

Lesson 5: Our Ecosystems

LESSON INTRODUCTION

Time Frame: One 60-90 min. Lesson *or* Two 40-60 min. Lessons

Materials:

- A comfortable space for an outdoor class discussion
- Google Slides [Presentation](#) (*You will need to edit the slides in this presentation alongside the class discussion so you will need to “Make A Copy.” You may also wish to add some of your own vocabulary.*)
- Projector and computer with access to the internet
- Personal computers with internet access
- [Oak Woodlands Species](#) cards - printed two-sided, enough copies for groups of 2-4 students
- Scissors, tape/glue
- Strips of butcher paper (cut about 3’ x 2’) or 1 poster board for each group
- Pencils, black sharpies and coloring utensils
- Optional: [Online Northern Pomo Talking Dictionary](#)

This lesson emphasizes interdependent relationships within ecosystems, with a special focus on Oak Woodlands. Students will collaborate on a final presentation in which they will think about the interconnectedness of the natural world and reflect on our relationship with it and the local Tribes that tended to it since time immemorial.

Expressive Outcomes:

I know I can show respect for the homelands of the local Native people.

I know I can explain how ecosystems and humans interact.

I know I can partner with Native Americans in keeping California healthy and clean.

Teacher Background:

The final critical orientation for Indigenous Studies is *partnerships* (Sabzalian, 2019)¹.

¹ Sabzalian, L. (2019). [Critical orientations for Indigenous studies curriculum](#).

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Thus, the key word in the title of this lesson is *Our*. We are all responsible for the caring and stewarding of the land on which we live. From the very beginning, settler colonialism has devastated our homelands. Entire groups of human beings were nearly wiped from this place. However, ancient knowledge that had built upon itself for thousands of years somehow survived. Today, we have a term for that knowledge; we call it **Traditional Ecological Knowledge**, or **TEK**. A core element of TEK is that humans adapt to their environments, and are likewise able to adapt their environment to fit their needs in a way that is respectful and mindful of the ecosystem's health. Native caring for the environment has required major adaptation throughout the millennia, and continues to require adaptation and innovation. Many settler environmentalists are listening to this ancient knowledge that Western science has never been able to acknowledge, finally creating space for both perspectives to unite.

This lesson aims to debunk students' perception of Native peoples as being wild, untamed, and unable to support the natural environment. The United States conservationist movement was rooted partially in the idea that nature should be left untouched, and advocated for the protection of "wilderness spaces" that were safe from development. This is in direct opposition to the approach California Natives took to land management, that saw all landscapes as tendable. Native people took great care to support the health of forests, waterways, deserts, woodlands, etc., and so did not have the same concept of "wilderness." Exploring this difference is essential for challenging the stereotype that Natives were primitive hunter-gatherers and were instead skilled land stewards who took care of every aspect of the environment. Introducing **land stewardship** in this way promotes **allyship** with Native communities, as well as plant and animal species.

To prepare for this lesson, we highly suggest watching the TED talk by Rebecca Thomas linked in the Sources about "**Two-Eyed Seeing**." A fundamental step to creating meaningful partnerships with local Native peoples is to acquire this skill of holding two perspectives simultaneously. Neither is right nor wrong, but both are valid and can exist in concert. When teaching science in your classroom, practice applying Two-Eyed Seeing to the content you are to teach. How can the content be enriched by TEK? How can scientific objectivity be harmful to Indigenous communities? Can concepts like space, time and energy be taught from multiple perspectives and not just the dominant one?

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To answer these questions, it is crucial for educators to seek collaboration with the eldest stewards of these lands. Invite speakers into your classroom, or better yet to school-wide workshops. Promote the hiring of a school tribal liaison, or a multicultural curriculum council representing all of your students' identities. Invest in professional development led by Indigenous education specialists. Make it a professional goal to indigenize your lessons year-round, in addition to celebrating Native American Heritage Month and Indigenous Peoples' Day. Becoming a true ally of Native communities means incorporating all six of these critical orientations into everyday interactions in your classroom. Try to connect the 3 R's to multiple subjects, such as art, math and physical education. In evaluation of your students' learning, deepen students' understanding of themselves within the community by highlighting their strengths. Remember that the classroom is but one venue where learning takes place; assume that each and every student brings with them their own funds of knowledge with applicable usefulness in daily curriculum.

Well-known educational philosopher John Dewey once suggested that school life should be an extension of home life. To *indigenize* curriculum means to value the knowledge of place, to value perspective, to challenge power dynamics within curriculum by providing students with opportunities to learn about Indigenous power and agency, and by creating meaningful connections with the community, including members of Indigenous nations and organizations.

