

1.4

Grade Level

6-9

Subjects

Science

Time Frame

1 Class Period

Teacher Materials

- Oak Woodland Ecosystem Cards
- Acorn Processing Material Photos
- Audio Dictionary

Oak Woodlands Introduction

This lesson introduces students to traditionally significant species and food sources for the Pomo people. Students learn indigenous words for local plants and animals and begin to explore relationships between species within food chains and webs.

Teacher Background

Throughout the next few lessons students will become familiar with one ecosystem in particular: the **Oak Woodlands**. The Oak Woodlands ecosystem houses a wide variety of oak trees, conifer trees, and Native grasses and flowers. The climate in California's Oak Woodlands is "Mediterranean" with hot, dry summers and falls, and a moderate amount of rain in winter and spring.

For the **Pomo people**, cultural traditions, foods, and spiritual practice are intertwined with the specific ecosystems in which the communities live. Baskets, which are used for a wide variety of purposes, depends on the **accessibility** of the plants in the ecosystem, for example. If the plants needed to produce culturally important items were to disappear or become less available to the Pomo people, then their cultural traditions would be impacted.

It is important to note that resource accessibility is deeply impacted by the illegalization and stigmatization of collecting natural resources.



Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

Native people do not have consistent access to their cultural materials due to the privatization of local lands, and regulations around gathering in state and national parks. Ironically, the lack of responsible **cultural gathering** and tending can lead to a multitude of ecological challenges such as increased wildfires, influx of invasive species, species disappearance and overgrowth, etc. Many native communities advocate for the allowance of cultural gathering, as it is such an integral part of culture and community health.

In this lesson, students will be introduced to Pomo language words. As noted in the directions, there are **twelve distinct Pomo tribes**, all with their own language dialect. It is common for tribal communities to consist of smaller neighboring tribes, sometimes known as bands, all sharing similarities in culture and/or language. Because not every tribal band uses the same dialect, some tribal bands do not have words (or we could not locate the word), for the species highlighted in this program. The **Northern Pomo** tribal language family has created an online **audio dictionary**. Because of the accessibility of the language audio, we have used the Northern Pomo dialect as our primary dialect in this lesson.

Link to audio dictionary: <https://northernpomolanguagetools.com/>



Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

Vocabulary

- **Ecosystem:** A system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment.
- **Species:** A group of similar organisms that are able to reproduce. This is part of how scientists classify living things in order to organize or compare them.
- **Culture:** The customs, arts, social institutions, and achievements of a particular nation, people, or other social group.
- **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.
- **Dialect:** A particular form of a language which is peculiar to a specific region or social group.

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Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

Engage

Ask students to respond to the following writing prompt:

1. **What is your favorite type of outdoor landscape?**
2. **What are some of your favorite things to do outside in our county?**
3. **When you spend time outside, what are you normally doing, and who are you with?**

Explore

Explain to students that they are going to explore examples of the indigenous species of plants and animals, including humans, in the Oak Woodland Ecosystem, one of the ecosystems in the land tended by Pomo people. Each species not only has an important role to play in the Oak Woodland ecosystem, but also has special cultural significance to Native peoples in the area.

Provide students with the “**Oak Woodland Ecosystem Cards**”. Walk students through each card, helping them pronounce the Pomo word for the organism as well as the English word. Explain that even within the Pomo community, there are twelve tribes, each with their own language dialect. Many of the dialects are quite different from one another, even though the tribes are culturally connected.



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Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

Native people rely on the species on the cards for food and for traditional practices. The species also have an important relationship to one another. On the front of each species card is information about the trophic level, what each species eats and is eaten by, and the English and Pomo word for the species. Students will learn about trophic levels in greater depth in the following lesson.

To better familiarize themselves with the species, ask students to organize their cards in the following combinations, using the cultural and scientific information provided:

- 1. Find all the cards that are collected in a basket.**
- 2. Find all the cards that are hunted by Pomo people.**
- 3. Find all the cards that are eaten by deer.**
- 4. Find all the cards that are eaten by humans.**
- 5. Find all the cards that rely on the oak tree for shelter.**
- 6. Find all the cards that rely on the oak tree for food.**

Explain

Explain to students that every one of the species explored is important to the health of the ecosystem. Without one of the species, Native culture would be impacted, as would many other species populations.

