



# WETLAND KŌKUA

How do wetlands help our community and how can we *kōkua* (help) to care for wetlands?

## HAWAII DOE STANDARD BENCHMARKS

### Social Studies 7: Geography: WORLD IN SPATIAL TERMS

- **SS.3.7.4** Examine the ways in which people modify the physical environment and the effects of these changes.

### Language Arts 5: Writing: RHETORIC

- **LA.3.5.1** Add details, descriptions, and information from different sources to elaborate meaning.
- **LA.3.5.2** Organize information by introducing it, elaborating on it, and drawing a conclusion about it.

## GENERAL LEARNER OUTCOMES

### GLO 2: Community Contributor

- Cooperate with and help and encourage others in group situations.

## NĀ HONUA MAULI OLA

- **NHMO 14-10** Preserve, protect, and sustain a healthy environment.

## KEY CONCEPTS

- People have introduced alien plants and animals that are harmful to wetlands.
- We can *kōkua* (help) wetlands by restraining pets, removing alien plants, planting native plants, and preventing pollution.

## ACTIVITY AT A GLANCE

Students visit a wetland environment and make observations of plants and animals.



They plant the wetland plant they grew in the previous activity to *kōkua* and demonstrate *aloha 'āina*. Students complete their Learning Logs and collaborate with others to develop a presentation that addresses the unit essential question.

## ASSESSMENT

Students:

- Write a one-page paper that explains why we need wetlands, how people have changed wetlands, and what students did to help wetlands
- Work with teammates to develop a HyperStudio or PowerPoint presentation that expresses their observations and their answer to the unit essential question. (Save on CD for sharing with others.)
- Present information that addresses the unit essential question to others in the school and/or community.

## TIME

3 – 4 class periods, plus a field trip



## SKILLS

observing, classifying, writing,  
technological literacy, collaboration

## MATERIALS

### Provided:

- ✓ rubrics (provided in Unit Introduction)
- ✓ plant hunt sheet
- ✓ *Oli Komo No Kawai Nui* (on CD and in Appendix)
- ✓ Mākālei – the Legend of Kahinihini'ula
- ✓ Learning Log 7 (storyboard)

### Needed:

- ✓ plants (from previous activity)
- ✓ box for plants
- ✓ digital camera (for taking pictures during the field trip)
- ✓ binoculars (optional)

### Students' Checklist for Field Trip

- ✓ hat
- ✓ sunscreen
- ✓ tabi or old shoes
- ✓ old clothes
- ✓ bottled water in backpack
- ✓ garden gloves (optional)

## TEACHER BACKGROUND INFORMATION

### **Kawai Nui (Great Freshwater) Marsh**

Kawai Nui Marsh is the largest wetland remaining in the Hawaiian Islands. It covers nearly 830 acres in the Kailua *ahupua'a*. Approximately 3,000 - 5,000 years ago, the marsh was a large lagoon that extended approximately a mile inland from the present shoreline. As the hillsides around the lagoon gradually eroded, sediments filled much of the lagoon to form Kawai Nui Marsh. Hawaiians converted the area to a large inland fishpond, once known as Kawai Nui Loko. As with Nu'upia Ponds,

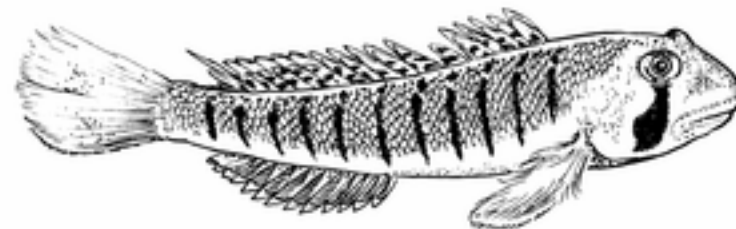
## VOCABULARY

alien species – non-native plants or animals that were introduced to an area by people  
endangered species – plant or animal species that are officially recognized by the government as being in danger of going extinct

## ADVANCE PREPARATION

- Copy the Learning Log sheet for each student.
- Visit the *Aloha 'Āina* link on Pacific American Foundation Web site [www.thepaf.org](http://www.thepaf.org) for information on setting up the field trip.
- Organize your class into three teams and give each student a name tag that includes the team number.
- Refer to the Field Site Appendix for more details.