ENGAGE

Outdoor Discussion (10-15 minutes)

1. Pick a location outside the classroom comfortable enough to sit in a circle. Start this lesson off feeling more connected to this place you spend 40+ hours per week. Perhaps have students take a deep breath before beginning the conversation.
2. **ASK** your students:
 - a. How is your lunch related to water? How is your desk related to a forest?
 - b. What are some other ways humans depend on land, water, plants and

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- animals?
- c. What are some ways they depend on us?
 - i. ******This is not an easy question to answer. We often think of ourselves as receivers of the many gifts Mother Earth has to offer, but it is important to understand how the Earth needs us, too. Here are some follow-up questions you can ask students should they struggle with this question:
 - Are there mistakes humans have made that only humans can fix?
 - Are there certain traits specific to humans that have positive energy?
 - d. How can we make this relationship more reciprocal?
3. **In partners**, have students discuss:
- a. Their favorite types of landscapes:
 - i. Ocean, woods, forests, mountains, deserts, etc
 - b. How they would describe their relationships with these landscapes
 - i. Why is it their favorite? Do they have special memories visiting these places? Do these landscapes give them something important?
 - c. How can they improve those relationships by showing respect and reciprocity for the land?
 - d. How would their lives be impacted if these places started to disappear?

EXPLORE

Food Chain Computer Game (10-20 minutes)

1. Give students some time to play this ecosystem game:
 - a. [Food Chain Challenge](#)
 - b. Instruct students to work their way up to level 6. Once they've completed level 6 they can do free play to see how many different food chains they can create.
 - c. Students will learn some vocabulary related to food chains and gain a basic understanding of how plant and animal species depend on one another to survive.
2. Follow-up Discussion:

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- a. What's a 'producer?' What were some examples of producers?
- b. What's a 'consumer?' What are some examples of consumers that eat plants? What are some examples of consumers that eat other animals?
- c. Can anyone describe a food chain they created in the game?
- d. How many new food chains were you able to make (# out of 53)? What were some of the challenges?

EXPLAIN

Google Slides: Ecosystem Vocabulary (10-25 minutes)

1. **SAY**, "All things are connected. The plants, the animals, the water, the soil, the sun, and humans. In Native culture we are all a part of the same community. If we want to improve our relationships with the land, we must try to understand it. Take a moment to think about your friends; do you want to get to know them? What are your friendships based on? Are you silly with one another? Do you like to play the same games? These relationships require a common understanding. So together we are going to talk about some of the vocabulary people use to describe our land, water, plants, animals, and non-living friends."
2. **PRESENT** Google **Slides 5-12** on Ecosystems Vocabulary:
 - a. For each slide, see if the class can work together to come up with definitions for each word.
 - b. Then, give them the formal definition (in the speaker notes) and compare.
 - c. Are the definitions similar? If there is anything you missed, can you rephrase it in your own words?
 - d. *See speaker notes for more conversation points.*
3. **PRESENT Slide 13** and **EXPLAIN** that we are all living on Traditional Miwok, Wappo, Wailaki, or Pomo traditional lands (Change if living in a different territory). Even Native people are guests if they are living on land that is not their traditional territory. Because of this, we must be respectful guests by taking care of the ecosystem. In the Oak Woodland ecosystem, disrespectful guest behavior can cause problems for the plants, animals, and humans. Let's learn about some of the most important plant and animal species in our ecosystem, so that we can begin to learn how to support them.

ELABORATE

Oak Woodlands Species Exploration (15-25 minutes)

1. **PRESENT Slide 14** and **SAY**:
 - a. “These are four different species that live in an Oak Woodlands ecosystem. The arrows represent the energy that is transferred when the species are consumed, or eaten. For example, Valley Quail and Grasshoppers eat Brome Grass, so the energy that the Brome Grass receives from the sun is transferred to the Valley Quail and the Grasshopper. Valley Quail also eat Grasshoppers, and the Coyote eat Quail. “
2. **ASK** students:
 - a. Which species are the producers and consumers?
 - b. Which are omnivores, carnivores or herbivores (as presented in the web)?
 - c. What would happen to this food web if the Quail disappeared from the ecosystem?
3. **Break students up** into groups of 2-4
4. **HAND OUT** copies of the Oak Woodlands Species cards
5. **EXPLAIN** that the species on these cards are very important to Native people. On the front (or top) of each card they will find information about each species. On the back (or bottom) they can read why they are important. Have them circle the correct trophic level once they’ve read all of the information.
6. **ON THE BOARD**, write these six categories:
 - a. Species that are collected in a basket.
 - b. Species that rely on people.
 - c. Species that are eaten by deer.
 - d. Species that are eaten by humans.
 - e. Species that rely on the oak tree for shelter.
 - f. Species that rely on the oak tree for food.
7. Give students time to work together to go through their cards and create these combinations. Have each group choose one student to write down the combinations on a piece of paper.

