"A fishpond is like a beautiful smile in the sparkly Pacific Ocean."

Rachel Luczon, Grade 4
Kilohana School, Moloka'i
The Physical Setting

"Fishponds, loko ʻiʻa, were things that beautified the land, and a land with many fishponds was called a ‘fat’ land (ʻāina momona)."

Samuel Manaiakalani Kamaka (1869)

Fishponds are either human-made or natural enclosures of sea water (kai), fresh water (wai), or brackish water (wai kai) used for the raising and harvesting of various edible fish and plants. Fish farming has long been practiced throughout the world by many cultures. In Egypt, 4,500-year-old drawings in the tombs of the pharaohs show tilapia and mullet as food sources. The Chinese have raised common carp in dirt fishponds as early as 4,000 years ago, and they continue to do so today. Fishponds are known to have existed in ancient Mesopotamia and Assyria, and the nobility of Rome built both freshwater and saltwater ponds for raising fish. They were particularly fond of eels, as food and as pets.

While rock-wall fishtraps, similar to the loko ʻume iki in Hawaiʻi, are found in parts of Southeast Asia and throughout the Pacific, the fishpond totally unique to Hawaiʻi is the loko kuapā. The Polynesian settlers of Hawaiʻi developed a variety of fishponds and fishtraps to increase the availability of aquatic plants and animals for food as part of their ahupuaʻa aquaculture and agriculture system. The loko ʻume iki were most notably built along the southern coast of the island of Molokaʻi.

The development of loko ʻiʻa (fishponds) for the specific purpose of sheltering and nurturing fish for consumption began as early as the 13th century in Hawaiʻi. The impressive fishpond walls we see today were built by thousands of workers passing stones from hand to hand.

The Hawaiian fishpond of the loko kuapā style is made of a massive stone wall extending on to the reef flat. In these walls Hawaiians built ʻauwai kai (channels) that allowed the exchange of water with each changing of the tide. The ʻauwai kai caused a swift current that attracted fish depending on which way the tide was flowing. A defining characteristic of the Hawaiian fishponds was the placement of a wooden mākahā (sluice grate) in the ʻauwai kai (or ʻauwai in freshwater fishponds). This grate controls what goes in and out of the pond and allows for the easy collection of fish with the changing tide. The construction of fishponds using mākahā represented a major milestone in the evolution of the Hawaiian people as it marked the transition from a hunter/gatherer existence to that of a farmer. In this case, however, it was the fish being farmed using the water as the pasture. The location of the pond was not by chance, as characteristically a fresh water source (such as a stream or spring) fed into the fishpond. The fresh water percolating through the ground or flowing from streams brings with it minerals and trace nutrients that enter into the pond and act as fertilizer for phytoplankton and algae, on which herbivorous fish like ʻamaʻama (striped mullet) and awa (milkfish) feed.
Without any external input, the loko kuapā ecosystem could support approximately 500 pounds of fish per acre. The true genius of the design, however, is seen in the way fish were stocked into the fishpond. The pua (fry) stages of certain kinds of fish and invertebrates migrate to the brackish water environment inside of the fishpond, undoubtedly attracted by the large amount of food and the safe haven of the nursery habitat. While still small, the fry can easily squeeze between the individual bars of the mākāhā and once inside of the fishpond they feed and grow rapidly. Soon, the fish are so large that they can no longer exit through the mākāhā and they become part of the fishpond community.

The Ahupua’a

Ahupua’a are traditional units of land in Hawai‘i that vary in shape and size. They are political and ecological land units designed to meet a community’s need for food and materials. Ahupua’a generally range from summit peaks or ridge crests, extending down slope, becoming wider as the land slopes downward and to the outer edge of the reef. The boundaries between adjacent ahupua’a usually conform to valley walls or ridges. The general concept of the ahupua’a is that the human community living within its boundaries would be self-sufficient in obtaining the resources needed for survival such as fish, water and land to grow kalo (taro), medicinal herbs, and trees for canoes and shelter. However, due to the wide range of elevation, rainfall and topography in the Islands, there are a number of ahupua’a that don’t conform to this generalized ideal. For example, on O‘ahu, the ahupua’a of Wai‘anae reaches beyond Wai‘anae valley to include a wedge of land that extends to the summit of the Ko‘olau range. In early times, this extended boundary enabled people living in the arid leeward area of Wai‘anae valley to gather resources from the wetter Ko‘olau area.

