



# Seeds of Change

**Grade:** 3

**Subject Areas:**

Life Science, Earth  
Science, Mathematics

**Skills:** drawing,  
finding proportions,  
predicting ?

**Duration:** 1 hour

**Connections:**  
art, environmental  
changes, mathematics,  
Native Americans, land  
management, geography

**Vocabulary**

biomes

grasslands

ecosystem

annual

perennial

exotic

controlled burning

benefits

cultivated

restoration

**Objective:**

Students will learn about the disappearing habitat of Californian native grasslands and how they were managed by native peoples.

**Materials**

- colored squares of paper or plastic
- 10 x 10 grid paper
- colored pens and pencils
- scenario cards
- pictures and/or samples of native California grasses
- pressed samples of native grasses

**Standards**

**Strands: Excellence in Environmental Education Guidelines**

**Strand 1—Questioning: F) Working with models and simulations:**

Learners understand that relationships, patterns, and processes can be represented by models.

**Strand 2.2 —The Living Environment: A) Organisms, populations, and communities:** Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat. **C) Systems and connections:** Learners understand basic ways in which organisms are related to their environments and to other organisms.

**Strand 2.3 Humans and their Societies: A) Individuals and groups:**

Learners understand that people act as individuals and as group members and that groups can influence individual actions. **B) Culture:** Learners understand that experiences and places may be interpreted differently by people with different cultural backgrounds, at different times, or with other frames of reference.

**California State Educational Standards:**

**Life Sciences 3a:** Students know plants and animals have structures that serve different functions in growth, survival, and reproduction.

**3b:** Students know examples of diverse life forms in different environments, such as oceans, deserts, tundra, forests, grasslands, and wetlands. **3d:** Students know when the environment changes, some plants and animals survive and reproduce; others die or move to new locations.

**Investigation and Experimentation (I and E): 5c:** Students will use numerical data in describing and comparing objects, events, and measurements.

# Background

## A Grassy State

The basic vegetation types found within the Earth's biosphere are separated into different **biomes**. Vegetation types greatly dictate the types of wildlife living within an **ecosystem**. Biomes are largely influenced by latitude, ocean currents, weather patterns, and topography. The more common biomes include: tropical rainforests, savannahs, deserts, coniferous forests, deciduous forests and grasslands.

The location and latitude of California lends itself well to a diverse landscape. Both sides of the state are flanked by mountain ranges: the Coast Range in the west, and the Sierra Nevada in the East. These two ranges are separated by a wide, wet, fertile grassland known as the Central Valley. The southern portion of the state is mostly arid desert and coastal shrub.

California has a rich human history as well. Trappers, miners, farmers and lumberjacks all moved to California for extraction of its abundant resources, and upon doing so began modifying the landscape quickly. Now nearly 37 million people live in the state. As a result of this high population density, the biodiversity of California is teetering towards a steep decline. The rolling foothills and the open valley floor use to be prime grasslands. Today, many of the **grasslands** across the United States have disappeared and those in California are not different. In the Midwest, for instance, only 1% of the tall grass prairies remain. In California, the unique grasslands are touted as the most rare of all communities, with only 8-10% remaining.

**Grasslands** have been important in the evolution of humans for millions of years. Archeological evidence has revealed that in Africa, humans inhabited grasslands two million years ago. Grasslands are rich grazing lands for many ungulates, or hooved mammals, like elk, zebra, antelope and horses. These animals are highly sought after as food by people and other predators. Because of the abundant food sources in grasslands, humans probably ventured away from foraging in the forest. They probably organized hunting in groups to bring down megafauna (large animals, especially mammals). This in turn promoted tool making and the need to control fire.