EVALUATE

Create A Food Web (15-30 minutes)

1. In the same small groups, students will now use their species cards to create their own Food Web in an Oak Woodlands ecosystem.
2. **PROJECT Slide 15** for full instructions.
3. Allow each group to present their finished posters to the rest of the class!
***Take pictures and share with us!*

ADDITIONAL ACTIVITIES

1. If you would like to hear the names for some of the Oak Woodlands species in a local Native dialect, visit:
 - a. [Online Northern Pomo Talking Dictionary](#)
 - i. Search the English name for each species. Play the pronunciation of each word and have students repeat.
 1. *No pronunciation is available for mushroom, grasshopper, brome grass, or human (you may look up man and woman if you like)*
2. Text Analysis: [Pomo Stories](#)
 - a. This lesson highlights the interdependence between humans, plants and animals through stories. A story from Greg Sarris' [How A Mountain Was Made](#) is featured.
3. [We Are Water Protectors](#) by Carol Lindstrom with [Activity Kit](#)
 - a. This is a beautifully illustrated book with a strong message for the need to protect our water. See the Activity Kit for discussion questions and engaging activities!
4. [EdPuzzle](#): 3 Animals That Keep Their Whole Ecosystem Together
 - a. A review of the role that “keystone” species play in their environment

VOCABULARY

Food chain: A series of organisms interrelated in their feeding habits, the smallest being fed upon by a larger one, which in turn feeds a still larger one, etc.

producer: plants that make their own food by absorbing sunlight and turning the energy into sugar

consumer: all species that eat other living things for food

herbivore: an organism that feeds on plants

omnivore: an organism that feeds on both plants and animals

carnivore: an organism that feeds on meat

species: A group of similar organisms that are able to reproduce

population: All the individuals of one species in a given area

biodiversity: Diversity, or having many different kinds of something, among and within plant and animal species in an environment

abiotic: Physical but not biologically living. The web of life is created by relationships not only between living things, but also between living and non-living things

ecosystem: A system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment

STANDARDS

Common Core:

Reading: Informational Text

CCSS.ELA-LITERACY.RI.4.1

Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

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CCSS.ELA-LITERACY.RI.4.4

Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

CCSS.ELA-LITERACY.RI.4.7

Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

CCSS.ELA-LITERACY.RI.4.9

Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.

Reading: Foundational Skills

CCSS.ELA-LITERACY.RF.4.3

Know and apply grade-level phonics and word analysis skills in decoding words.

CCSS.ELA-LITERACY.RF.4.4

Read with sufficient accuracy and fluency to support comprehension.

Language

CCSS.ELA-LITERACY.L.4.1

Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

CCSS.ELA-LITERACY.L.4.2

Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

CCSS.ELA-LITERACY.L.4.3

Use knowledge of language and its conventions when writing, speaking, reading, or listening.

CCSS.ELA-LITERACY.L.4.4

Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.

Writing

CCSS.ELA-LITERACY.W.4.1

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Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

CCSS.ELA-LITERACY.W.4.2

Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

CCSS.ELA-LITERACY.W.4.9

Draw evidence from literary or informational texts to support analysis, reflection, and research.

Speaking and Listening

CCSS.ELA-LITERACY.SL.4.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.4.4

Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.

CA Indian Essential Understandings:

Essential Understanding #3: *Native Traditional Beliefs*

The ideologies of Native traditional beliefs and spirituality persist into modern day life as tribal cultures, traditions and languages are still practiced by many American Indian people and are incorporated into how tribes govern and manage their affairs. Additionally, each tribe has their own oral history beginning with their genesis that is as valid as written histories. These histories pre-date the “discovery” of North America.

Native Knowledge 360° Essential Understandings about American Indians:

Essential Understanding #3: *People, Places and Environments*

For thousands of years, indigenous people have studied, managed, honored, and thrived in their homelands. These foundations continue to influence American Indian relationships and interactions with the land today.

- The story of American Indians in the Western Hemisphere is intricately intertwined with places and environments. Native knowledge systems resulted from long-term occupation of tribal homelands, and observation and interaction with places. American Indians understood and valued the relationship between local environments and cultural traditions, and recognized that human beings

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are part of the environment.

- Long before their contact with Europeans, indigenous people populated the Americas and were successful stewards and managers of the land, from the Arctic Circle to Tierra del Fuego. European contact resulted in exposure to Old World diseases, displacement, and wars, devastating the underlying foundations of American Indian societies.

Essential Understanding #8: *Science, Technology and Society*

American Indian knowledge resides in languages, cultural practices, and teaching that spans many generations. This knowledge is based on long-term observation, experimentation, and experience with the living earth. Indigenous knowledge has sustained American Indian cultures for thousands of years. When applied to contemporary global challenges, Native knowledge contributes to dynamic and innovative solutions.