People also shared resources among ahupua’a to obtain plants that only grow in certain areas. Pili grass, which was prized for thatching, grows best in dry leeward areas. Hala trees, which provide materials for weaving, grow best in wet windward valleys. Koa trees large enough for canoes were found in koa forests that typically grow at elevations above 3,000 feet on the larger islands.
Politically, the ahupua’a were governed by a konohiki (land manager) who oversaw the right to use the resources within the ahupua’a and served as an intermediary between the chief and the haku’ohana, or representative of the resident families or commoners (maka’aiinana). Konohiki were responsible to chiefs of greater rank (ali’i nui or ali’i) that ruled over a moku (an island or district). Within the ahupua’a, individual families were allowed to cultivate and inhabit smaller sections of land or ‘ili. The konohiki also directed the people in the building and repair of fishponds whenever the ali’i nui commanded.

During the Makahiki (great annual harvest festival), an entourage of ali’i (chiefs) sometimes numbering 100 people or more, would tour the island, traveling from one ahupua’a to another. At the boundary of each ahupua’a, the residents placed an offering of some of their food crops, fish harvest, and feathers from forest birds for the touring ali’i. The offerings were placed at an ahu (collection of stones) that was adorned with the head of a pig (pua’a). The people in each ahupua’a would provide shelter and food for the ali’i and all those who traveled with them.

**Types of Fishponds and Fishtraps**

The types of fishponds or fishtraps built by the Hawaiians in a specific location were directly related to the physical attributes of a particular ahupua’a. “No two fishponds or fishtraps are identical in construction, shape, or internal components” (Kikuchi, 1973). The sizes of the ponds are random, as the early Hawaiians utilized nearly all of the naturally occurring bodies of water available. The size was determined by the topography. Perhaps the simplest in construction and the most diversified were the various fishtraps. Many of those used in Hawai‘i are similar to those found throughout Polynesia.

![umu (small fishtrap)](image)

![loko pu‘uone or hakuone](image)

![loko ‘ume iki](image)

![loko kuapā](image)
Pā (a wall, fence, or enclosure) is a primitive type fishtrap that has a single lane to guide fish at low or high tide, but not at both. The purpose of all lanes was to guide the fish into an enclosure where they could be caught with nets.

While the topography of a few ahupua'a allowed for the construction of all types of ponds or traps, most land divisions could utilize only two or three types. For example, the largest number of loko kuapā (70) were built along the shores of O'ahu. The island of Hawai'i had few loko kuapā but the largest number of loko pu'uone. Along the island of Moloka'i, 13 loko 'ume iki were known to have existed (Farber, 1997). Some ahupua'a weren't suited to any ponds or traps.

The importance of fishponds in Hawai'i prior to European contact is illustrated by their numbers and distribution. In 1778, when Captain Cook arrived, about 360 fishponds were identified. In 1990, DHM Planners, Inc., conducted a thorough survey of fishponds and fishtraps in the six major islands and concluded the number to be 488, some distinguished only by remnants of the pani wai (walls) or mākāhā (sluice grates). The large number of ponds and traps on O'ahu (178) and Hawai'i (138) reflects the large human populations and the suitability of the landscape with its streams, estuaries, broad plains, and flat coastal reefs for the construction of fishponds. On O'ahu, 23 ponds were located around the shores of Kāne'ohe Bay. Some of the remaining ponds around Kāne'ohe Bay are Waikalua, He'eia, Kahanlu'u, Nu'upia and Mōli'i. Until 1999, when the caretaker retired, Mōli'i pond was the oldest continuously operated pond in the state. The numbers of fishponds and fishtraps on the other islands were as follows: Moloka'i (74), Kaua'i (50), Maui (44), and Lāna'i (4) with the one pond on Ni'ihau not included. The sizes of loko kuapā ranged from one to 523 acres and loko pu'uone from several acres to 300 acres. The largest and most noticeable of the shoreline ponds, the loko kuapā, are the type that most people regard as Hawaiian fishponds (Farber, 1997).

