

Guiding Question: How does wildfire impact the landscapes we live in?

Goals:

- To build confidence in making observations and sharing ideas about fire in class.
- To highlight regional and ecological differences in Butte County landscapes.
- To learn how healthy ecosystems are shaped and maintained by fire.

Objectives

Students will be able to:

- 1) Interpret maps by making observations and comparisons.
- 2) Explain factors that affect where plant communities are found.
- 3) Sketch and describe differences in a healthy versus unhealthy forest zone found in Butte County.

Materials and Preparation:

- Read *Forward to Educators* section on the Wildfire in the Foothills webpage.
- Butcher paper to make your Class Community Rules poster.
- Student folders to keep wildfire journals and program handouts together.
- Prepare to project the PowerPoint slideshow for *Lesson 1: Fire on our Landscapes*.
- Prepare materials for students to make their wildfire journals.
 (10 pieces of lined paper, 5 sheets of computer paper, construction paper or blank paper for a cover page)
- Butte County Forest Health Guidebook (Requested in print or accessed digitally.)

Standards:			
NGSS	Crosscutting	Patterns	
	Concepts	Scale, Proportion, and Quantity	
		Structure and Function	
		Stability and Change	
	Science and	Developing and Using Models	
	Engineering	Analyzing and Interpreting Data	
	Practices	Constructing Explanations and Designing Solutions	
		Obtaining, Evaluating, and Communicating	
		Information	

Subjects: Science, Writing, Speaking and Listening, Reading, Art

Duration: 60 minutes

Setting: Classroom

Vocabulary:

Elevation, Fire Adapted Community, Fire Hazard Severity, Topography, Weather, Climate, Ecological Transition Zone

	Disciplinary Core	LS2.A: Interdependent Relationships in	
	Ideas	Ecosystems	
		LS2.C: Ecosystem Dynamics, Functioning, and	
		Resilience	
		LS4.C: Adaptation	
		ESS3 (A-C): Earth and Human Activity	
Environmental		Principle 1: People Depend on Natural Systems	
Principals and		Principle 2: People Influence Natural Systems	
Concepts		Principle 3: Natural Systems Change in Ways that	
		People Benefit From and Can Influence	
		Principle 5: Decisions Affecting Resources and	
		Natural Systems are Complex and Involve Many	
		Factors	

Lesson Overview:

Students may begin the program with negative views and valid fears about wildfire. The introductory activity of making a T-chart to note positive and negative impacts of wildfire may quickly reveal some of these attitudes. Their lived experience in a foothill community may enforce the ideas that fire is dangerous, destructive, and uncontrollable. While fire can be those things, this is not the whole picture.

This lesson frames fire as a natural process that is part of every landscape. Fire exclusion is not a sustainable strategy for living with fire, and across California, we are seeing the consequences of decades of fire suppression. The presentation slides scaffold to talking about how fire affects the landscape you live in. The lesson focus is on impacts on vegetation and ecosystems, rather than the impacts on people.

To begin, students are shown eight slides with maps and graphics representing location, elevation, fire hazard severity, and plant communities of Butte County. While you may choose to add additional questions or skip some suggested questions, the goal is to give students many opportunities to share their observations and make connections to where they live. The lesson moves on to describe the six landscapes found in Butte County. This brief overview gives examples of how fire interacts with each landscape in the "fire factors" section. A county-wide overview is given to make the program relevant to those living outside foothill communities and demonstrate regional differences.

The student assessment activity focuses on three plant communities, or "forest zones", that are found in the foothill and mountain regions of the county. Students will use the Forest Health Guidebook, created by the Butte County Fire Safe Council and Butte Resource Conservation District, to investigate and share findings about the blue oak woodland, Sierran mixed hardwood, and mixed conifer woodland.

Background County Information:

From the 2020 updated Butte County Community Wildfire Protection Plan:

"Butte County is located on the eastern side of the northern Sacramento Valley and encompasses over 1.1 million acres. The county ranges in elevation from 60 feet to 7,000 feet above sea level and is divided in half with two topographical features. The Sacramento Valley section in the western portion of the county is relatively flat and is predominantly grassland and farmland. The foothills and mountainous regions of the northern Sierra Nevada and southern Cascade Mountains comprise the eastern portion of the county. This area is scattered with homes and communities intermixed amongst woodland fuels creating a serious Wildland Urban Interface (WUI) problem. These are areas where wildland fire once burned only vegetation but now burns homes as well.

Butte County has a Mediterranean climate with cool, wet winters and hot, dry summers. Precipitation is normally in the form of rain, ranging from approximately 20 to 80 inches per year, with snow in the higher elevations. The average high temperature for January is 55 degrees and for July is 96 degrees, with many days in which temperatures reach over 100 degrees."

The full text can be found at:

https://buttecounty.sacriver.org/cwpp/community-wildfire-protection-plan

Pages 29-47 provide information about the fuels, topography, weather, and fire history specific to your area of Butte County.

Procedure:

- 1. Make your Class Community Rules poster for the program and set expectations for talking about wildfire. (See Forward to Educators section.)
- 2. Explain to students: We are going to begin by learning more about the place we live. To better understand fire and how to live more safely in a fire-prone area, it is important to know about the lands that surround us. We will discover how these lands, and many of the plants found here, are adapted to live with fire.
- 3. Go through presentation slides for *Lesson 1: Fire on our Landscapes*. Notes are included in the speaker's notes section of the presentation, as well as here. To save space, some links and sources cited are included in the presentation notes, but not in the lesson plan notes.

