

Restoring Ea

Lesson 2: *What organisms live in Loko ea? How has the management of Loko ea affected which organisms live here?*

What we do in this lesson

We arrive at Loko ea and do an initial *kilo* (careful observation). We rotate through three stations and figure out what Loko ea used to be like in the past and how it has changed with intentional management. We contribute to restoration efforts by pulling California grass and documenting our efforts. We make observations about the fish and plankton that live in Loko ea.

Key ideas we figure out

- Ecosystems, like Loko ea, have many components, both biotic and abiotic, which interact with each other.
- A change to the living or nonliving parts of an ecosystem can cause a population to decrease below the typical range because there are fewer resources available to them.
- Living things need space. Ten years ago, invasive California grass took up space and left little space for fish.
- We get *mo'olelo* (stories) about the fishpond and connection to our ancestry through the fishpond.

Ideas we are *not yet* developing

- Students will not yet focus deeply on water quality and management. This will come in Lessons 4-7.

NGSS Sensemaking and HĀ Outcomes

Lesson-Level Performance Outcome

Ask questions to seek further information about how the gradual changes to the physical and biological components of Loko ea have accumulated over time and inform future management of the fishpond.

Focal HĀ Outcomes

1b. Know about the place I live and go to school

in order to work towards developing a:

1. **Strengthened Sense of Belonging:** I stand firm in my space with a strong foundation of relationships. A sense of Belonging is demonstrated through an understanding of lineage and place and a connection to past, present, and future. I am able to interact respectfully for the betterment of self and others

6c. Learn the names, stories, special characteristics, and the importance of places in Hawai'i

6e. Share the histories, stories, cultures, and languages of Hawai'i

in order to work towards developing a:

6. **Strengthened sense of Hawai'i:** I am able to navigate effectively across cultures and communities and be a steward of the homeland.

NGSS Dimensions

- **DCI LS2.C: Ecosystem Dynamics, Functioning, and Resilience:** ~~Ecosystems are dynamic in nature; their characteristics can vary over time.~~ Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations.
- **SEP1 Asking Questions and Defining Problems:** Ask questions that arise from careful observation of phenomena, ~~models, or unexpected results,~~ to clarify and/or seek additional information.
- **CCC7 Stability and Change:** Stability might be disturbed ~~either by sudden events or gradual changes that~~ accumulate over time.

Lesson At A Glance

Lesson type: Investigation/Outdoor Field Experiences and Stewardship / Civic Action

Time: One 2-hour field trip *See table below for other length field trips*

Time*	Activity and key teacher moves	Materials
1. Arrive, welcome, and opening circle		
50 min	a. Enter and arrive at Loko ea	- Lesson 2: Student Activity Sheet - clipboards or study surface for writing on - pencils or pens
	b. <i>Kilo</i> (careful observation) of Loko ea	Lesson 2: Student Activity Sheet
	c. Share out <i>kilo</i> (careful observations) and introduce guiding question for the day	Lesson 2: Student Activity Sheet
	d. Explain the three stations and station rotation	Lesson 2: Student Activity Sheet
2. Station A: Loko ea from past to present		
30 min	a. Discuss how our <i>kilo</i> (careful observations) may have differed on a different day, month, year	
	b. Share the focus question for this station	
	c. Hear <i>mo'olelo</i> (stories) of what Loko ea looked like in the past	Past images of Loko ea fishpond (provided by Loko ea)
	d. Compare <i>mo'olelo</i> (stories) from the past to observations of the pond today	
	e. Generate and record questions about pond management	Lesson 2: Student Activity Sheet
3. Station B: Fish and plankton kilo		
30 min	a. Share the focus question for this station	
	b. Conduct <i>kilo</i> (careful observations) along the channel to look for fish (optional if time allows)	
	c. Introduce fish and plankton stations and scientific sketching	- chart with ABCDE of sketching - colored pencils/crayons/markers
	d. Rotate through 2 observation stations, one fish and one plankton	- Lesson 2: Student Activity Sheet - fish and plankton tanks (provided by Loko ea)
	e. Discuss observations and generate questions about fish and plankton	Lesson 2: Student Activity Sheet
4. Station C: Collective action work station with California grass		
60 min	a. Share the focus question for this station	
	b. Frame the California grass problem	
	c. Remove California grass	gloves, wheelbarrows, waders (provided by Loko ea)

	d. Have a few students take pictures at the California grass photo points	- iPad or mobile device (4 iPads provided by Loko ea) - students also use personal or school-provided devices if desired
5. Closing circle		
10 min	a. Revisit the guiding questions for the day and share appreciations	
	b. Optional home learning	Lesson 2: Student Activity Sheet
	c. Prepare to depart	

* Approximate times will vary with your students' needs and your teaching style.