Kawai Nui Loko provided a productive environment for cultivating fish such as 'ama'ama (mullet), *awa* (milkfish) and 'o'opu (goby).



For more information about the fascinating history of the marsh, see the following Web site developed by Ko'olau Net:

[http://www.pixi.com/~isd/Kawai\\_Nui.html](http://www.pixi.com/~isd/Kawai_Nui.html).



Today many alien species, such as the invasive California grass and cattails cover much of the marsh. A number of community groups led by the efforts of 'Ahahui Mālama I Ka Lōkahi are working together to help restore native plants to the area. Native wetland plants that grow in the marsh include *uki* (saw grass, sedge), *'uki'uki* (lily) *neke* (fern), *neki* (bulrush), and native hibiscus (*hau hele wai*).

### Nu'upia Ponds

The plants at Nu'upia Ponds Wetland Management Area on the peninsula of Mōkapu include a number of alien species such as pickleweed that grows on the salt flats, Indian fleabane, which is common in the shrub lands around the salt flats, and a water lily that roots in the mud and has flat leaves that float on the open water. The water lily provides cover and food for the native waterbirds, so even though it grows quickly, it is not targeted for removal as much as the pickleweed and another alien, the mangrove (Wilcox, 1998). Mangroves were introduced to the Islands in 1902 to prevent silt from agricultural lands from washing into the ocean (Merlin, 1999). They spread quickly and are a major pest in Hawaiian wetlands. At Nu'upia Ponds about 20 acres of mangrove were removed mechanically with heavy equipment to maintain the open water of the ponds (Drigot, 2000). Volunteers continue to monitor the mangroves and remove them.



mangrove

Pickleweed is also extremely invasive. It grows to about five feet in height and like the mangrove, it crowds out the native *'ākulikuli* filling in the salt flat habitat that wetland birds need. Once each year, prior to *āe'o* (Hawaiian stilt) nesting season, the marines practice maneuvers on the salt flats using amphibian assault vehicles that help to break up the dense mats of pickleweed. The maneuvers of these 26-ton vehicles create a checker-board pattern with moats and islands where birds can nest without disturbances from the alien mongoose that prey on chicks and eggs.

### Kōkua

Statewide, more than 30 percent of wetlands in Hawai'i have been drained and filled for development or converted to other uses such as agriculture (DLNR, 2001). Waikīkī was once a wetland where Hawaiians raised fish and taro and where native waterbirds flourished. Due to the loss of wetland habitat statewide and impact from alien predators, five of the native Hawaiian waterbirds - the *āe'o* (Hawaiian stilt), *'alae 'ula* (Hawaiian moorhen), *'alae ke'oke'o* (Hawaiian coot), *nēnē* (Hawaiian goose) and *koloa* (Hawaiian duck) are endangered species.



There are many ways that we can *kōkua* (help) to care for wetlands:

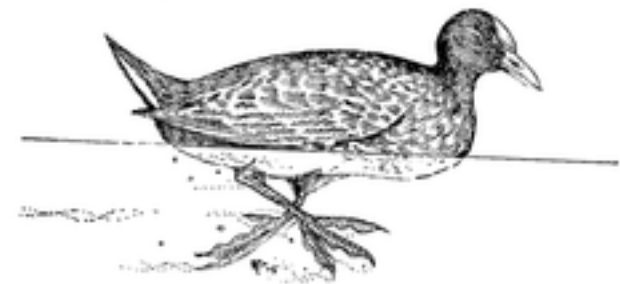


- Remove invasive alien plants, such as mangrove and pickleweed, which crowd out native plants and take away habitat.
- Replant native species to restore habitat.
- Prevent the introduction of additional alien animals and trap and remove pests such as the mongoose.
- Keep dogs and cats restrained to prevent them from harming wetland birds.
- We can also work to prevent future draining and filling of wetlands to protect these areas for the vital role they play in preventing flooding and siltation, and providing habitat.