Generally speaking there are two types of native grassland communities in California: **annual** and **perennial grasslands**. Annuals are short-lived flowers generally only blooming once and perennials are plants that live many years, flowering multiple times. Typically, the large open Central Valley in the middle of the state is famous for its annual grasslands, although new studies reveal that these areas had high diversity of perennial grasses as well. In the King Range National Conservation Area (NCA), and other foothill regions of California, perennial grasslands were a common sight. These places were covered with a wide assortment of flowers and grazing animals.

## Local Connection

One of the first community-based restoration groups in the state of California was formed along the banks of the Mattole river. In the late 1970s, many Mattole valley residents noticed a sharp decline in the numbers of returning salmon. Investigation into probable causes pointed primarily to excess sedimentation in the streams, most likely due to the logging practices of the period. People joined together to help restore the streams and the beginning of the Mattole Restoration Council (MRC) was formed.

Today the main purpose of MRC is to continue to restore the natural systems within the Mattole river watershed to sustainable levels of health and productivity. Many habitats are partially restored by planting native plants. The council operates two greenhouses, one in Petrolia and another on Prosper Ridge where native grasses, shrubs, and trees are grown from local seed collections. A recent grant will help fund restoration efforts at four grasslands sites within the King Range NCA.

In addition, the MRC promotes environmental education which is implemented through a subgroup called the Mattole Ecological Education Program (MEEP). This educational outreach group works in six local public schools including Whale Gulch and Whitethorn School. Council staff work with teachers, provide field trips, and encourage kids to get involved with various restoration projects, among other outreach efforts. Projects have included watershed monitoring, native tree planting, and mulching decommissioned roads.

For more information go to: [www.mattole.org](http://www.mattole.org)

It is difficult to know for sure the nature of California's grasslands before Europeans arrived here. Some of the earliest accounts by pioneers moving and settling in California, describe the abundant grasslands as prime grazing land. Grazing has probably been the largest factor in the decline of this particular habitat. Once domestic animals began to graze on the native grasses, **exotic** or non-native grasses from Europe and Asia began to take root.

## Competing Grasses

Studies indicate that there are four main reasons for the drastic decline in perennial grasslands which are referred to in northern California as coastal prairies. These disturbances are: the introduction of highly competitive non-native grasses, year-round grazing from domestic livestock, the elimination of fire management, and cultivation. More vigorous by nature, non-native grasses push out native grass species. Grasses like velvet grass (*Holcus*) and ripgut brome (*Bromus*) out-compete natives for water, space, and sunlight. They produce more seeds than the native varieties too.

There is early documentation revealing the fact that indigenous peoples managed California grasslands through fire including those in the King Range NCA. Through regular burning regimes, small trees and shrubs were killed and grasses were able to flourish. **Controlled burning** is a normal management practice in grassland and savannahs all over the world such as the Serengeti and the Australian outback. It is thought that regular burning in California promoted better foraging for animals, reduced unwanted fires, and resulted in a better field for harvesting bulbs and other foods.

Where controlled burning has been stopped, shrubs, especially one called Coyote Bush (*Baccharis*), and trees begin to dominate.

Native Americans surely used grasslands for a variety of purposes, however, the extent of uses is unknown. They hunted in these open places for plentiful game including elk and rabbits. It is also noted that they harvested insects like grasshoppers regularly.

Grasses have many ecological **benefits** (benefits promote well being or give an advantage). They have more roots than most plants. They have a greater ability to stabilize hillsides and hold moisture. Perennial grasses stay greener longer compared to non-native grasses, making them less flammable which reduces fire hazards. In addition, they lengthen the grazing season and help to build organic matter in soils. The ability to increase soil nutrients is one of the reasons why grasslands are readily tilled or **cultivated**. This rich agriculture land allows new crops to take root very easily. For the early pioneers, turning the grasslands over was irresistible. California is now one of the most productive farming regions of the world.