Timing for Varying Field Trip Lengths

2 hours	3 hours	4 hours	Activity refer to above table for activity details
50 min	65 min	65 min	1. Arrive, welcome, and opening circle
30 min	40 min	45 min	2. Station A: Loko ea from past to present
30 min	40 min	45 min	3. Station B: Fish and plankton <i>kilo</i> (careful observations)
60 min	80 min	90 min	4. Station C: Collective action work station with California grass
		35 min	Optional activities, second <i>kilo</i> (careful observation), or Loko ea coloring sheets
10 min	15 min	20 min	5. Closing circle

Advance Preparation

- Review [Teacher Background information](#) if needed.
- Make and bring extra copies of the student activity sheet in case students forget them or leave them at home.
- Bring extra writing utensils. Loko ea will provide clipboards for each student.
- Gather sets of colored pencils, crayons, and or markers to use at Station B.
- Review the Teacher Guide.
- Work through student tasks to anticipate challenges for your students.

Prepare for a successful field trip

- Follow your school's procedures for obtaining administrative approvals, coordinating bus and food services, and completing paperwork.
- Schedule field trip dates with Sayo Costantino, 808-483-0678 or Loko ea office 808-637-3232 as early as possible.
- Confirm final numbers and group organization (e.g., how to organize your class at the Loko ea entrance) with Sayo Costantino.
- Review any medical needs of your students and assemble any needed paperwork and medical supplies. Discuss plans with your school's medical personnel.
- Determine student groups and chaperones in advance. Choose chaperones wisely and have several backup chaperones. Consider name tags for students and chaperones.
- Distribute the following to all adults participating in the field trip:
 - MLEF-Group Adult Waivers
 - MLEF COVID-19 Addendum
 - MLEF Tips for a Successful Field Trip

- Guidelines for Chaperones (**Note:** edit this document as needed for your setting)
- Lesson 2 Student Activity Sheet
- Print directions to Loko ea if needed.
- Consider ideas this field trip generates for you. Do you have a specific area of interest that you'd like Loko ea staff to address during the field trip (particularly if you can spend 3-4 hours at Loko ea)? For example, if you are interested in native plants, students can plant native plants, propagate a native plant cutting, or utilize native plants in traditional ways. Reach out to Loko ea staff to discuss ideas that connect to your interests, your students' interests, or other relevant concepts you are focused on.
- Be prepared to be an active participant in all Loko ea led activities, modeling proper behavior and expectations for your students. The long-term goal is that you become comfortable with this lesson at Loko ea so that, in future trips to Loko ea, you will be able to co-lead portions of this lesson with Loko ea staff.

On the day of the field trip

- Before getting on the bus:
 - Make sure students have used the bathroom if needed
 - Collect waivers
 - Text Sayo Costantino as you depart: 808-483-0678 or call Loko ea office: 808-637-3232
- On the way to Loko ea:
 - Practice the *oli* (chant)
 - Designate a line leader to lead students into Loko ea after you arrive
 - Discuss how to organize at Loko ea entrance
- Upon arrival at Loko ea:
 - Text Sayo Costantino: 808-483-0678 or call Loko ea office: 808-637-3232
 - Organize students; use porta potties if needed
 - Give Loko ea staff all waivers

After the field trip

- Consider having students write a note of *mahalo* (thanks) to Loko ea staff, bus drivers, chaperones, and others who made the field trip possible.

Prepare Station A (to be done by Loko ea staff)

- Prepare visuals of Loko ea from the past to use for *mo'olelo* (stories).

Prepare Station B (to be done by Loko ea staff)

- Depending on the group size, plan for 4-6 tanks. The ideal group size is 20 students, with 5 students around a plankton station or fish tank.
- Prepare 2-3 plankton stations. Get a water sample and prepare an iPad with a microscope so students can view the different kinds of plankton.
- Prepare 2-3 fish tanks. Get 2-4 different kinds of fish in each tank.
 - Prioritize: Tilapia, 'ama'ama (mullet), and *āholehole* (Kuhlia fish)

Prepare Station C (to be done by Loko ea staff)

- Determine site for California grass removal.
- Prepare equipment for removal of California grass.