## TEACHING SUGGESTIONS

### Before the Field Trip

1. **Revisit the unit essential question and discuss the paper students will be assigned to write to address this question.**
  - Review the rubric criteria that will be used to evaluate students' papers.
2. **Discuss the culminating project that students will be presenting to other students.**
  - Set a date for the *hō'ike* (exhibit) and have students invite the class and parents and *kūpuna*, if desired.
  - Show students the sample rubric and discuss criteria for evaluating their presentation.
3. **Encourage teams to think about information and wetland images they want to collect for their presentations during their field trip.**
  - To help generate some ideas, show students the Web site developed by 'Ahahui Mālama I Ka Lōkahi about Kawai Nui Marsh. See: <http://alohahosting.net/~ahahui/PROGRAMS/NaPohaku.html>
  - As students review the site, have them summarize both the positive and negative ways that people have an impact on these wetlands.
  - Record their initial ideas on the board and have students add to the list after the field trip.
4. **Discuss ways that students could *kōkua* (help) to keep the ponds healthy, including replanting the wetland plant that students grew in the previous activity.**
5. **Prepare for the field trip.**
  - Ask a *kupuna* to help teach your students an *oli* (chant) for Kawai Nui. See the chant provided in the Appendix and on CD.

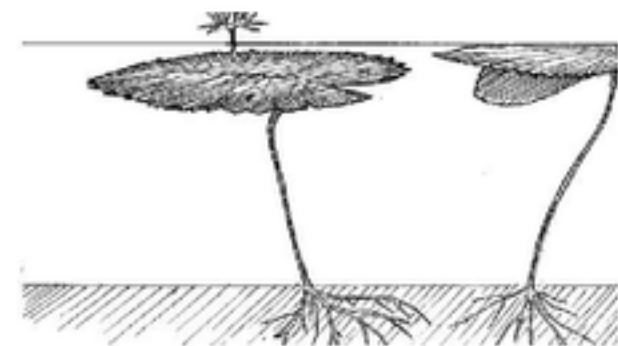




- Discuss the meaning of the chant and why it is part of the protocol for visiting the site.
- Review appropriate clothing to wear for the field trip – old shorts and t-shirt, shoes, socks, and hat; and what to bring: backpack with drinking water and snack, sunscreen, insect repellent.
- Also gather materials from the classroom including digital camera, clipboards with plant hunt sheets, and native plants in a box for transporting to the site. If students will be using binoculars to view waterbirds, practice using the binoculars before the field trip.
- See the following Web site for useful tips for using binoculars:  
<http://shorebirds.pwnet.org/monthly/binoculars.pdf>

### During the field trip

- When students arrive at the Nā Pohaku site they will be greeted by someone from 'Ahahui Mālama I Ka Lōkahi. If students have learned the chant, they may greet with the *oli kāhea* and someone at the site will respond with the *oli pane*.
- The group will have an orientation to the marsh and then participate in three learning stations:
  - Station 1...*Mo'olelo* and overview of the area
  - Station 2...Native birds and planting native plants
  - Station 3...Plant Hunt
- The general schedule for the day is:
  - 9:00 Arrival and greeting
  - 9:15 Overview of the marsh
  - 9:30 Learning stations – rotate every 20 minutes as follows:
    - Team 1 – Stations 1, 2, and 3
    - Team 2 – Stations 2, 3, and 1
    - Team 3 – Stations 3, 1, and 2
  - 11:00 Board bus
  - 11:15 Lunch at Ulupō Heiau
  - 11:45 Orientation to the *heiau*
  - 12:15 Return to school



### After the field trip

6. Discuss what students learned on the trip, including ways that people impact wetlands.
  - Have students add to the list they generated earlier about ways that people have an impact on wetlands.



**7. *Hō'ike* Preparation: Distribute Learning Log 7.**

- Brainstorm a list of key points that students want to include in their *hō'ike* presentation to address the unit essential question.
- Divide the class into teams and have each team be responsible for one of the key points.
- Challenge each student to produce two screens in the computer presentation.
- Explain how to use the Learning Log sheet (blank storyboard forms) and work with students on creating storyboards for their computer screens.
- Encourage them to think about images they'll use (either photographs or pictures they draw) and the wording that will appear on screen.