Losing the native grasses of California has many dramatic and long lasting consequences. First of all, an amazing array of genetic diversity is lost. In addition, native pollinators are disrupted and weakened. Animals that depend on grasslands are displaced and greater erosion of hillsides occurs. Without grasses to absorb and protect hillsides, erosion and siltation is increased which is detrimental to salmon streams below. Open spaces are interrupted which are important for wildlife corridors as well being visually pleasing to people. Lastly, this unique ecosystem, once flourishing with life, is lost. With it,

cultural and spiritual connections are gone too.

## A 'Grass-ful' Future

Historically, not much has been done to restore the grasslands of California, but today people are beginning to try. **Restoration** efforts include application of limited grazing and periodic fire management. These two things recycle nutrients, reduce seed production of annual grasses, and encourage native grass seed production and growth.

In the King Range NCA, the Mattole Restoration Council has begun a native grassland restoration project (see *Local Connection*). This organization collects native seeds, grows the plants in greenhouses and then plants them in areas where non-native grasses have been removed. These efforts, along with interpretive educational programs, are positive steps towards the restoration of a California legacy— its native grasslands.

# Activity: Getting Down to 10%

## Preparation

Cut out the scenario cards. (see attached)

## Procedure

1. Begin by holding up specimens or showing pictures of California native grasses. Explain to the students that they are going to learning about a landscape that is quickly becoming lost. Ask questions to get them started and to give them background about this disappearing biome.

- *What type of plant am I holding up?*
- *Where do you see plants like this?*
- *What likes to eat plants like this?*
- *Do humans eat plants like this? (sugarcane, rice, corn and wheat are grasses)*
- *What types of things live in a grassland?*
- *Who were the first local peoples to inhabit this area?*
- *What benefits do you think grasslands had for the Indians?*
- *What benefits to you think grasses do for the ground?*
- *Are certain animals raised on grasslands? What kind?*
- *Do you think wild animals grazed on grasslands? What kind?*
- *Did you know that some of the grasslands are disappearing?*
- *How much of the original grasslands, do you think, remain?*

## Materials

- colored squares of paper or plastic
- grid worksheet
- colored pens and pencils
- scenario cards
- pictures and/or samples of native California grasses
- pressed samples of native grasses

2. Explain to the students the concept of land management. Once an area gets disturbed, it changes. For instance, taking away wild animals like antelope and elk and replacing them with different animals like sheep and cows, is a way in which people have changed the landscape. Continue to explain the causes for disappearing grasslands. Be sure to include the fact that Native Americans managed grasslands by regular burning. Explain some benefits to controlled burning.

3. Next, tell them that they are going to make a grassland on 10x10 grid paper (100 grids total) and then changes are going to take place on their grassland. Together come up with a list of changes that take away grassland habitat (hopefully many of these will match the scenario cards). Some things are farms, non-native plants, lack of fire, roads, shopping centers, houses, etc. Give them time to draw a native grassland. Their native grassland should be pristine, no houses or farms yet. Afterwards, explain to them that people like grasslands so much that only 10% of the original grasslands remain. Have them color in the proportion that 10% represents on their grid paper.

4. Next, have them lay out 10 colored squares on top of their picture. Each square represents 10 % of the total area of a hypothetical native grassland. Review percents with them by asking some simple questions: How many squares make up 40% (answer 4:  $4 \times 10 = 40$ )? Hold up a picture of a grassland and explain that they are going to look at percents because almost 90% of grasslands have been lost. Cut out a corner of the picture, representing 10% (equivalent to one square). Ask the students by what percent you reduced the grassland picture. Do this one or two more times.

5. Next read the scenario cards and have them slowly take away proportions to reinforce the concept of habitat loss. This may be a good time to promote restoration. Have a restoration card which allows them to put back one of their colored squares. After they are done, pass the pressed samples of native grasses around. Review by having the students share what they have learned.



