

Our Community Module



Introduction

Clear Lake's waters are cared for by many. Learn more about cultural connections, examine water quality data and key managing agencies, contribute data on potential harmful algal blooms, and make plans to get involved in the community.

Through basket weaving, educators will be able to share with students how important wetland species like tule are for maintaining both healthy water quality and traditional Tribal practices. Harmful algal blooms (HABs) are a critical water quality concern that students will learn about by comparing their own observations with local data. Questions generated by looking at the data can feed into the discussion of key groups that are monitoring and protecting water quality in the lake. Educators can then guide students in how to use the participatory science app, bloomWatch, to contribute observations of potential HABs. Finally, traditional knowledge, student data questions, key groups, and contributing observations will come together through examining Clear Lake wetland restoration efforts.

Activities

Time Frame: 6 hours

Either Inside or Outside

- [Basket Weaving](#) (1-2 hours): As they practice how to weave their own baskets, students discover the role tule and other wetland species play in traditional practices and maintaining healthy water quality for Clear Lake.
- [Power Mapping and Decision Makers](#) (45 minutes): Create a visual chart and map out the different stakeholders and decision makers in your community and the power relationships between them. This chart can then serve as a planning tool to help your team look into ways they can get involved with water quality monitoring and restoration.
- [Water Quality Data Investigation](#) (1 hour): Educators will take a look at where harmful algal blooms are occurring, and investigate trends in water quality data over time. Educators can connect students' own observations and prior knowledge about water quality and compare those to the ongoing data.
- [Youth Engagement with BloomWatch](#) (45 minutes): In order for water quality managers around the lake to identify where HABs occur, they rely on multiple sources of information. One source is the participatory science app, BloomWatch. Users can identify algae and submit photos of a potential bloom to BloomWatch, a national database.

- [Wetland Restoration Projects](#) (1 hour, 30 minutes): Students will make connections to essential wetland functions. Students will attempt to migrate as birds and collect enough food at wetlands. As different threats remove wetlands, local projects will restore wetlands and help students successfully migrate. Afterwards, students read about the local wetland restoration projects. Educators can walk students through generating ideas for how students can get involved in these projects that help to improve Clear Lake's water quality.
-

Suggested Flow

[The 5E Inquiry-Based Instructional Model](#) can serve as your guide during the design and implementation of STEM instruction. While these activities are ordered to build upon each other, you may complete them out of order as part of any of the 5E's. If there are time restrictions, these activities are also designed to be completed individually (one does not require another activity to be completed). Below is a suggested flow for this module:

Engage Activity: Basket-weaving

Starting with this activity introduces the cultural and ecological significance of wetland species such as tule, and these species' role in maintaining healthy water quality.

Explore Activity: Power Mapping and Decision Makers

There are many different organizations, agencies, and Tribes that are all working together to improve Clear Lake's water quality. Educators can help students determine which groups are involved using students' prior knowledge, and determine how these groups can help students have a positive impact.

Explain Activity: Water Quality Data Investigation

Students can compare their own observations about Clear Lake's water quality with local water quality monitoring data.

Elaborate Activity: Youth Engagement with BloomWatch

To help the decision-making groups discussed in the previous activity know where HAB events are happening around the lake, students will learn how to contribute observations of potential HAB events to the app, BloomWatch.

Evaluate Activity: Wetland Restoration Projects

After exploring decision-making groups and contributing to local data in the prior activities, students learn about the essential functions of a wetland and local organizations involved in restoration projects.