**8. Assign two students who are most interested and able to coordinate the overall presentation.**

- These students should select the font and color scheme and share these criteria with the teams.
- They should also help to assemble the completed program.

**9. Monitor students' progress and provide feedback.**

- Give teams some class time to work on their presentations.
- Discuss ways to incorporate students' products from the unit during their presentation, e.g., show the "Mathematical Marsh," simulate the role of wetlands with the model, and display students' Learning Logs around the room.
- Collect students' unit papers and provide them with feedback.
- Ask teams to select one representative to narrate or present their part of the presentation.

**10. Conduct the *hō'ike* and celebrate students' accomplishments.**

- Revisit the K-W-L chart from Lesson 1 and have students fill in what they have learned about wetlands.

**ADAPTATION/EXTENSION**

**Math 11: Fluency With Data:** Encourage students to add their field observations of wetland plants and animals in mathematical statements on the "Mathematical Marsh" display. They could make bar graphs to summarize the numbers or kinds of animals they observed. Integrate technology and incorporate some computer-generated graphs with colors for the number and types of species observed. A class graph could be done to represent observations during a certain season. This information could be exchanged with another school that visited at another season.



## REFERENCES

Department of Land and Natural Resources (DLNR). 2001. *Hamakua Marsh Ecosystem Restoration and Community Development Project*. Wildlife Conservation and Restoration Program Project Description. Honolulu, HI.

Drigot, Diane. 2000. *Safeguarding Hawaii's Endangered Stilts*. Endangered Species Bulletin. Volume XXV, No. 6. Retrieved April 11, 2005, from, [www.pixi.com/~isd/Hawnstilt.html](http://www.pixi.com/~isd/Hawnstilt.html)

Merlin, Mark. 1999. Fourth Edition. *Hawaiian Coastal Plants. An Illustrated Field Guide*. Pacific Guide Books. Honolulu: HI.

Wilcox, Bruce A., Eric B. Guinther, Kristin N. Duin and Hilary Maybaum. 1998. *Mōkapu: Manual on Watershed Health and Water Quality*. Institute for Sustainable Development. Kāne'ohe, HI.

## RESOURCES

Soehren, Rick. 1996. *The Bird Watcher's Guide to Hawaii*. The University of Hawai'i Press. Honolulu, HI.

*Birding Hawaii Recent Sightings – February 2006*. <http://www.birdinghawaii.co.uk/recentsightings2.htm>.



## WETLAND KŌKUA

## MĀKĀLEI – THE LEGEND OF KAHINIHINI'ULA

A long, long time ago, Kailua used to look very different. This was before Times supermarket or Pali Highway were built. There was no shave ice store or *musubi* at Kalapawai Market.

This was a time when Kailua Bay was so big, that Kawai Nui Marsh came up to meet it. Back then, Kawai Nui was not just a marsh, it was a very big fishpond (*loko pu'uone*) and a big wetland where many water plants, birds and fish lived. Kawai Nui went so far *mauka* that it was hard for the fish to tell when they left the mountain streams and when they swam into Kawai Nui!

It was only when they could see or hear so many *'alae'ula*, our red-headed mudhen, and *āe'o*, the Hawaiian stilt with the very long legs, that the fish knew they had entered Kawai Nui. Then the fish would certainly know they had reached their destination, because they could hear the chirp-chirp of the little chicks in the nests, where the birds had made their homes.



Many years ago, there were many farmers growing *kalo* in the *lo'i* (taro patches) high up in Maunawili Valley, all the way down to the edge of Kawai Nui. Hawaiians loved this *kalo*, because it made the most delicious *poi*. And it wasn't just the people that loved the *kalo*, the fish loved the *kalo* too! There were so many delicious foods in the waters of the *lo'i* – just like dessert! As the water from the *lo'i* flowed into the fishpond, the fish would eat and grow fat and happy.



There were so many fish! It looked like more fish than stars in the sky! No one could count all the fish, not even you.