Teacher Procedures

1. Arrive, welcome, and opening circle

Time: ~50 min *Note: all times are approximate and based on a 2-hour field trip*

Purpose: Support students to feel welcomed into Loko ea and get to know it through *kilo* (careful observation), and focus on the core question for the day.

a. Enter and arrive at Loko ea

- i. **Text Sayo Costantino (808-483-0678) when leaving school and when buses arrive.** Organize students into a horizontal line at the entrance when they get off the buses. Designate a line leader for the class who will lead the class into Loko ea. Staff will meet you at the gate and introduce the concept of *kilo* (careful observation) and the importance of using every opportunity to observe.
- ii. **Upon arrival at Loko ea chant the *oli*, when entering.** The *oli* (chant) is on page 1 of the Lesson 2: Student Activity Sheet. If your school has its own *oli*, you are welcome to use it. After students enter, have them come to the main gathering area and get comfortable for the opening circle.
- iii. **Introduction to Loko ea staff and spaces**
 - Loko ea staff will share the Five Fishpond board and provide an introduction to Loko ea.
 - Loko ea staff will discuss safety protocols.
 - The teacher will give signed waivers for all students, teachers, and chaperones to Loko ea staff as students assemble.

b. *Kilo* (carefully observe) Loko ea (led by Loko ea staff)

The steps below will help you anticipate the process the Loko ea staff will use. Familiarize yourself with the process in order to support your students as they *kilo*.

- i. **Introduce the concept of *kilo*, a Hawaiian practice.** Share *mo'olelo* (story) to introduce the idea of *kilo*: to study carefully through all of our senses to make sense of the world.
- ii. **Discuss what *kilo* means.**

Suggested prompts:

 - What does it mean to *kilo*, to observe?
 - How can we practice observing?

Listen for ideas such as:

 - Looking with intention
 - Using your senses
 - Noticing small and large things
 - Drawing pictures
- iii. **Introduce the “I notice, I wonder, It reminds me of” prompts to support *kilo* and practice one or two observations with the whole group.** There is a chart students should use for this on page 2 of the Lesson 2: Student Activity Sheet.
 - Suggest that students begin their *kilo* with the sky. Then *kilo* the land, beginning with the mountain ranges, followed by the land surrounding Loko ea and the land below your feet. *Kilo* the water and, finally, what's in the water.

Example *kilo*

I notice	I wonder	It reminds me of
There is a lot of water in the pond and it's really glassy and calm.	Where does the water come from?	A pond near where I grew up because it was so calm it reflected clouds in the sky like this pond.

- iv. **Review expectations about how to safely and respectfully *kilo*.** Share the boundaries about where students can go during this time and that they should stay with their small group and chaperone.
- v. **Do a *kilo* walk in small groups of ~10 students per adult chaperone (optional if time allows).** *Kilo* nearby the gathering area for about 10 minutes. Students should use page 2 of their Lesson 2: Student Activity Sheet record "I notice", "I wonder", and "It reminds me of" statements.

c. Share out *kilo* and introduce guiding questions for the day

- i. **Have a few students share out what they observed.** Record patterns on a white board. Categories of *kilo* we might anticipate, depending on where students made observations include:
 - sky
 - larger landscape, mountains
 - mid-range landscape
 - water
 - organisms in the water /on land
- ii. **Introduce the two guiding questions for the day.** Post these questions in a public place. These are also on Page 2 of the Lesson 2: Student Activity Sheet.
 - What organisms live in Loko ea?
 - How has the management of Loko ea affected which organisms live in Loko ea?

d. Explain the three stations and station rotation. Explain that students will rotate through three stations and have an opportunity to further practice making observations. Have students follow along on the Lesson 2: Student Activity Sheet as you review the three stations.

- i. **Station A: Loko ea from Past to Present**
 - Location: *Keiki* (child) pond in the shade
 - Focus question: What does Loko ea look like now compared to how it looked in the past and why?
- ii. **Station B: Fish and Plankton *Kilo***
 - Location: Determined by Loko ea staff
 - Focus question: What's living in the fish pond?
- iii. **Station C: Collective Action Work Station with California Grass**
 - Location: Determined by Loko ea staff
 - Focus question: How much California grass is currently at Loko ea and what can we do about it?

Explain how students will rotate through stations. (Refer to the tables in the Lesson At A Glance. The directions that follow are for a 2-hour field trip.)

- There will be two 60-minute periods. During one period, students will spend 30 minutes at either station A or B and then swap. During the other period, students will spend the whole 60 minutes at Station C.
- Share how students and chaperones will know to rotate to the next station.