The activities in this unit help students to explore different types of fishponds and fishtraps and to understand how these structures were built to take advantage of different physical features within an ahupua'a. The introductory Grades 4 - 5 lesson in this unit focuses on the first six types of fishponds and fishtraps identified in the illustrations on the previous pages. The pā is introduced in the Grades 6 - 8 Pacific Patterns activity.

References

DHM Planners, Inc. and The Bernice Pauahi Bishop Museum. 1990. Hawai'i Fishpond Study: Islands of Hawai'i, Maui, Lana'i, and Kaua'i. Honolulu, HI.


Cultivating Activity

**Activity:** Toako I'a

- Hawaiians built different types of fishponds and ha'apai to practice taro, huge underwater edible fish and seaweed taro (wailoa), to raise and harvest water (wai), or brackish seawater (kalo), and endosperm of sea water (kala).

- Hawaiians built different types of fishponds and ha'apai in the environment that take advantage of physical features that are unique to places. They built different types of fishponds and ha'apai with key features defined:
  - Put your fishpond inside a mountain depression and keep the pond and ha'apai shallow. Students produce booklets that include:
    - Students produce booklets that include:
      - A summary describing the ponds and ha'apai and student activity sheet:
      - A completed chart comparing the ponds and ha'apai with key features identified:
      - Included:
        - Exposing students to ha'apai and fishponds that:
          - Design students to understand the different differences between different environments and summarizing student responses.

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## Sample Rubric for Unit 1 Culminating Activity

<table>
<thead>
<tr>
<th>Performance Indicators</th>
<th>Kūlia (Exceeds Standard)</th>
<th>Māka'akau (Meets Standard)</th>
<th>'Ano Māka'akau (Almost at Standard)</th>
<th>Māka'akau 'Ole (Below Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Social Studies:</strong> World in Spatial Terms</td>
<td>Information is in logical sequence and organized to communicate how physical features in the ahupua'a support different types of fishponds; makes comparisons to similar features in other ahupua'a.</td>
<td>Information is logically organized to communicate how physical features in the ahupua'a support different types of fishponds.</td>
<td>Information is not well organized and does not clearly communicate how physical features in the ahupua'a support different types of fishponds.</td>
<td>Not enough information and sequence of information is difficult to follow.</td>
</tr>
<tr>
<td><strong>Points</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explain the meanings, patterns and relationships found in geographic data.</td>
<td>Writing accurately describes the relationships between the types of fishponds and the different physical features within the ahupua'a and compares these relationships to those in another ahupua'a.</td>
<td>Writing accurately describes the relationships between the types of fishponds and the different physical features within the ahupua'a.</td>
<td>Writing makes few connections; content is good; but needs more detail about the relationships between types of fishponds and physical features of the ahupua'a.</td>
<td>Writing does not make connections between the types of fishponds and the physical features in the ahupua'a.</td>
</tr>
<tr>
<td><strong>Points</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construct a map that includes collected geographic data.</td>
<td>Map includes a legend or key and has features accurately located and labeled; shows evidence of extra effort to provide details that make the map easier to understand.</td>
<td>Map includes a legend or key and has key features accurately located and labeled.</td>
<td>Map includes some of the key features accurately located; map is adequate, but needs more information (such as a legend or key or labels).</td>
<td>Map does not include a legend or key; features of the ahupua’a are not accurately located; map is difficult to understand.</td>
</tr>
<tr>
<td><strong>Points</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**INOTICED:**
Loko I‘a

- Why did Hawaiians build different types of fishponds (loko i’a) and fishtraps?
- What are the similarities and differences between different types of fishponds and fishtraps?