## Extensions

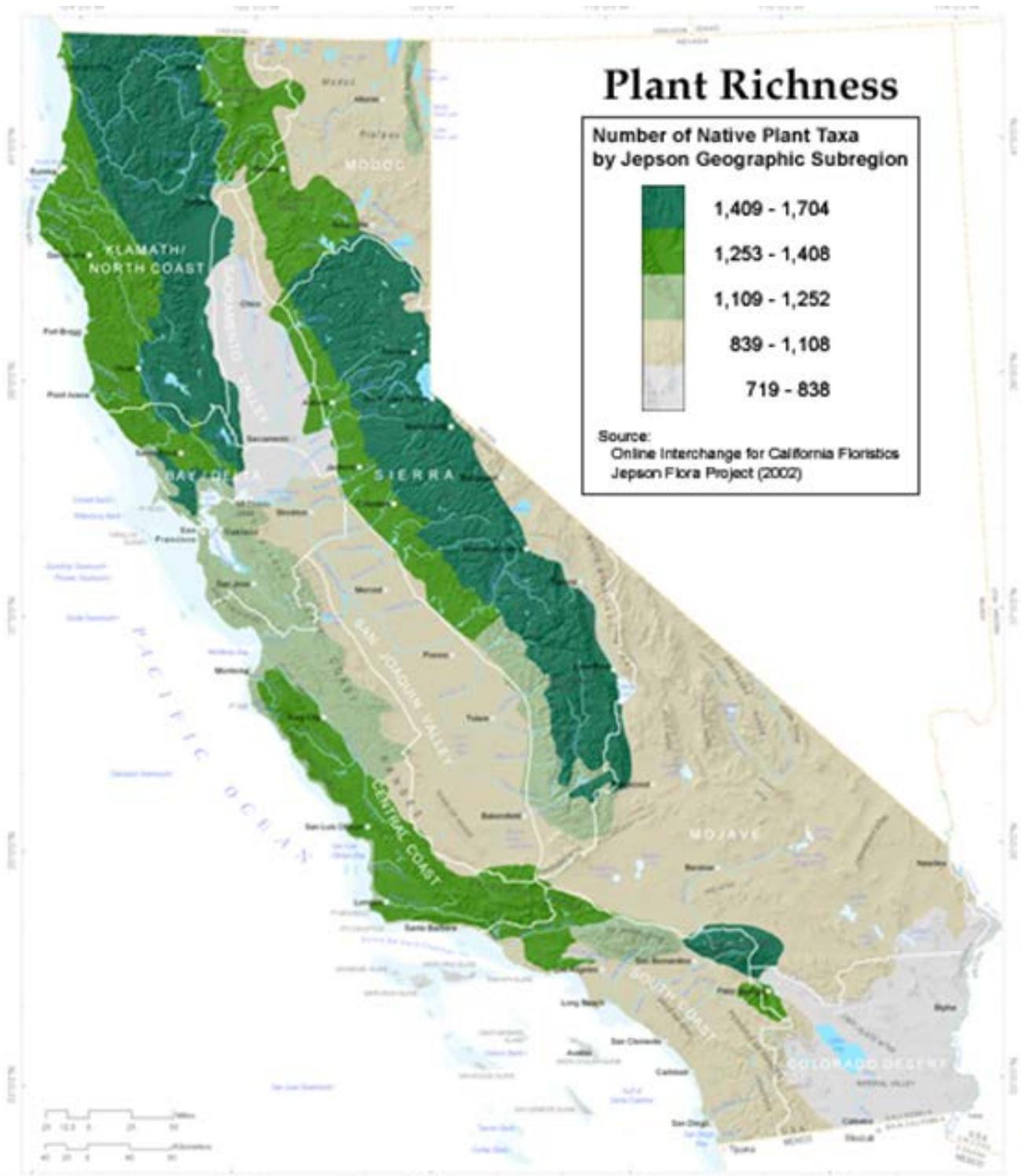
- Perform experiments on planted grass seeds; native vs. non-native
- Relate the sun and the energy it produces to the growth of plants including grasses.
- Bring in atlases and maps for kids to find where major grassland occur around the world.
- Read stories of pioneers moving into California.
- Invite a local Native American into the classroom to tell stories and share their culture.
- Role play different sized plants and how shade or certain characteristics affect their ability to grow.
- Have the students bring in a food made from one or more grasses.

