

Grades 4-5



WETLANDS = HOME FOR KOLOA MAOLI

Focus Questions: What are wetlands and where are they found in Hawai'i? Why aren't more Koloa maoli living in these wetlands?

Lesson at a Glance: Students will learn about various types of wetlands that are habitat for the Koloa maoli and create diorama representing those habitats. They will also write a summary paper expressing what they learned about the Koloa maoli.

Key Concepts

- Koloa maoli are endangered Hawaiian ducks that need healthy wetlands in which to live.
- Most wetland areas in Hawai'i have been altered; some have disappeared.
- Koloa maoli face many threats – loss of good habitat; predation by introduced animals, and hybridization with non-native invasive ducks – are among the key threats.

Objectives: Students will be able to:

- Describe what the Koloa maoli is and what it looks like.
- Describe several types of wetlands in Hawai'i that are suitable habitat for the Koloa maoli and explain why they are good habitat.
- Describe the interdependent relationships of plants and animals in the wetland ecosystem and the cycles of matter.
- State the main threats facing the Koloa maoli and what can be done to save them from extinction.

Time

two to three class periods

Subject Areas

science, social studies, language arts, art

Materials

- Koloa Maoli videos and wetland photos on disk (provided)
- CD/DVD player and monitor
- student worksheet (provided)
- natural and recycled materials for students to make wetland dioramas (e.g. shoe and cereal boxes, paint, fabric, clay, leaves, stones).

- optional – Flowing to the Sea: Companion Book and DVD (available from the Moanalua Gardens Foundation – see end of activity for contact information)

DOE Standards and Benchmarks

Science Standard 1: The Scientific Process: SCIENTIFIC INVESTIGATION: Discover, invent, and investigate using the skills necessary to engage in the scientific process

Topic: Scientific Inquiry

Benchmark: SC.5.1.2: Formulate and defend conclusions based on evidence

Science Standard 2: The Scientific Process: NATURE OF SCIENCE: Understand that science, technology, and society are interrelated

Topic: Unifying concepts and themes

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

Science Standard 3: Life and Environmental Sciences: ORGANISMS AND THE ENVIRONMENT: Understand the unity, diversity, and interrelationships of organisms, including their relationship to cycles of matter and energy in the environment

Topic: Cycles of matter and energy

Benchmark: SC.4.3.1: Explain how simple food chains and food webs can be traced back to plants

Benchmark: SC.5.3.1: Describe the flow of energy among producers, consumers, and decomposers.

Topic: Interdependence

Benchmark: SC.5.3.2: Describe the interdependent relationships among producers, consumers, and decomposers in an ecosystem in terms of the cycles of matter.

Science Standard 5: Life and Environmental Sciences: DIVERSITY, GENETICS AND EVOLUTION: Understand genetics and biological evolution and their impact on the unity and diversity of organisms

Topic: Unity and Diversity

Benchmark: SC.4.5.2: Describe the roles of various organisms in the same environment

Benchmark SC.4.5.3: Describe how different organisms need specific environmental conditions to survive

Language Arts Standard 6: Oral Communication: CONVENTIONS AND SKILLS: Apply knowledge of verbal and nonverbal language to communicate effectively in various situations: interpersonal, group, and public: for a variety of purposes

Topic: Discussion and Presentation

Benchmark: LA.4.6.1: Participate in grade-appropriate oral group activities

Benchmark: LA.4.6.2: Give short, informal presentations to inform or persuade

Benchmark: LA.5.6.1: Use speaking skills to fill a prescribed role in group activities.

Benchmark: LA.5.6.2: Give informal presentations or reports to inform.

Teacher Background

The Koloa maoli is one of two native duck species found in Hawai'i (the other is the Laysan Duck that is currently found only in the Northwestern Hawaiian Islands). Koloa maoli is our only native duck in the main Hawaiian Islands. It is an endangered species with an estimated population of only about 2,200 of these waterbirds left on Earth.



Koloa maoli pair, photo by Brenda Zaun, USFWS

What makes the Koloa maoli unique among other waterbirds is that they are able to live in a wide variety of wetland habitats ranging from lowland areas to higher areas of elevation such as rain forests. A **wetland** is an area of land that has standing or moving water, such as a swamp, marsh, bog, or riparian zone (river and floodplain). A **habitat** is a place where a plant or animal can get the food, water, shelter and space it needs to survive.