Many years passed, the fish and the birds were happy, even the farmers, the streams and the *'āina*. But after a while things began to change.

The fishpond keepers were not doing their duties and Kawai Nui became thick with *limu* (algae). Around that time, a new *konohiki* (ruler) came to Kailua. He saw that Kawai Nui pond had become overgrown, and the fish would hide in the *limu*. Whenever the fisherman would fish in the pond, they couldn't see the fish!





So the *konohiki* asked all the people of Kailua to *kōkua*, come help clean the pond. Men, women and children came to help, and among them was a little boy named Kahinihini'ula – the little red-haired boy. Kahinihini'ula lived with his *tūtū wahine* (grandmother) deep in Maunawili Valley in the area called Makawao. His *tūtū wahine* was too old, so he came alone to help in the pond.

For three days the people of Kailua helped clean Kawai Nui pond. At the end of each day, the *konohiki* would have a big *pā'ina* (party) of *poi* and roasted pig and fish to thank the people for their hard work. And that wasn't all. Each man, woman and child, was given a gift of four fish to take home to their *kūpuna* who were too old to work in the ponds.

Everyone was very happy, except Kahinihini'ula. He was so little that he was ignored, and the fishpond keepers didn't give him any fish for his *tūtū wahine*. So he went home empty-handed, tired after a long day of work.



His *tūtū* was not very pleased when she found out that the *konohiki* had not given Kahinihini'ula any fish. What a shame that the *konohiki* ignored the little boy! She told her *mo'opuna* (grandchild) not to go back the next day, but he did. And for the next two days, Kahinihini'ula worked all day, and still the fishpond keepers gave him no fish!

His *tūtū wahine* was angry! How could the *konohiki* allow his fishpond keepers to be so *lōlō*, so unfair? If someone, no matter how little, gives their *kōkua*, they must be appreciated. If there are plenty of fish, they must always be shared so that no one goes hungry!

So in the morning, Kahinihini'ula's *tūtū wahine* gave him a special branch—a *mākālei* tree branch that belonged to her family from long, long ago. The branch was a gift from her ancestor Haumea, mother of the 'āina, mother of all living things.

With this branch, *tūtū wahine* told Kahinihini'ula to go to the pond and show the fish the *mākālei* branch. He did as he was told, and the fish knew that it was Haumea's magic branch.





The fish formed a long thick line, and they followed Kahinihini'ula and his *mākālei* branch. He walked around the pond along the stream, up the valley to his home. As Kahinihini'ula walked from Kawai Nui to Maunawili, all the fish followed him. Soon the pond at Kawai Nui was empty and all the fish were in the pond just outside Kahinihini'ula's *hale* (home)!

It didn't take long for the fishpond keepers to see that fish had left the pond! When the *konohiki* found out, he knew that a great wrong had been done. The ancestors (gods) were unhappy at how they had treated Kahinihini'ula. It was wrong not to share the fish with everyone, especially those that had helped.

So the *konohiki* went to Maunawili to find Kahinihini'ula and his *tūtū wahine*. He apologized for their terrible mistake, and Kahinihini'ula forgave him. The fish returned to the pond. From then on, the *konohiki* was sure to instruct his fishpond keepers to always be fair and share the fish from his pond.

### Discussion Questions

- Where does this story take place?
- What is a *lo'i*? Why do the fish like it?
- Why did the *konohiki* call all the people of Kailua?
- Who is the young boy in the story? Where does he live?
- Why was his *tūtū wahine* so angry?
- What did his *tūtū wahine* give him? Where did it come from?
- What did she ask him to do?
- What did the *konohiki* and his fishpond keepers do that was so wrong?
- What is the lesson that the *konohiki* learned?

(Source: Kawai Nui Heritage Foundation. 1985. *Kawainui Marsh: A Child's Heritage. A Native Hawaiian Library Project*. Alu Like, Inc. Honolulu, HI. Original story authored by Samuel Kaiākea Keko'owai, as published in the Hawaiian language newspaper *Kū'oko'a*, January 26, 1922. Translated by Kihei de Silva.)