Hawai‘i DOE Content Standard

Social Studies: Geography: World in Spatial Terms
- Students collect, organize and analyze data to interpret and construct geographic representations.

Grades 4 - 5 Performance Indicators
- Show organization of collected data.
- Construct a chart that includes collected geographic data.
- Explain the meanings, patterns and relationships found in geographic data.

Key Concepts
- Hawaiians built different types of fishponds and fishtraps — enclosures of sea water (kai), fresh water (wai), or brackish water (wai kai) — to raise and harvest various edible fish and plants.
- Fishponds and fishtraps have key features in common, yet each type has unique features that take advantage of physical conditions in the environment.

Activity at a Glance

After viewing the Project Kāhea Loko video, students play a game to reinforce new vocabulary and discover different types of Hawaiian fishponds and fishtraps. These discoveries become the geographic data needed for the second part of the unit.

Time
3 class periods

Skills
reasoning, analysis, comparison, deduction
Assessment

Students produce booklets that include:
• organized information about each type of fishpond or fishtrap with key features identified;
• a completed chart comparing the ponds and traps (student activity sheet); and
• a summary describing relationships — similarities and differences between different types of fishponds and fishtraps.

Vocabulary

‘auwai – ditch or canal
loko i’a – fishpond
kuapā – seawall
mākahā – sluice grate or gate
‘auwai kai – ditch or small canal connecting the fishpond to the ocean
ali‘i – chief
maka‘ainana – commoner
pu‘uone – sand heap or sand dune
lo‘i – taro patch
algae or limu – aquatic plants and organisms containing chlorophyll
‘upena – fishing net
mahī‘ai – farmer
lawai‘a – fisher

Materials

Provided:
• Kāhea Loko video
• vocabulary cards
• fishpond descriptions
• fishpond illustrations
• student activity sheet

Needed:
• tape
• optional: additional pictures of fishponds (see the Kāhea Loko Website: www.thepaf.org)

Advance Preparation

Set up a chart with three columns, each labeled with a letter “K,” “W” or “L.” The “K” represents what students know about fishponds, the “W” will be what they’d like to learn, and the “L” will be what they learn as a result of this unit. Make a copy of the student activity sheet for each student. Copy one set of the vocabulary word cards and cut them apart. Make five copies of each fishpond description sheet. Make one copy of each fishpond and fishtrap illustration and cut along dotted lines. (Be sure to keep the drawing number on the cut sheet.)
Teaching Suggestions

1. Explain the K-W-L chart to students. Ask the students a series of questions to explore what they know about fishponds and record their responses under the “K.”

   - What is a fishpond? (Agree on a general definition.)
   - Have you ever visited a fishpond? Describe it and where it was located.
   - How did Hawaiians decide where and how to build fishponds?

2. Introduce the Kāhea Loko video to the class by challenging students to watch it with the following questions in mind: Why did Hawaiians build different types of fishponds? What is the feature that the fishponds have in common and why is it important?

3. Explain that after watching the program, the class will be playing a game based on what students have learned.

4. Watch the video, and if desired, pause the videotape on the graphic screens to discuss the questions posed.

5. After watching the program, discuss why Hawaiians built different types of fishponds (to cultivate and store fish for the ali‘i, and to have fish available in mauka areas during times of need) and what the important feature in the fishponds was (the mākāhā, which trapped the fish and allowed water to circulate in the ponds.) Record what students have learned under the “L” on the K-W-L chart. Then ask the students to generate a list of what they would like to learn and record their questions under the “W” on the chart.

6. To build students’ vocabulary for their fishpond study, divide the class into five small groups to play round one of the Loko I’a game. Display all of the vocabulary pictures by taping them up on the board. (Leave room for a word label to be taped below each picture.) Place the vocabulary words in a stack and explain that each word matches one of the pictures.