Elaborate & Extend

To further explore the connection between the species on the cards, make combinations of 3-5, based on what species eat. Explain to students that these combinations are called Food Chains. Allow students to share their food chains with one another

As students make their combinations, you may ask:

- 1. Which species eat plants?**
- 2. Which eat meat?**
- 3. Are any species not eaten by another?**
- 4. What role do the mushrooms play?**



Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

As an extension, provide time for students to practice making food chains using the **Woodland Food Chain game** from PBS Kids:

PBS Link: <https://www.bbc.co.uk/games/interactive/g6klkqfxx1>

Evaluate

To wrap up the lesson, ask students to reflect on the following:

1. **How is culture connected to nature?**
2. **How does culture depend on the health of the ecosystem?**



Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

Lesson Resources

- **PBS Link:** <https://www.bbc.co.uk/games/interactive/g6klkqfxx1>
- **Audio Dictionary Link:** <https://northernpomolanguagetools.com/>



Oak Woodlands Introduction

Healthy Ecosystems Feed Healthy Communities

Learning Standards

CA Indian Essential Understandings

Essential Understanding 1: California is home to the largest number of culturally diverse American Indian tribes in the country; each with distinct language and cultural heritage and histories.

Essential Understanding 3: Tribal traditional beliefs and practices, including links to spirituality, are practiced in communities where the culture, traditions and languages are vibrant parts of daily life. Additionally, each tribe has an oral history that pre-dates contact with non-Indians.

CA Content Standard

Common Core

CCSS.ELA-LITERACY.RH.6-8.7

Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.

NGSS Standards

This lesson is an introductory lesson. Proceeding lessons will further explore the following standards:

Performance Expectations:

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive

Disciplinary Core Ideas:

LS2.B: Cycle of Matter and Energy Transfer in Ecosystems

Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level.

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Healthy Ecosystems Feed Healthy Communities

Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)

LSI.C: Organization for Matter and Energy Flow in Organisms

All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

Cross Cutting Concepts:

Patterns

Patterns in the natural and human designed world can be observed and used as evidence.

California Environmental Principles and Practices

Principle 1 - 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. 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.

Principle 2 - 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.



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Healthy Ecosystems Feed Healthy Communities

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

Principle 3 - Natural Systems Change in Ways that People Benefit From and Can Influence

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



Valley Quail

What do I do?

Quails like to live in grassy, shrubbed areas and in open oak woodlands. They often live with one quail, and stay in one area for their entire lives. During mating season, quails live with other quail families.

What do I eat?

Seeds, leaves, acorns, insects, and bulbs.

Who eats me?

Humans, coyotes, snakes, foxes, all eat quail meat and eggs for protein. Mushrooms decompose quail waste.

Trophic Level:

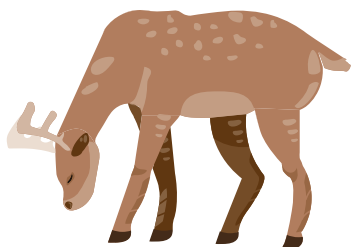
Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer



Mule Deer

What do I do?

Deer migrate toward oaks/acorns, their favorite food. Deers are prey for many animals, and are important for maintaining coyote populations. Deer are a major source of protein.

What do I eat?

acorns, leaves, and twigs
grasses, mushrooms,
shrubs

Who eats me?

coyotes, humans bears,
some birds and small
mammals, mushrooms

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

Northern Pomo Word: shaka.ka

Why am I important?

The Pomo people have a number of intricate **quail designs** that are used in their baskets. The quail design often includes feathers and other details that make the basket decorative rather than practical. The quail design basket is usually given as a gift. Quail is also integrated into traditional food recipes, as it is a source of protein. Quails are **primary consumers** because they eat **primary producers**.

Northern Pomo Word: bishe

Why am I important?

Pomo basket weavers use a deer hoof **basket design** on their baskets as a decorative element. Deer meat is a common food in Native culture, and is cooked in a variety of ways. It can be cooked over fire or heat, and can also be eaten dried. Deer meat is high in protein and helps maintain energy. Deer is a **primary consumer** because it eats **primary producers**.



Mushroom

What do I do?

Mushrooms break down dead matter. By decomposing dead animals and plants, mushrooms help bring nutrients back to the soil so that new plants can grow.

What do I eat?

Dead plant and animal matter

Who eats me?

Humans, deer, squirrels, insects

Trophic Level:

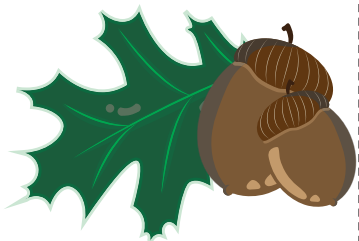
Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer



Black Oak

What do I do?

The oak provides shelter for many insects, animals, birds, and plants. Oak leaves and acorns feed many species. Oak trees protect the forest floor with shade. Oaks keep air clean by absorbing Carbon Dioxide.

What do I eat?

Oaks need smoke to ward off bacterias and disease. Oaks need water and nutritious soil.

Who eats me?

deers, birds, quails, humans, mushrooms, bears, and many more

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

Northern Pomo Word: chahn-than'-che-e

Why am I important?

