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Grade Level

6-9

Subjects

Science

Time Frame

1 Class Period

Teacher Materials

- Edpuzzle and California Academy of Sciences video
- Ecosystem Sample 1
- Ecosystem Sample 2

Biodiversity Introduction

This lesson prepares students to examine and model food web resiliency by introducing them to the importance of biodiversity. Students challenge their perceptions on what it means for land to be well maintained.

Teacher Background

The lesson below explores the concept of “wilderness” and works 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 tend-able. 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.

More on this topic can be found at this link: <https://www.kcet.org/shows/tending-the-wild/what-john-muir-missed-the-uniqueness-of-california-indians>

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Biodiversity Introduction

Healthy Ecosystems Feed Healthy Communities

This lesson introduces students to the concept of **biodiversity**, or species richness. The health of an ecosystem depends on its biodiversity (the variety of plant and animal species and microorganisms). In addition, different ecosystems depend on the biodiversity of other ecosystems in order to support the interactions between them. When ecosystems have strong biodiversity, there are many positive outcomes. For example, there may be natural ways to clean waterways, store nutrition within soil, stronger ability to recover from major climate events, a higher amount of food and natural resources, a reliable source of future needed resources, etc.

California Native communities have been perfecting methods of protecting and promoting biodiversity within their environments since time immemorial. **Traditional Ecological Knowledge (TEK)** encompasses not only scientific understanding of the environment, but also incorporates many elements of spirituality and Native culture. 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.

For more on TEK, visit: <https://www.fws.gov/nativeamerican/pdf/tek-fact-sheet.pdf>

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Biodiversity Introduction

Healthy Ecosystems Feed Healthy Communities

Vocabulary

- **Biodiversity:** Diversity, or having many different kinds of something, among and within plant and animal species in an environment.
- **Ecosystem:** A system, or a group of interconnected elements, formed by the interaction of a community of organisms with their environment.
- **Population:** All the individuals of one species in a given area.
- **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.

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Biodiversity Introduction

Healthy Ecosystems Feed Healthy Communities

Engage

Ask students to draw or describe what they think the “Wilderness” looks like.

Project the **Ecosystem Sample 1** provided. **Sample 1** is an example of a settler ecosystem. Ask students to Notice details about the ecosystem, and wonder or ask questions.

Repeat the process with **Ecosystem Sample 2**.

Now, compare the two ecosystems, asking what the difference is between the two. (Students will notice that one ecosystem has a greater amount of different species/species richness, that one ecosystem has more farms and open spaces, that one has more forests with clear forest floors, while the other has forests with overgrown trees, bushes, etc.)

Ask what parts of the samples meet their idea of “wilderness”. Note that neither is actually “wild.” **Sample 2** features natural spaces tended to by Native peoples. **Sample 1** is a built, settler environment, however the natural spaces are overgrown and not well maintained. The point of this exercise is to challenge students’ perceptions of where Native people live and how they interact with their environment.

Now, ask students which sample ecosystem looks the strongest, or which one they think would be the sturdiest if it were to be faced with a disaster, like a fire, drought, or flood. Ask them to explain their answers. (Students might point out that the houses look like a good place to shelter during an earthquake, for example, or that one has less overgrown plants-that would typically serve as fire hazards).

Ask students to observe the amount of different plant and animal species seen in **Sample 1**. How do the species in **Sample 1** differ from **Sample 2**? Ask, if the number of animals matters when it comes to ecosystem strength? (For example, what would happen if an ecosystem had only cows and humans? Or only deer and rabbits?)

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Explore

Ask students what it means for something to be “Diverse.” For example, when we say our classroom or community is diverse, what do we mean?

Explain to them that in science, when an ecosystem has lots of different species of plants and animals, the ecosystem is biodiverse, or has biodiversity.

Guide students to the **EdPuzzle activity**. This EdPuzzle features a short video made by the California Academy of Sciences titled “Biodiversity Ecosystems and Ecological Networks.” Review answers with students when complete.

Edpuzzle: <https://edpuzzle.com/media/5f0f5487e-7f43a3f02c59109>

California Academy of Sciences: <https://www.calacademy.org/explore-science/ecosystems-and-ecological-networks>

Explain

Explain that since time immemorial, Native peoples have worked hard to maintain species richness, or biodiversity, in the local ecosystem. Because every ecosystem is different, Native peoples experiment with lots of methods of promoting biodiversity. Some common methods are using fire and smoke to prevent plant disease and promote growth of plants, manipulating the placement of plants and trees, sustainably altering water ways to irrigate land, pruning plants to promote food growth, etc.

We refer to the information that Natives use to take care of their ecosystems as **Traditional Ecological Knowledge**, which we will learn about in greater detail in future lessons.

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Elaborate & Extend

To help students understand that ecosystems rely on a wide range of plants and animals in order to survive, allow them to explore biodiversity using the PBS kids game “**Plum Landing**”. The game presents an ecosystem (the Australian desert) and requires students to balance the ecosystem by introducing the right combination of plants and animals so that all the species have enough food to survive. Note that although this ecosystem may not match their local ecosystem, the same principles of biodiversity apply.

PBS Link: https://pbskids.org/plumlanding/games/ecosystem/feed_the_dingo.html

Evaluate

As a class, explore the following questions:

- 1. Did all the animals in the game require the same things? Why not?**
- 2. What would happen to a species when it did not have enough food to eat?**
- 3. What happened if you had too much of one kind of plant or animal?**
- 4. If you were able to keep your ecosystem strong and healthy, what did you do to achieve that health?**
- 5. How does biodiversity, or species richness, support a healthy ecosystem?**
- 6. If humans were included in the ecosystem model, how would they need to behave in order to keep the ecosystem balanced and the different species healthy?**

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Lesson Resources

Additional Teacher Resources:

- **Plum Landing Sit Map:** <https://pbskids.org/plumlanding/about/sitemap.html>
- **TEK Information:** <https://www.fws.gov/nativeamerican/pdf/tek-fact-sheet.pdf>

Video Links:

- **Edpuzzle:** <https://edpuzzle.com/media/5f0f5487e7f43a3f02c59109>
- **California Academy of Sciences:** <https://www.calacademy.org/explore-science/ecosystems-and-ecological-networks>
- **PBS Game Link:** https://pbskids.org/plumlanding/games/ecosystem/feed_the_dingo.html

Source URL:

- [Oxford Dictionary](#)
- [Dictionary.com](#)

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Biodiversity Introduction

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Learning Standards

CA Indian Essential Understandings

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.SL.7.2

Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

NGSS Standards

This lesson is the first in a series of lessons that explore the following standards:

Performance Expectations:

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

Science and Engineering Practices:

MS-LS2-3- Develop a model to describe phenomena

Disciplinary Core Ideas:

MS-LS2. A Interdependent Relationships in Ecosystems: Organisms, and populations organisms, are dependent on their environmental interactions both with other living things and with nonliving factors.

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Healthy Ecosystems Feed Healthy Communities

MS-LS2-1 In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction.

MS-LS2-1- Growth of organisms and population increases are limited by access to resources.

MS-LS2-2- Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared.

Crosscutting Concepts

Patterns

MS-LC 2-2- Patterns can be used to identify cause and effect relationships.

Cause and Effect

MS-LS2-1- Cause and effect relationships may be used to predict phenomena in natural or designed systems.

California Environmental Principles and Practices

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

Concept a: Students need to know that natural systems proceed through cycles and processes that are required for their functioning

Ecosystem Sample 1



Ecosystem Sample 2