   **Loko I’a Game - Round 1**

   - Have teams take turns drawing a vocabulary word.
   - Give a team 30 seconds to make a match and tape the word below the correct picture. Correct matches earn a team one point.
   - If a team is not correct, the first team to signal may attempt to make a match and earn a point. If that team does not succeed, another team may try.

   **Bonus Round**

   - Once all words are drawn and matched, hold up a word and challenge teams to write a definition for the word. After 30 seconds, check their definitions and award two points for each correct answer.
7. Remove the vocabulary cards and replace them with the fishpond and fishtrap illustrations. Explain that these are the "mystery" ponds for students to identify using the clues on the pond description sheets. These descriptions use the vocabulary words introduced in round one to describe each pond's key features.

**Loko I'a Game - Round 2**

- Distribute the first fishpond description to each team and read it aloud. Challenge teams to match the description to one of the numbered mystery ponds. Instead of calling out their answers, have students write the number of the pond and circle the clues in the description—the key features that describe the pond or fishtrap.

- Ask teams to share their ideas and verify the correct match. See answers below.

- Award each team two points for identifying the correct illustration and one point for each correct clue or key feature identified.

- Distribute another fishpond description and read it aloud with students. Challenge the teams to again match the description to one of the displayed illustrations and circle the clues. Continue this process until teams have attempted to match all fishpond and fishtrap descriptions with the displayed illustrations.

<table>
<thead>
<tr>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Loko Kuapā</td>
</tr>
<tr>
<td>2  Umu</td>
</tr>
<tr>
<td>3  Loko Puʻuone</td>
</tr>
<tr>
<td>4  Loko Wai</td>
</tr>
<tr>
<td>5  Loko I'a Kalo</td>
</tr>
<tr>
<td>6  Loko ʻUme Iki</td>
</tr>
</tbody>
</table>

8. To summarize the game, ask students to help you arrange the six fishpond/fishtrap illustrations from mauka to makai. (The drawings fit together to form one continuous ahupuaʻa if you place them in the following order: 5, 4, 3, 6, 1, and 2; refer to the illustration on pages 2 and 3 of the Unit Introduction.) Discuss what students have discovered and fill in their K-W-L chart.
Discussion Questions

- What features do all Hawaiian fishponds have in common? (makāhā, ‘auwai or ‘auwai kai, fed by streams or springs)
- Which fishponds and fishtraps were located near the sea? (loko kuapā, loko pu‘uone, loko ‘ume iki, umu, and sometimes loko wai)
- Which were located in the uplands? (loko wai, loko i'a kalo)
- What would you like to find out about the different types of ponds?

9. Distribute the student activity sheet and ask students to complete the assessment activities. Answers to the student activity sheet are listed below.

<table>
<thead>
<tr>
<th>Type of fishpond or fishtrap</th>
<th>Uses mākāhā</th>
<th>Used only to trap fish</th>
<th>Fed by streams or springs</th>
<th>Used for growing kalo</th>
<th>Has no ‘auwai or ‘auwai kai</th>
<th>Uses the shoreline as one wall</th>
<th>Exists only in Hawai‘i</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loko I'a Kalo</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loko Wai</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loko Pu‘uone</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loko Kuapā</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loko ‘Ume Iki</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Umu</td>
<td>X</td>
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<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Adaptations/Extensions

- Gather a number of pictures and illustrations of various fishponds throughout Hawai‘i, and have the students classify each using the key features they identified for ponds in this activity.