For Pomo people, mushrooms can be integrated into various recipes, depending on the variety. Some mushrooms are nutritious and edible, while others are poisonous and can be very dangerous to eat. There are a wide variety of mushroom species within Pomo country. Mushrooms are **decomposers** because they break down dead matter in order to return nutrients to the soil.

Northern Pomo Word for acorn: dishiy Northern Pomo Word for oak tree: dishey xale

Why am I important?

Oak trees produce acorns, a **staple food** for the Pomo people. There are many species of oak trees that produce their own type of acorn. The Black Oak acorn is known as being one of the easier acorns to leech (a process used to reduce the bitterness of the acorn), and also being very oily when cooked. Acorns are gathered in the fall in burden baskets, and are stored in large granaries so that they can be processed and used for food for the entire year. Oak trees are a **primary producer** because they convert the sun's light into energy through photosynthesis.



Manzanita

What do I do?

Animals that eat manzanita berries spread manzanita seeds, allowing more to grow. When manzanitas die, they shed their leaves, which can be a fire hazard. Controlled burns are used to support the health of the manzanita tree.

What do I eat?

Manzanitas like Mediterranean climates. They do not like excess water.

Who eats me?

Seeds: birds, insects
Berries: humans, coyotes, mushrooms

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer



Ground Squirrel

What do I do?

Squirrels often burrow in the hollows of oak trees. They sometimes make nests out of grasses and twigs. Squirrels collect and bury seeds in the ground as a way of storing food. Often, plants grow from the seeds, creating new plant life.

What do I eat?

nuts, acorns, seeds, mushrooms

Who eats me?

humans, coyotes, wildcats, hawks, owls, mushrooms

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

**Northern Pomo Word for Manzanita berries:
bakay**

**Northern Pomo Word for Manzanita Tree:
kaye**

Why am I important?

Manzanita berries must be processed in order to be consumed. This is because they have a sharp seed in the center that can be dangerous to digest. For Pomo people, manzanita berries are traditionally processed into ciders that are high in vitamins C and D. This cider is often used in the wintertime to support the immune system. Manzanita berries are prepared for cider by grinding them with a mortar and pestle, and sifting them through a cheesecloth. Manzanitas are a **primary producer** because they turn sunlight into energy through photosynthesis.

**Northern Pomo Word:
bike**

Why am I important?

Squirrels and Native peoples compete with one another for acorns. Both squirrels and Native peoples rely on **acorns as a staple food** in their diets. Squirrels collect acorns at the same time as humans, storing their acorns in caches that they bury at the base of oak trees. Historically, when acorns were hard to come by, Pomo people could locate and steal the acorns from the squirrel caches. Likewise, squirrels could steal acorns from the granaries used by Natives to store their acorns. To keep squirrels from stealing their acorns, Pomo people designed granaries to stand above ground, making the acorns more difficult to access. Squirrels are **primary consumers** because they consume **primary producers**.



Grasshopper

What do I do?

Grasshoppers cycle nutrients throughout ecosystems. When the weather is wet, grasshopper populations can grow out of control, causing them to destroy grass and plant populations with their eating.

What do I eat?

grasses, shrubs, weeds, oak tree bark, mushrooms

Who eats me?

Humans, insects, small birds, mushrooms, foxes

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer



Brome Grass

What do I do?

Brome grass keeps soil from eroding and is drought resistant. If not managed, brome grass can spread rapidly, taking over other grasses. Fire is used to burn brome grass in order to make more space for other grasses to grow.

What do I eat?

Brome grass can grow in many kinds of soil, including dry soil. It needs little water.

Who eats me?

deer, quail, mice. Humans can use brome seeds to make meal.

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

Northern Pomo Word: Pako

Why am I important?

For Pomo basket weavers, the grasshopper design is a **popular design** that serves as a line breaker. In Pomo culture, grasshoppers could be roasted and ground into a flour that could then be used in a variety of recipes. Grasshopper flour could be added to acorn flour in order to increase the protein content of the meal. Grasshoppers are **primary consumers** because they consume only plants, or **primary producers**.

Northern Pomo Word: unknown

Why am I important?

Brome grass is sometimes used to make a traditional Pomo meal called yu-hu. Humans burn brome grass regularly in order to promote growth of other grasses that they enjoy eating. Brome grass seeds can be harvested using **winnowing baskets**, which are helpful when separating the seeds from the stalk of the grass. Brome grass is a **primary producer** because it uses photosynthesis to convert sunlight into energy.



Red Clover

What do I do?

Clover is sometimes attacked by mushrooms, harming their ability to grow. Clover is often harvested by Native people to promote growth and grass biodiversity.

What do I eat?

Likes sandy, well drained soil.

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

Who eats me?

Humans, quail, grasshoppers, deer, mushrooms



Butterfly

What do I do?

