai* box and give each *'ohana* five water droplets and a pair of scissors to start the game.

6. Discuss students' reaction to the game. How did they feel about sharing water? How did they feel when farmers upstream used more than their share of water?

7. Ask students to complete the assessment activities.

Extended Activities

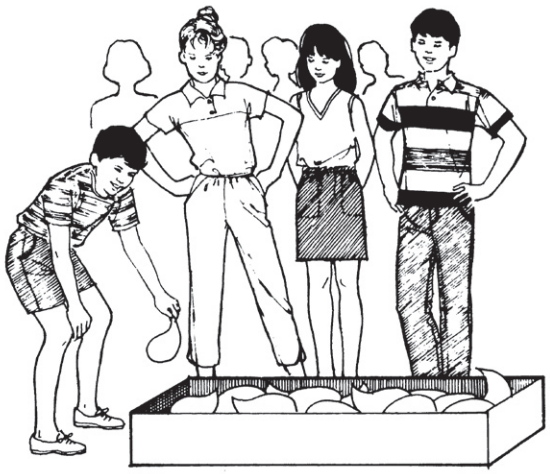
- Ask each *'ohana* to create a presentation about *wai ola*, the water of life. These could be posters, stories or dramatizations to share with other classes.

- Students could generate a list of places on their island that have *wai* in the name. Locate the places on a map and see if they are near streams or other sources of water. Distinguish between *wai* (fresh water) and *kai* (seawater).

- If possible, arrange a field trip to Ka‘ala Farm that was featured in the *Exploring the Islands* telecast.

Objective

To collect "water" needed for life from the stream by correctly answering game cards.



Cards

The **Wai** cards present questions about water use, growing and harvesting kalo. Some cards are marked "**Chance.**" **Chance** cards describe events that affect a group's water supply.

How to Play

1. Each *'ohana* takes turns drawing a **Wai** card from the top of a stack placed in the middle of the room. (Keep the cards in numerical order.)

2. An *'ohana* member reads the question aloud and takes the card back to the group. The 'ohana has a maximum of 60 seconds to answer the question on the card.

3. A group responding correctly is awarded *wai* in the form of a paper water droplet from the *'auwai.*

4. A group responding incorrectly is not rewarded any water. Another *'ohana* may choose to help supply the answer and share the water with the group that needed help. Water is shared by cutting a droplet in half.

5. If a **Wai** card is marked **Chance**, the *'ohana* should first try to answer the question on the card and then draw a card from the **Chance** stack. The *'ohana* should read the **Chance** card to the class and follow the directions.

6. A **Chance** card is drawn even if an incorrect answer is given for the **Wai** card.

7. Rotate turns so that each *'ohana* answers four questions.

To End the Game

When all cards have been drawn, the *'ohana* with the most *wai* is the wealthiest, or hardest working group in the ahupua'a.

1. Hāloa was the son of Wākea, the first man and ancestor of all Hawaiians. Hāloa was born a shapeless mass and buried next to Wākea's house. In that spot the first *kalo* plant grew.
2. Nutrients flow from the stream to the sea allowing algae (*limu*) to grow, and fish and lobster to come and feed.
3. The farmer received more water by helping to build and maintain the *ʻauwai*.
4. Water is necessary for life.
5. Washing, drinking, farming, source of food
6. The modern system does not return water to the stream, especially not clean water.
7. They dove into the sea and collected fresh spring water in gourds.
8. The stream dries up or becomes shallow and native streamlife loses its habitat. (Also slower-moving, warmer water is better habitat for alien species like tilapia, which introduce diseases and parasites to native species.)
9. Lack of cool, clear running water creates rotten *kalo* and in some cases, streams have dried up and *kalo* farms have been eliminated.
10. *Kalo* is replanted with cuttings from the *ʻohā* called *huli*. They are planted in the *loʻi* where they need a steady supply of cool running water, soil and sun.
11. *Kalo* is harvested by pulling up the plant and cleaning the corm. The *lūʻau* (leaves) can also be harvested one and one-half to two months after planting. (The corm needs 9 to 12 months to grow before harvest.)
12. The upland forest provided medicinal herbs, trees for wood and bird feathers, the stream carried fresh water for growing *kalo*, and the reef provided fish and limu.
13. Poi is made by first cooking the kalo corm an then pounding it, adding water, and pounding more until it becomes *poi*.
14. It smothers algae, it clogs small streams, and kills streamlife.
15. There was no refrigeration in old Hawaiʻi. By making *poi*, Hawaiians were able to store the *kalo* and have it as food for a longer time than if they just stored the corm.
16. They collected fresh water that seeped from the roofs of caves and from freshwater springs in the ocean.
17. They spend part of their life in the sea and then return to a stream.
18. Stream water has been diverted for other crops and some streams have dried up.
19. Do not discard litter or chemicals in streams; conserve water.
20. The silt is carried downstream and into the sea where it smothers the reef.