- Ask the students to share their knowledge of fishponds located near their communities. This could include personal experiences, family history, legends, or books and articles they have read. The activity could take several forms:
  - an informal class discussion
  - a story circle (where everyone sits in a circle and each has an opportunity to speak)
  - a writing assignment, a short theme or essay
  - an art activity where the students draw pictures to illustrate a place, event, story, or personal experience

- Challenge students to create fishpond models to demonstrate how the mākāhā functions. See Engineering Ingenuity in Unit 3.
ʻupena

lawaiʻa
mākāhā

‘auwai kai
aliʻi

makaʻāinana
loʻi

mahīʻai
limu

ʻauwai
Hawaiians built loko i‘a kalo (taro fishponds) in the mountains next to streams. Stream water flowed through an ‘auwai (ditch) into the lo‘i (taro patches). From the taro patches the water flowed into deeper ponds. These deep ponds were used to raise fish and taro. Taro was planted in mounds of soil. Fish swam around these mounds to find food. The fish ate insects, algae, and plants that fell into the ponds. Small mākāhā (grates) kept the larger fish from escaping into the stream. The maka‘ainana (common people) harvested fish from these ponds for food.

What lives in the loko i‘a kalo?

**Plants**
- kalo (taro)
- limu kalawai (freshwater pond algae)

**Animals**
- ‘o‘opu (goby)
- awa (milkfish)
- ‘ama‘ama (mullet)
- āholehole (flagtail)
- ‘ōpae (freshwater prawns and shrimp)
Loko wai are freshwater inland ponds. Hawaiians of old made these ponds by digging out natural pools. Stream water flowed into the ponds through ‘auwai (ditches). Sometimes the ponds were built on or near natural groundwater springs. Hawaiians caught fish from the ocean, placed them in gourds filled with water, and carried them to the ponds. They put the fish in the loko wai to grow. Other animals, such as gobies and prawns, swam into the ponds from the streams. Small mākahā (grates) prevented the larger fish from swimming back into the stream. Hawaiians harvested the fish with ‘upena (woven fish nets). They placed these nets across the channel between the pond and the stream. The fish would swim right into the ‘upena.

What lives in the loko wai?

Plants
- kalo (taro)
- limu kalawai (freshwater pond algae)

Animals
- ‘o‘opu (goby)
- awa (milkfish)
- ‘ama‘ama (mullet)
- āholehole (flagtail)
- ‘ōpae (prawns and shrimp)
- weke (goatfish)
- awa ‘aua (ladyfish)
Loko Pu‘uone

A loko pu‘uone is an isolated shore fishpond named for a pu‘uone (a sand dune or heap of sand) that holds water in the pond. The water in the loko pu‘uone was brackish (wai kai); this means it was part salt water and part fresh water. Fresh water flowed into the ponds from springs or streams. Salt water flowed in through an opening called an ‘auwai kai. Hawaiians dug the ‘auwai kai to connect the pond to the sea. They built a mākāhā (sluice grate) at one end of the ditch. Small fish swam into the pond through openings in this grate. When the fish got bigger, they couldn’t fit through the mākāhā. These trapped fish were caught for food. Some of the loko pu‘uone were for maka‘āinana (commoners). Others were built for the ali‘i (chiefs).

What lives in the loko pu‘uone?

Plants
- limu (seaweed)

Animals
- ‘o‘opu (goby)
- pāpa‘i (crabs)
- awa (milkfish)
- ‘ama‘ama (mullet)
- āholehole (flagtail)
- weke (goatfish)
- awa ‘aua (ladyfish)
- ‘ō‘io (bonefish)
- pāpio and ulua (jacks)
- nehu (anchovy)
- akule (big-eyed scad)
- palani (eye-striped surgeonfish)
- pualu (yellowfin surgeonfish)
- ‘ōpae (prawns and shrimp)
- ‘o‘opu hue (puffer fish)
Loko Kuapā

Loko kuapā are fishponds with kuapā (seawalls) built of stones and coral. Hawaiians built these fishponds on a reef flat near a freshwater stream or spring. The shoreline was the inner wall of the pond. The outer walls had openings called ‘auwai kai with mākāhā (sluice grates) that allowed sea water to flow in and out of the pond. Fish swam into the pond through the mākāhā. When the fish grew bigger, the mākāhā trapped them in the pond. Some loko kuapā had a nursery pond inside. Pua ʻiʻi or pua ʻiʻa (baby fish) were kept in the nursery to protect them from larger fish. Hawaiians built loko kuapā for the aliʻi (chiefs). This kind of pond exists only in Hawaiʻi.