- American Indian knowledge can inform the ongoing search for new solutions to contemporary issues.
- American Indian knowledge reflects a relationship developed over millennia with the living earth based on keen observation, experimentation, and practice.
- American Indian knowledge is closely tied to languages, cultural values, and practices. It is founded on the recognition of the relationships between humans and the world around them.
- American Indian knowledge allowed American Indians to live productive, innovative, and sustainable lives in the diverse environments of the Western Hemisphere.
- Much American Indian knowledge was destroyed in the years after contact with Europeans. Nevertheless, the intergenerational transfer of traditional knowledge, the recovery of cultural practices, and the creation of new knowledge continue in American Indian communities today.

CA Social Sciences Framework:

4.1 Students demonstrate an understanding of the physical and human geographic features that define places and regions in California.

1. Identify the state capital and describe the various regions of California, including how their characteristics and physical environments (e.g., water, landforms, vegetation, climate) affect human activity.
2. Use maps, charts, and pictures to describe how communities in California vary in land use, vegetation, wildlife, climate, population density, architecture, services, and transportation.

4.2 Students describe the social, political, cultural, and economic life and interactions among people of California from the pre-Columbian societies to the Spanish mission

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and Mexican rancho periods.

1. Discuss the major nations of California Indians, including their geographic distribution, economic activities, legends, and religious beliefs; and describe how they depended on, adapted to, and modified the physical environment by cultivation of land and use of sea resources.

NGSS Standards:

4-ESS3-1 Earth and Human Activity

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

CA Environmental Principles and Practices:

Principle I - People Depend on Natural Systems

The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.

Concept A. The goods produced by natural systems are essential to human life and to the functioning of our economies and cultures.

Concept B. The ecosystem services provided by natural systems are essential to human life and to the functioning of our economies and cultures.

Concept C. That the quality, quantity, and reliability of the goods and ecosystem services provided by natural systems are directly affected by the health of those systems.

Principle II - People Influence Natural Systems

The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.

Concept A. Direct and indirect changes to natural systems due to the growth of human

populations and their consumption rates influence the geographic extent, composition, biological diversity, and viability of natural systems.

Concept B. Methods used to extract, harvest, transport, and consume natural resources influence the geographic extent, composition, biological diversity, and viability of natural systems.

Concept C. The expansion and operation of human communities influences the geographic extent, composition, biological diversity, and viability of natural

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systems.

Principle III - Natural Systems Change in Ways that People Benefit from and can Influence

Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.

Concept A. Natural systems proceed through cycles and processes that are required for their functioning.

Concept B. Human practices depend upon and benefit from the cycles and processes that operate within natural systems.

Concept C. Human practices can alter the cycles and processes that operate within natural systems.

Principle IV - There are no Permanent or Impermeable Boundaries that Prevent Matter from Flowing Between Systems

The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Concept A. The effects of human activities on natural systems are directly related to the quantities of resources consumed and to the quantity and characteristics of the resulting byproducts.

Concept B. The byproducts of human activity are not readily prevented from entering natural systems and may be beneficial, neutral, or detrimental in their effect.

Concept C. The capacity of natural systems to adjust to human-caused alterations depends on the nature of the system as well as the scope, scale, and duration of the activity and the nature of its byproducts.

SOURCES

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- Sabzalian, L. (2019). [Critical orientations for Indigenous studies curriculum.](#)
 - [Online Northern Pomo Talking Dictionary](#)
 - Watch [TED talk](#) - Etuaptmumk: Two-Eyed Seeing by Rebecca Thomas

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- Traditional Ecological Knowledge [Fact Sheet](#)
- This lesson was adapted from Redbud Resource Group's [Oak Woodlands Introduction](#) lesson
 - Read the Teacher Background section for more information on Oak Woodlands ecosystems and their importance to local Native tribes
- [How A Mountain Was Made](#) (Sarris, 2018). "Lizard and Mockingbird Kidnap Rock's Daughter."
- [We Are Water Protectors](#) by Carol Lindstrom with [Activity Kit](#)
- [EdPuzzle](#): 3 Animals That Keep Their Whole Ecosystem Together

Other useful resources to become familiar with:

- Read articles in
 - The Wildlife Professional - "[Two-Eyed Seeing](#)"
 - KCET - "[What John Muir Missed: The Uniqueness of California Indians](#)"
- Listen/read along to [The Serviceberry](#) by Robin Wall Kimmerer
- [CA Indian Essential Understandings](#)
- [Native Knowledge 360 Essential Understandings](#)
- [List of Tribal Nations by County](#)