Koloa maoli were once plentiful on nearly all of the main Hawaiian Islands but their populations crashed from the combined effects of habitat loss, introduced predators and over-hunting. At one point they were down to roughly 500 birds. Their numbers increased after protection efforts increased. However, the threats to the Koloa maoli continue, including:

- **Habitat loss:** In the last century, more than 30 percent of coastal plain wetlands have been lost to draining and filling. Most of the wetlands that remain are degraded by altered hydrology, invasive plants and contaminants and not good habitat for Hawaiian waterbirds. A shift from wetland agriculture to other crops also has reduced the amount of wetland habitats.
 - **Altered hydrology:** Changes to wetland habitats for flood control or to provide municipal water sources can disturb the Koloa maoli habitats.
 - **Non-native invasive plants:** Several species of invasive plants, including pickleweed, water hyacinth, and mangrove reduce or

completely cover open water, mudflats, or shallows which are important Hawaiian waterbird microhabitats.

- Environmental contaminants: Fuel and oil spills are harmful contaminants
- Introduced predators: Koloa maoli eggs and ducklings are especially vulnerable to predation by dogs, rats, feral cats, mongooses, cattle egrets, barn owls, and non-native predatory fish (e.g., bass).
- Avian Diseases: the most important disease affecting Hawaiian waterbirds is avian botulism (not contagious to people).
- Hybridization: Koloa maoli are interbreeding with a closely related but non-native invasive bird, the feral Mallard.

*feral = domesticated species that has gone wild

Currently, the most serious threat to the Koloa maoli is hybridization with feral Mallards. Hybridization is when two closely related species reproduce to create a crossbreed. This is a problem for the Koloa maoli, because their gene pool is diminishing.

Several solutions are to: protect and enhance their habitat, breed and release additional populations that are safe from threats, and conduct education and awareness programs to address issues of predation by introduced predators as well as hybridization and control of feral Mallards (reduce their population; don't buy, sell, or feed them – and don't release them into the wild).

For students of this age, the threats that you may want to focus on are habitat loss and invasive species. Giving students a basic idea about these threats will help them to understand similar threats to other endangered Hawaiian waterbirds.

Teaching Suggestions

Preparation

If time permits, take students on a field trip to a local wetland area. See “Extended Activities” for possible sites.

Part One

- 1) Start by asking the focus question – what are wetlands and where are they found in Hawai'i? Discuss what wetlands are and have students think about the various types of wetlands in Hawai'i (e.g. coastal marshes, streams, wet forest bogs, taro *lo'i*).

- 2) Explain that wetlands are important habitat for Hawaii's native waterbirds, including the Koloa maoli. Explain what habitat loss means and why it happens.
- 3) Discuss the Koloa maoli's main habitat, the wetlands, through pictures or stories. Show photos of Hawaiian wetlands on the CD provided and have the class watch one or more of the short videos on the Koloa maoli (provided on disk). They do not need to understand all of the concepts, but this will help them to make a visual connection with the Koloa.
- 4) If available, read the book *Flowing to the Sea* and show its companion DVD with images of Hawaii's wetlands. Or show the Kawainui Marsh poster (see Resources) and reinforce the ideas of what lives in Hawaiian wetlands.

Part Two

- 5) Divide students into groups of four and give each group an assignment – create a diorama representing a wetland habitat of the Koloa maoli. Have each group create a different diorama (e.g. coastal marshes, streams, wet forest bogs, taro *lo'i*). Encourage students to research the various habitats and use materials like large cardboard boxes, clay, natural materials like leaves, grass and seeds, stones, fabric, paint to create their diorama.
- 6) Ask students to include within each diorama a few wetland birds like the Koloa maoli as well as the food it eats (grasses, seeds, aquatic insects and snails, small crayfish and shrimp, algae). Note that fish are not part of the normal diet. Invasive fish (mosquito fish and tilapia) compete with Koloa maoli for food and degrade water quality. Explain the roles of producers, consumers, and decomposers. You could also ask them to show signs of threats (e.g. predators, invasive weeds, contaminants).
- 7) Have students present their wetland diorama and Koloa maoli to the class, pointing out the important parts of what makes their diorama a wetland and why they think that the Koloa maoli would live there. Have them also describe the interdependent relationships among producers, consumers, and decomposers.
- 8) For homework, ask each student to write about their wetland diorama including where it is located, the plants and animals found there, what could threaten the health of the wetland and what people can do to help.