What lives in the loko kuapā?

Plants
• limu (seaweed)

Animals
• pāpaʻi (crabs)
• ʻōpae (shrimp)
• awa (milkfish)
• ʻamaʻama (mullet)
• āholehole (flagtail)
• weke and kūmū (goatfish)
• awa ʻaua (ladyfish)
• ʻōʻio (bonefish)
• manini (convict tang)
• palani (eye-striped surgeonfish)
• pualu (yellowfin surgeonfish)
• pāpio and ulua (jacks)
• nehu (anchovy)
• akule (big-eyed scad)
• moi (threadfin)
• kākū (barracuda)
• uhu (parrotfish)
• hīnālea (wrasse)
• kāhala (amberjack)
• kala (unicorn fish)
• pūhi (eel)
• ʻoʻopu hue (puffer fish)
• nahawele (mussel)
Hawaiians built loko ‘ume iki on the reef flats along the coast. The walls of these ponds had many funnel-shaped openings. Some of the openings were wider toward the land, and others were wider toward the ocean. The fishtrap walls had no mākāhā (sluice grates) to keep the fish from leaving. Fish were attracted to the currents created by the changing tides. Twice a day, when the tide changed, women came to gather fish. When the tide went out, fish swam into the trap. When the tide came in, fish swam out of the trap. Women placed nets across the openings to catch the fish as they swam in or out.

What is caught in the loko ‘ume iki?

Plants
- limu (seaweed)

Animals
- pāpa‘i (crabs)
- ōpae (shrimp)
- awa (milkfish)
- ‘ama‘ama (mullet)
- āholehole (flagtail)
- weke and kūmū (goatfish)
- awa ‘aua (ladyfish)
- ‘ō‘io (bonefish)
- pāpio and ulua (jacks)
- nehu (anchovy)
- akule (big-eyed scad)
- moi (threadfin)
- kākū (barracuda)
- uhu (parrotfish)
- hinālea (wrasse)
- kāhala (amberjack)
- manini (convict tang)
- palani (eye-striped surgeonfish)
- pualu (yellowfin surgeonfish)
- kala (unicorn fish)
- pūhi (eel)
Umu (heap of rocks) are small underwater “houses” that trap fish. Hawaiians made these traps by piling stones loosely into a mound. Seaweed grew on the surface of the stones and that attracted the fish. Water flowed through the umu and fish would hide inside. Women caught fish by placing a woven net over the opening on one side while shaking a palm frond or stick along the other opening. The fish inside the umu would swim away from the stick or palm and into the net. Sometimes an eel would enter the umu and scare the little fish away. The women would then catch the eel for food. Soon little fish would return to the umu to hide in the rocks. Umu were not permanent fishtraps. People today still use this method to trap fish.
List the four types of fishponds and two types of fishtraps in the first column. Then make an “X” in each box that describes something about that pond or trap.

<table>
<thead>
<tr>
<th>Type of fishpond or fishtrap</th>
<th>Uses mākāhā</th>
<th>Used only to trap fish</th>
<th>Fed by streams or springs</th>
<th>Used for growing kalo</th>
<th>Has no ‘auwai or ‘auwai kai</th>
<th>Uses the shoreline as one wall</th>
<th>Exists only in Hawai‘i</th>
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On the back of this sheet write a brief summary comparing the different types of fishponds and fishtraps in Hawai‘i.
Mauka to Makai: The Ahupua‘a

- How did physical features within an ahupua‘a determine where Hawaiians built different types of fishponds and fishtraps?

Hawai‘i DOE Content Standard

Social Studies: Geography – World in Spatial Terms
- Students collect, organize and analyze data to interpret and construct geographic representations.

Grades 4 – 5 Performance Indicators

- Show organization of collected data.
- Construct a map that includes collected geographic data.
- Explain the meanings, patterns and relationships found in geographic data.