2. Station A: Loko ea from past to present

Time: ~30 min *Note: all times are approximate and based on a 2-hour field trip*

Purpose: Give students a historical perspective on the pond and prompt them to consider how the pond has been managed to get to its present day state.

a. Discuss how our *kilo* may differ on a different day, month, or year.

The steps below will help you anticipate the process the Loko ea staff will use. Familiarize yourself with the process in order to support your students at this station.

Suggested prompts:

- How would what we observed today be different than a week ago? A month ago? In the summer? 1 year ago? 10 years ago?

Listen for ideas such as:

- Time of day would differ with the tides
- Seasonal changes in temperature or precipitation might lead to different observations
- Over years, there may have been less water and fish if there was more California grass

b. Share the focus question for this station: What does Loko ea look like now compared to how it looked in the past and why?

c. Hear *mo'olelo* (stories) about what Loko ea looked like in the past.

i. Share *mo'olelo* about the time before the fishpond was established.

- This area is an estuary - Hawaiians were keen observers and would want to build a fishpond already abundant with life. *Kilo* was a way of life - they did not stop what they were doing to *kilo* with intention.
- Invite students to consider what it would take to develop a fishpond here?

ii. Share *mo'olelo* about the pond 60 years ago

- Share *mo'olelo* of place names of the past. Place names come from what the area used to look like or what it was used for. Place names can be used as clues to develop a picture of the space.
- Describe the different ownership and management of fishponds. Note that management of Loko ea was not necessarily traditional through the 1900's.
- Note that all through Hawaii the movement of water has changed:
 - Water has been diverted for agriculture
 - Water has been pulled from the aquifer
 - Ocean water movement has changed with addition of harbours and jetties

iii. Share *mo'olelo* and show images of the pond 10 years ago including the rediscovery of the *Keiki* (child) pond by the management team.

- Share the beginning of the nonprofit foundation Mālama Loko Ea.

Additional Guidance

Key ideas to share in *mo'olelo*

- During pre-contact time, there was the main pond we see today as well as the connected 'Uko'a pond.
- *Keiki* (child) pond was only rediscovered by the Mālama Loko Ea team 10 years ago due to invasion of California grass.
- Restoration efforts started to create space for fish.

Focus on HĀ Outcomes:

- 6c, 6e. Strengthened Sense of Hawai'i: Learn the names, stories, special characteristics, and importance of places in Hawai'i; Share the histories, stories, cultures, and languages of Hawai'i

Learning about the history of Loko ea supports students in navigating across cultures and fosters stewardship of place.

Focus on HĀ Outcomes:

- 1b. Strengthened Sense of Belonging: Know about the place I live and go to school

Learning about the history of Loko ea supports students in making connections to past, present, and future.

Learning about relationships between land and people begins to create a sense of belonging.

d. Compare *mo'olelo* from the past to observations of the pond today.

Suggested prompts:

- How do these *mo'olelo* compare to what you observe today?

Listen for ideas such as:

- The amount of water in the pond has changed. A long time ago, there was more water, then less as California grass came in, and now there's more water again.
- There are fewer numbers/abundance of fish today than many years ago in the ocean and in Loko ea.

e. Generate and record questions about pond management. Record questions on Page 3 of the Lesson 2: Student Activity Sheet.

Suggested prompt:

- What questions do you have about how the pond has been managed over time so that it looks the way it does today?

Focus on CCCs

- **CCC7 Stability and Change:** Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

Through comparing careful observation today and *mo'olelo* (story) from the past, students start to think about how the pond has changed over time.

Focus on SEPs

- **SEP1 Asking questions and defining problems:** Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

Through comparing careful observation today and *mo'olelo* (story) from the past, students generate questions about pond management that they will use later in the unit to consider how to best manage Loko Ea to sustainably produce fish for the community.

3. Station B: Fish and plankton kilo

Time: ~30 min *Note: all times are approximate and based on a 2-hour field trip*

Purpose: Prompt students, through kilo and sketching, to notice that there are many different kinds of fish and plankton in the pond.

- Share the focus question for this station:** What's living in the fish pond?
The steps below will help you anticipate the process the Loko ea staff will use. Familiarize yourself with the process in order to support your students at this station.
- Kilo (carefully observe) along the channel to look for fish (optional if time allows).** Give students time to make observations along the channel for different fish. Emphasize that it is hard to really see from so far away.
- Introduce fish and plankton stations and scientific sketching as a way to observe closely.** Show students the tanks where students can *kilo* the fish and plankton up close. Emphasize that scientific sketching is not about being good at art. Anyone can practice making observations and drawing what they see. Introduce the ABCDE heuristic for making a scientific sketch.
 - **A - Accurate:** Instead of drawing your idea of a flower or fish, draw what you actually see.
 - **B - Big:** Blow up so you can show a lot of detail.
 - **C - Colorful** - (optional) Use color or write notes about specific colors you observe.
 - **D - Detailed** - Include sketches or notes about specific details. Draw a zoom-in bubble.
 - **E - Explained** - Include words to describe what you see.