Objectives

- Understand how wetland plants impact water quality
- Understand the cultural importance of tule to local Tribes and Clear Lake
- Have students' prior knowledge and observations contribute to sense-making
- Understand what a HAB is and what causes HABs to occur in Clear Lake
- Read maps and interpret data
- Utilize protocols to submit scientific data
- Identify HABs
- Develop student questions
- Engage with local groups and their projects

Key Vocabulary

Wetlands, pollutants, Harmful Algal Bloom (HAB), restoration, water quality, power, advocacy, monitoring, algae, cyanobacteria, organism, nutrients, pesticides, sediments, toxins, fertilizers, detergents, phosphates, water quality, dissolved oxygen, function, habitat, shoreline, development, migrate, northern/southern hemisphere, surface water diversion, invasive species

Resources to Support Educator Background Knowledge

Anything contributing to making the water too acidic, too warm, or with too little oxygen, is a pollutant. Pollutants heavily impact Clear Lake's water quality and can lead to harmful algal blooms (HABs). Algae and cyanobacteria are simple organisms that live in the water. Algae and cyanobacteria can grow fast, or "bloom," when water is warm, slow-moving, and full of excess nutrients from pollutants like pesticides and sediments. When there is cyanobacteria present, these blooms can sometimes produce toxins called cyanotoxins. People and animals can get sick when swimming, boating, or near water with a cyanobacterial bloom. While it's important to reduce or eliminate the production of pollutants contributing to HABs, restoring wetland plants can help cycle excess nutrients from the lake. Wetland species like tule are important in cultural practices, providing habitat for animals, preventing lake shoreline erosion, and improving water quality by filtering pollutants. Caring for wetland species around Clear Lake and its tributaries positively impacts the health of the lake and its people.

Supporting Background Information

Resource	Resource Type	Source
Citizen Science: Harmful Algal Blooms & Fish Kills : Learn in-depth about the factors contributing to HABs and fish kills in Clear Lake, and how they can be observed, reported, measured, monitored, and mitigated.	Online course	Big Valley Band of Pomo Indians
Clear Lake Water Quality, Tribes, and Cyanotoxins : An overview of the Tribal monitoring program, and cyanobacteria and its impacts.	Report	Big Valley Band of Pomo Indians
Clear Lake Cyanobacteria and Cyanotoxins Monitoring Program : Find resources and data relating to cyanotoxins in Clear Lake. Explore the map below to view the latest cyanotoxin levels measured at sites around Clear Lake. During the summer season we take water quality samples every two weeks at each of our shoreline or interior of the lake sites.	Database	Big Valley Band of Pomo Indians
Clear Lake Tules : a flier with quick facts and information about tules.	Flier	Lake County Water Resources Department
Traditional Pomo Tule Toys with Meyo Marrufo : Meyo discusses tule traditions and demonstrates how to make toys out of tule.	Video	Grace Hudson Museum
On the Water: From Cache Creek to Clear Lake, Hydro History : Walk through the history of water and water ownership in the region.	Online Exhibit	Lake County Museums
Water Quality Wednesday : A video series featuring local speakers that discuss projects, issues, and more related to water quality.	Video	Lake County Department of Water Resources
Clear Lake Water Quality : Importance of water quality; portal for data that monitors trends.	Website	Lake County Department of Water Resources
Anderson Marsh State Historic Park : An overview of the park's key features and history.	Brochure	California State Parks
Reviving a famously polluted California lake : Describing the efforts to restore Clear Lake by multiple Tribes and agencies.	Article	Knowable Magazine

Lake, Mendocino, and Sonoma County Tribal Listening Session: Summary Indicators of Climate Change in California : The Big Valley Band of Pomo Indians, the Middletown Rancheria of Pomo Indians of California, and the CalEPA Office of Environmental Health Hazard Assessment jointly convened a listening session with Lake, Sonoma, and Mendocino County Tribes. The listening sessions had the following objectives: 1.) Listen to perspectives from tribal communities in these counties on climate change impacts they are experiencing and identify common themes, and 2.) Collect tribal input to help the OEHHA Indicators of Climate Change in California report raise awareness about tribal-specific climate change impacts and increase recognition of the value of tribal knowledge in reporting climate change impacts.	Report	California Office of Environmental Health Hazard Assessment
Tules: Weaving Baskets, Boats, Decoys, and Houses : Tules and their importance for indigenous people across California.	Article	PBS