Key Concepts

- Ahupua‘a (traditional Hawaiian units of land) vary in shape and size and the distribution of geographic features.
- Hawaiians built different types of fishponds to take advantage of existing geographic features within an ahupua‘a. These features include the flow of water, natural depressions in the land, reefs, bays and sand bars.

Prerequisite

Loko I’a

Activity at a Glance

Students create a large mural that illustrates where Hawaiians built different types of fishponds and fishtraps to take advantage of geographical features within an ahupua‘a.

Ahupua‘a Mural
Kāne‘ohe Elem. Gr. 4
Time

3 - 4 class periods

Skills

reasoning, analysis, mapping

Assessment

Student groups:
- Create a section of an ahupua'a mural that depicts one type of fishtrap or fishpond with labels of the physical features that are important for that type of pond or trap.
- Present their section of the mural to other students in the school.

Vocabulary

ahupua'a – traditional Hawaiian land unit usually extending from mountain summits to outer edge of reefs
kai – sea water
kula – plains; open country
uka – upland, towards the mountain
moku – land district
mauka – toward the mountain
makai – toward the sea

Materials

Provided:
- fishpond illustrations (from Loko I'a)

Needed:
- round loaf of sweet bread
- knife with serrated edge (to cut bread)
- large butcher paper for mural
- construction paper
- colored markers
- scissors
- glue

Advance Preparation

Line up the six illustrations of fishponds and fishtraps (see Loko I'a) from mauka to makai and post them in the classroom.

Teaching Suggestions

1. Place a round loaf of sweet bread in front of the class and ask students to imagine that it is a mountainous island surrounded by ocean. Ask them what kind of resources, such as fresh water, soil and forest, this island would need if people were to live on it. Discuss how people might share those resources.
2. Cut the bread into pie-shaped wedges from the top of the bread (mauka) to the edge (makai). Define an ahupua'a. Explain that this section of the island might be a valley with valley walls delineating its boundaries. Cut additional wedges of varying widths from the bread and discuss why some ahupua'a might be smaller than others.

3. Display the illustrations from the Loko I'a activity and ask students to point out the physical features in the different parts of the ahupua'a. Ask students to imagine that they lived in an ahupua'a like this in old Hawai'i and discuss their ideas. During the discussion, add students' ideas to the K-W-L chart created in the previous activity and write in the types of fishponds or traps that they believe would be located in different areas of the ahupua'a.

Discussion Questions

- What are the main physical features in the upland (uka) region of this ahupua'a? (mountains, stream)
- What are the main physical features in the middle (kula) region? (stream, relatively flat areas) Which types of fishponds did Hawaiians build here? Why?
- What are the main physical features in the coastal (kai) region? (bay, sandbar, reef flat) Which types of fishponds and fishtraps did Hawaiians build here? Why?
- If you lived in this ahupua'a in old Hawai'i, where would you build your hale (house)? Why?

4. Explain that these illustrations make up an idealized ahupua'a and that most ahupua'a might have the physical resources to support only one or two types of fishponds, if any. Compare this idealized ahupua'a to the ahupua'a where your school is located. What are the similarities and differences?

5. Challenge the class to create a large color mural of an ahupua'a that includes all six types of fishponds and fishtraps. Divide the class into six ‘ohana (family) groups, refer to the fishpond illustrations, and assign tasks:

   - ‘Ohana 1 and 2: create the uka part of the mural and the kule area with a loko i’a kalo (‘ohana 1) and a loko wai (‘ohana 2).
   - ‘Ohana 3 – 6: create the kai region of the ahupua’a with each group working on one of the remaining fishponds or fishtraps.

6. When the mural is complete, have the class develop a presentation to share the mural with other classes. Ask each ‘ohana to present its fishpond or fishtrap and show how it is dependent on the physical features in that section of the ahupua’a.

7. Revisit the K-W-L chart from the Loko I’a lesson and fill in statements and questions for each category.