- d. **Rotate through 2 observation stations, one fish and one plankton.** (Note: the structure of this station may be adjusted based on the number of students attending.) Have approximately 4-5 students at each station. Swap halfway through the time so students have a chance to observe both a fish tank and a plankton sample.
- e. **Discuss observations and generate questions about fish and plankton.** In a whole group, share out observations and have students record new questions on page 4 of the Lesson 2: Student Activity Sheet
Suggested prompts:
 - What did you notice about the fish and plankton?
 - What did it make you wonder?

Focus on SEPs

- **SEP1 Asking questions and defining problems:** Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

Through careful observation from sketches, students generate questions about the fish and plankton in the pond. This will prompt them to start wondering about biodiversity, specifically fish and plankton.

4. Station C: Collective action work station with California grass

Time: ~60 min *Note: all times are approximate and based on a 2-hour field trip*

Purpose: Help students feel a sense of contribution through participating in restoration and management of the pond.

- a. **Share the focus question for this station:** How much California grass is currently at Loko ea and what can we do about it?
The steps below will help you anticipate the process the Loko ea staff will use. Familiarize yourself with the process in order to support your students at this station.
- b. **Frame the California grass problem and prepare to document current California grass conditions.** Discuss the differences between cultivated, invasive, and Polynesian-introduced species. Note the differences between endemic and introduced endemic species. Share the history of invasives in Hawai'i. Note that many invasive species came to the islands from a lack of understanding and mismanagement of science. For example, the mongoose was introduced to control rats, but mongoose are diurnal and rats are nocturnal. California grass was introduced because it grows so well and ranchers were looking for grass for cattle. However, cattle don't prefer it so they don't eat it. Since there are no consumers of California grass or seasonal conditions to control its growth, the grass grows without limits.

Share the consequences of uncontrolled growth. California grass takes over space in the pond; the main management strategy is removal by hand. Discuss important Hawaiian culture that should be passed on to students, including: *aloha 'āina* (love of the land), *mālama 'āina*, *laulima* (many hands), *kuleana* (responsibility) and the environmental stewardship values that are part of this station. Discuss how a few students will help photodocument these restoration efforts at specific stations around the pond.

Share that prior experiences with invasive species are why caretakers of Loko ea really consider carefully decisions about management actions they might take. These experiences underscore the importance of understanding both traditional knowledge and science when making decisions.

Note that restoration is more than just removal of invasive species. The other part of restoration is restoring the plants that used to be there. You can't just remove the California grass because it will just grow back; you must consider what you will put in place of the California grass.

Focus on HĀ Outcomes:

- **6c, 6e. Strengthened Sense of Hawai'i:** Learn the names, stories, special characteristics, and importance of places in Hawai'i; Share the histories, stories, cultures, and languages of Hawai'i

Learning about the history of Loko ea supports students in navigating across cultures and fosters stewardship of place.

- c. **Remove California grass.** Have students prepare to remove California grass. They will need to pull out the grass, pile it up, and wheelbarrow it to the appropriate location.
- d. **Have a few students take pictures at the California grass station and photo stations.** Have students take a before and after photograph where they have been working. If time permits, students can take one photograph at the photo stations.

5. Closing circle

Time: ~10 min *Note: all times are approximate and based on a 2-hour field trip*

Purpose: Support students to share observations from the day and appreciations for Loko ea and staff.

- a. **Revisit the guiding questions for the day and share appreciations.** Have students share with a partner or small group what they figured out about the guiding questions for the day and appreciations for what they experienced at Loko ea. Have a few students share out with the whole group. They can record what they figured out on page 5 of the Lesson 2 Student Activity Sheet if time allows.
 - What organisms live in Loko ea?
 - How has the management of Loko ea affected which organisms live in Loko ea?
- b. **Optional home learning.** Share that we have observed many things during our time at Loko ea. Coloring sheets are being created for each pond. If you have time and interest, let Loko ea staff know that you and your students would like copies of the coloring sheets. You can invite students to continue to think about their *kilo* (careful observation) and experiences at Loko ea by coloring one or more coloring sheets.
- c. **Prepare to depart.** Take a group picture. Have students use the bathroom and load buses, then take attendance and depart.