Butterflies use their long tongues to collect and drink nectar. Butterflies spread pollen from plants to plants so they can grow. Due to loss of habitat, butterfly populations are not producing at a consistent rate, and so the population is reducing in size.

What do I eat?

Berries, sugary plants. Butterflies can also serve as decomposers, breaking down dead matter from many species.

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

Who eats me?

frogs, newts, lizards, mushrooms

Northern Pomo Word: so

Why am I important?

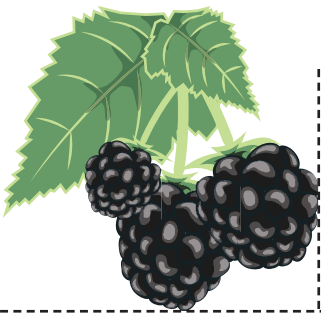
In Pomo country, Red Clover are some of the first greens to sprout from the ground in spring. Traditionally, clover is a favorite food of the Pomo people because they are flavorful, healthy, and full of healthy nutrients. Some families use clover to make candies, and others enjoy eating it fresh from the ground. When plucked carefully from the ground, harvesting clover can support biodiversity in the ecosystem by procuding nitrogen that supports other grasses that Native peoples like to eat. Clover is a primary producer because it uses photosynthesis to convert sunlight into energy.

Northern Pomo Word: uytoktok

Why am I important?

Many California Native communities, including the Pomo, have a butterfly basket design that is used to decorative purposes.

Butterflies are usually **primary consumers**, but can also serve as **decomposers**.



Blackberries

What do I do?

Blackberries prevent soil erosion. Many birds, and small mammals, like squirrels, use blackberries thickets to create nests. Blackberries local to California are often small and slow growing.

What do I eat?

Blackberries need water and nutrient rich soil.

Trophic Level:

Primary Producer

Primary Consumer

Who eats me?

Humans, bird, coyotes, bears, quails, butterflies, mushrooms /decomposers

Secondary Consumer

Apex Consumer

Decomposer



Human

What do I do?

Humans are responsible for helping the ecosystem stay balanced. They help do this by eating a variety of species, never eating or harvesting too much, and using technology and science to protect nature.

What do I eat?

acorns, berries, deer, quail, mushrooms, seeds, roots, manzanita berries, clover, grasshopper

Trophic Level:

Primary Producer

Primary Consumer

Who eats me?

mushrooms, decomposers, butterflies

Secondary Consumer

Apex Consumer

Decomposer

Northern Pomo Word: titimi

Why am I important?

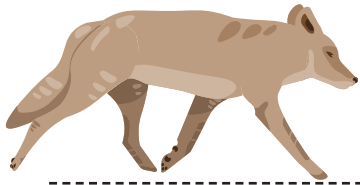
Blackberries are a favorite summer food for many Native communities. In Pomo communities, blackberries are traditionally gathered in a closed twine **willow basket** that is woven just loose enough for water and berry juice to seep through, similar to a colander used for draining pasta. Berries are eaten fresh, and can also be cooked down into a sweet sauce to put on top of other food dishes.

Blackberries are **primary producers** because they are able to photosynthesize light from the sun into energy that can be used to grow itself.

Northern Pomo Word: ja

Why am I important?

Humans have changed and manipulated the landscapes in California since time immemorial, using fire, gathering, pruning and coppicing practices to support plant growth and control species populations. Humans have altered water ways, introduced different plants to ecosystems, and modified species to fit their needs. Humans rely on the environment for their food, shelter, and for **cultural materials** that can be used to make clothing, baskets, musical instruments, tools, and technologies. In turn, California's environment relies on humans for helping maintain balance in the ecosystem. Humans are **omnivores**, meaning they eat both plants and animals. They are also **apex consumers**, meaning that they are at the top of their food chain. Humans eat many species, but not many species eat humans (besides decomposers).



Coyote

What do I do?

Coyotes regulate the population of many animals including foxes, raccoons, and other animals it consumes. They are often a top predator. They live in burrows that they dig.

What do I eat?

deer, quails/birds, frogs, berries, nuts, insects

Who eats me?

mountain lions, bears, eagles, mushrooms, vultures

Trophic Level:

Primary Producer

Primary Consumer

Secondary Consumer

Apex Consumer

Decomposer

What do I do?

What do I eat?

Trophic Level:

Primary Producer

Primary Consumer

Who eats me?

Secondary Consumer

Apex Consumer

Decomposer

Northern Pomo Word: diwi

Why am I important?

Coyote plays an important role in California Native oral history. Coyote is a trickster who is often used to distract humans or create trouble by breaking rules.

Coyotes are often **apex predators** in their ecosystems. They play an important role in keeping the food web balanced, as they consume many species and keep them from becoming overly populated.

Why am I important?