Assessment

You could assess students by:

- effectiveness in working together as a team to create the dioramas

- neatness and displaying habitat in a clear and organized way
- presentation of diorama with explanation of elements in the diorama, food chains and webs, and why it would be a good habitat for the Koloa maoli

Extended Activities

- If you are able to take your class on field trips, visit a wetland on your island and find the waterbirds as well as the habitat. Bring sketchpads and cameras and encourage students to be creative. Listed below are some lowland wetland areas; some sites are more accessible than others. Please contact the landowners/managers for permission to enter. A few of these sites offer guided tours or volunteer work projects.

Kaua'i –

- Hanalei National Wildlife Refuge – www.fws.gov/hanalei/
- Hulē'ia National Wildlife Refuge – (see from Menehune Pond Overlook) www.fws.gov/huleia/
- National Tropical Botanical Gardens (Lāwa'i and Limahuli Gardens) – ntbg.org/gardens/

O'ahu –

- James Campbell National Wildlife Refuge – www.fws.gov/jamescampbell/
- Ka'elepulu Wetland – kaelepuluwetland.com/
- Kawainui and Hamakua Marsh Wildlife Sanctuaries – contact State Division of Forestry & Wildlife at 808.973.9787
- kawainuimarsh.com/Site%20Folder/index.html
- hamakuamarsh.com/
- Marine Corps Base Hawai'i (Nu'upia Ponds Wildlife Management Area) – contact Environmental Compliance & Protection Department, 808.257.6920 ext 224
- Pearl Harbor National Wildlife Refuge (Honouliuli unit) – <http://www.fws.gov/pearlharbor/>; contact Hawai'i Nature Center at 808,955.0100; www.hawaiiaturecenter.org
- Pouhala Marsh Wildlife Sanctuary – <http://search.volunteerhawaii.org/org/opp/24532223.html>
- Waimea Valley – waimeavalley.net

Maui –

- Kanahā Pond Wildlife Sanctuary – kiosk for bird watching; open to public
- Keālia Pond National Wildlife Refuge – www.fws.gov/kealiapond/
- Mākena State Park – hawaiiastateparks.org/parks/maui/index.cfm?park_id=38
- Waihe'e Refuge – mauicoastallandtrust.org/

Moloka'i –

- Kakahai'a National Wildlife Refuge – <http://www.fws.gov/kakahaia/>

Hawai'i -

- Kaloko-Honokōhau National Historical Park ('Aimakapā Fishpond, Kaloko Fishpond, anchialine ponds) – nps.gov/kaho/
- Loko Waka Ponds (Hilo) and 'Ōpae'ula Pond (Makalawena, North Kona)– contact Kamehameha Schools Land Assets Division at 808.322.5300
- Waipi'o Valley – view from overlook (free)

See the *Hawai'i Wildlife Viewing Guide* by Jeanne L. Clark for more information. (Produced by Watchable Wildlife Inc., Adventure Publications, Inc. 2006.)

- As an art project, have students look more closely at features of the Koloa maoli. Have them draw both sides of the bird and color accordingly (e.g. orange legs, blue streak in wings). Put the two pieces together with colored sides facing out, stuff and staple. They could make chicks, too.

Resources

- *Flowing to the Sea, Companion Book and DVD*
In full-color with Hawaiian translation, *Flowing to the Sea*, the children's book, features two children discovering the magical stream connection as a mysterious ball leads them on a journey of understanding the water cycle, life cycles of native Hawaiian stream life, and the ways that we can care for our streams and near-shore environments. The 23 minute companion DVD includes footage of Hawaiian streams and wetlands and their native inhabitants and features popular island musician, Jerry Santos. Produced by Moanalua Gardens Foundation. Go to: www.mgf-hawaii.com/ to order on-line or contact: mgf-hawaii@hawaii.rr.com or 808-839-5334.
- *E Ola Mau Nā Manu O Kawainui! Long Live the Birds of Kawainui (poster)*
This is a beautiful full-color poster depicting wetland species of Kawainui Marsh. The poster is accompanied by a teacher's guide. These materials were made by the Conservation Council of Hawaii and are available on-line at:
http://conservehi.org/pg-posters/posters-pdfs/CCH_2007_Poster_front.pdf
http://conservehi.org/pg-posters/posters-pdfs/CCH_2007_Poster.pdf
(teacher's guide)
Full-size copies may still be available. Contact CCH at: (808) 593-0255 or info@conservehi.org

Websites for wetlands and waterbirds:

<http://www.fws.gov/refuges/refugeLocatorMaps/Hawaii.html>

<http://www.kaelepuluwetland.com/>

<http://www.kawainuimarsh.com/Site%20Folder/index.html>

<http://hamakuamarsh.com/>