## References

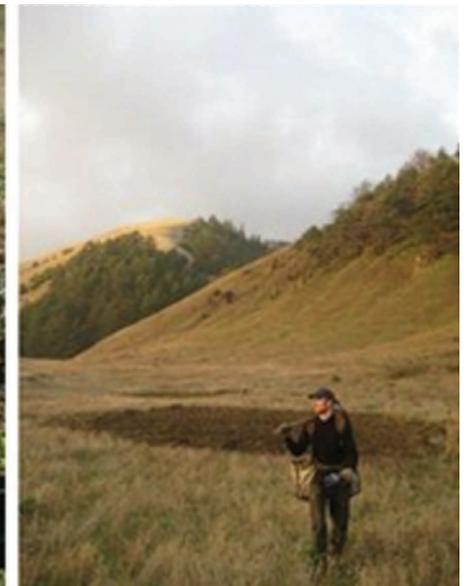
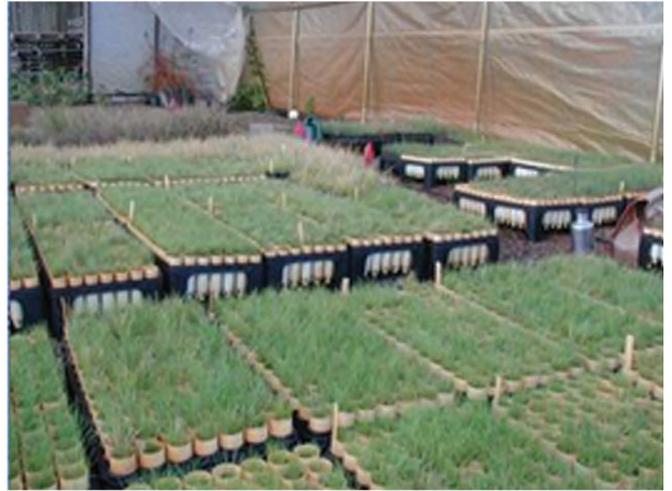
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- Coastal Praire, <http://www.cruzcnps.org/CPrairieTxt.html>, 2011
- Terrestrial Vegetation of California, pg. 491-510 and .pg. 733-745, California Native Plant Society, UC Davis, 1989
- Toolmaking Human Ancestors Inhabited Grassland Environments <http://www.sciencedaily.com/releases/2009/10/091020203420.htm>, 2011

## FOSS Connection

Grade 3  
Life Science: Structures of Life  
Earth Science: Water and  
Earth Materials



www.natureserve.org (Atlas of Biodiversity)



Mattole native grassland restoration <http://www.mattole.org>

# SCENARIO CARDS

Early pioneers move onto the grasslands. They clear their land for a house and begin grazing heads of sheep, cattle and horses on it.  
*(lose 10%)*

Native Americans have been displaced. No fires have been set for 50 years and ranching has taken over the area.  
*(lose 10%)*

The California gold rush is in full swing, and many horses and mules are grazing in the native grasslands. They use the native grasses for prime forage.  
*(lose 20%)*

It is much cheaper to use native grasslands for hay production. Grasslands are overcome with non-native exotics that farmers like better for their animals.  
*(lose 20%)*

After World War II, California experiences a boom (a large growth spurt) and many people buy up land and produce large farms to support their families.  
*(lose 10%)*

Several people move up from the bay area to homestead in the beautiful Mattole or Eel River valley. Each family raises horses, have a garden, and put in a new road.  
*(lose 10%)*

People have learned about the importance of native grasses. They begin to collect native seeds and grow them in a greenhouse. Many acres of grassland are planted.  
*(add 10%)*