Current Tribal Stewardship

The Big Valley Band of Pomo Indians and Elem Indian Colony began the [Clear Lake Cyanotoxin Monitoring Program](#) in 2014, and “together the two Tribes’ Environmental Departments have collaborated with equipment, resources and time to test the water for toxins produced by cyanobacteria. The visible blooms began to be a regular presence on the lake in 2009, and the California Office of Environmental Health Hazard Assessment (OEHHA) recommended monitoring in 2012. The Tribes stepped in to do this work to protect the lake, the Tribal citizens, and residents and visitors to the lake. Since 2021, Big Valley has continued the monitoring program on its own.”

Project	Tribe	Description of Project
Clear Lake Cyanotoxin Monitoring Program	Big Valley Band of Pomo Indians, Elem Indian Colony	Biweekly sampling for cyanotoxins at sampling sites around the lake.

Clear Lake Fish Kill Monitoring iNaturalist Project	Big Valley Band of Pomo Indians	A record of fish kills in Clear Lake and nearby tributaries that contributes to ongoing data collection and environmental monitoring efforts.
---	---------------------------------	---

Lake County Strong Connections

This project's materials build off of the shared goals of the [Lake County Strong curriculum](#). The purpose of incorporating this curriculum is to extend learning opportunities on environmental issues and activism within Lake County to build stewardship amongst youth and their families. These module activities incorporate lessons from the curriculum.

Activity	Lake County Strong Lesson
Basket Weaving	Pomo Basketry Patterns

Youth Community and Citizen Science Connections

By engaging with ongoing regional water quality monitoring activities, students can develop deeper understandings of which groups are doing the monitoring, visualize trends associated with HABs, and generate questions. Through the data collection process, youth learn more about ways in which water quality is being monitored regionally, as well as how those monitoring efforts are being used in management decisions. By connecting with local organizations actively engaged in restoration and monitoring, young people can build on their experiences to create change in their own lives or communities.

[Core Activities and Key Practices](#) Highlighted in this Module

Core Activity: Make meaning	Key Youth Practice: Engage with complex social ecological systems
Core Activity: Contribute Data	Key Educator Practice: Attend to the unexpected

Core Activity: Develop Expertise	Key Educator Practice: Frame the work globally and locally
Key Youth Practice: Take ownership of data quality	Key Educator Practice: Position youth as people who do science

Highlighted Participatory Science Project(s)

The following projects can be used in any location around the lake. They are intended to build students' skills and understanding of HAB impacts.

Project	Community Based Partner	Project Description
bloomWatch	Big Valley Band of Pomo Indians	By using the bloomWatch app on a smartphone, users can help state and local officials understand where and when cyanobacteria may be producing toxins that affect humans, pets, and our ecosystems.
Clear Lake Fish Kill Monitoring iNaturalist Project	Big Valley Band of Pomo Indians	A record of fish kills in Clear Lake and nearby tributaries that contributes to ongoing data collection and environmental monitoring efforts.

To Be Still is to be Animal

Georgina Marie Guardado, Lake County Poet Laureate 2020-2024

How the sun glimmers and glistens through Valley Oaks on a rustic hillside.
How the warmth permeates amber honey skin and a tense body loosens.
How the ground cover of fallen autumn leaves aches of a soothing vibrancy.
How I breathe between these happenings.
How yearning for more makes the muscles weak, turns the heart to a tiny blue egg, an oval shape, a crack on all sides as if someone took it and threw it into the night sky.

How the brittle shell was adorned with cornflower and flaxen.
How I came home to myself after the breaking, half-human, half-bird.
How winter frost is arriving again.
How a hunger remains.

How the Burrowing Owl and the American Robin observe, witnessing all of this.
How they don't swallow time in the same way or long for difference.

What if all of this was enough?