This program is for sixth-grade students in Butte County. YOU are part of creating a fire

adapted community!

The knowledge you gain in this program will help you, your family, and your community to be more wildfire-ready.



In the foothills, it is not a matter of *if* a fire will occur, but *when* a fire will occur. What can we do now to be ready?

Pictured: Wildfire Ready Raccoon, the Butte County Fire Safe Council and Paradise Ridge Fire Safe Council mascot.





Make your Wildfire in the Foothills journal! You will need: <u>- A cover page.</u>

A cover page.
 10 pieces of lined paper.

5 pieces of blank paper.

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Every lesson gives the opportunity to use journals for quick-write reflections, activity brainstorming and outlines, or assessments. Option to include a decorated cover page, table of contents, and a vocabulary page. Staple together a blank cover page, ten pieces of lined paper, and five blank pages for drawing and diagrams.

The National Wildfire Coordinating Group defines a fire adapted community as, "A human community consisting of informed and prepared citizens collaboratively planning and taking action to safely coexist with wildland fire."

It takes many people working together across many fields to live as a fire adapted community. Wildfire in the Foothills will introduce many of these topics, over seven lessons. Of the topics shown in the middle ring, this program focuses on Safety & Evacuation, Resident Mitigation, and Landscape Treatments. Youth education is a key part of community preparedness and living better with fire. Students can spread important messages to their peers, families, and to a wider community audience. They can also become contributing adults if they continue residing in Butte County as they get older.

"This graphic was created by the Fire Adapted Communities Learning Network. FAC is not a one-size-fits-all approach; every community's journey to living better with fire is unique." <u>Fire Adapted Communities Graphic and Facilitator's Guide</u>

Guiding Question: How does wildfire impact the landscapes we live in?

Make a T-chart on the whiteboard or butcher paper and brainstorm possible positive and negative effects of wildfire. Students' reactions may start out exclusively negative, pointing out the dangers to people and destruction of houses. However, some students may know about some ecosystems or species that benefit from or depend on fire. Keep the T-chart visible as you continue with the lesson and add new ideas as they arise.



Group share:

What did you use it for? Was it a paper map? Google maps? A posted sign at a hiking trail?



How does

vildfire impact

What types of information can maps tell us?

What features should be included on a useful map?



Pair share

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To be more complete, what features would you add to this map that shows Butte County's location?



Topography: The physical features on Earth's surface or the technique of representing surface areas of land on maps.

Topography includes mountains, ridges, valleys, plateaus, or water features on the land.







This map includes a title, legend, scale, north arrow, and labels, giving us lots more information. Take a moment to find your approximate location on the map and make some observations about your area.

How many counties border Butte County? (6) What is your nearest town? Approximate distance from Chico to

Paradise? (10 miles, as the crow flies.)

County Elevation

What percent of the county would you estimate is between 60-1,500 feet in elevation?

What is the highest point in Butte County? (7,124 feet on the Robert Jenkins mountain ridge)

Have you been to an area with a higher elevation than where we live? Can you remember some differences between that place and here?

CAL FIRE uses various types of data to map wildfire risk and categorizes areas into Fire Hazard Severity Zones. This represents not just the size or likelihood of a wildfire, but also how much harm it could cause to people and structures. Dark gray areas are non-wildland/non-urban, and the light gray represents urban areas around the City of Chico and City of Oroville. Note: These maps are created at a general scale and do not represent efforts that may have taken place locally to reduce fuels.





What similarities do you notice between these two maps? What connection could you make between elevation and fire hazard severity?

Other than elevation, can you think of other factors that could affect the fire hazard severity of an area?

This cross-section of California shows what plant communities are present, and at what elevation.

Take a moment to review California's basic topography with a quick demonstration. Invite students to make a cup shape with one hand, like they are trying to hold water in their palm. Compare their hand shape to the high and low points on the graphic.

Coastal Range (heel of hand), Sacramento Valley (palm), and Sierra Nevada Mountains (four fingers).

Where do you live in relation to the model you made with your hand?

Based on the graphic, which plant communities are found in your area?

What are some basic differences in plant structure you notice on the graphic?

(Short and grassy plants in the valley, leafy trees at or below 2,000 feet, and tall, needled trees at higher elevations.)

Elevation, climate, light, water, soil, and temperature all contribute to where plants can survive and how plant communities are formed on a landscape. Every landscape has its own history and relationship with fire, which is heavily influenced by humans.

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Quick pair share.

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Features: Western third of the county. Highly managed

land for crop and livestock production. Elevation: Approximately 60 ft Common species: Walnuts, rice, almonds, prunes, livestock, peaches, olives, and lots more! Fire Factors: Lower risk from wildfires. Cattle rancher use fire to clear seasonal grass and improve grass regrowth to feed livestock.

Butte County is made up of these six broad landscapes. Which landscape best describes where you live? Note: These are general categories. The more specific zone you may live in or near, including blue oak woodland, Sierran mixed hardwood, or mixed conifer woodland, will be explored in the assessment activity.

Although urban areas have lower wildfire risk, developments in or near wildland areas are at risk. Residents in urban areas such as Chico and Oroville that border on wildland areas should be prepared for wildfire.

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Are there any agricultural products grown near you? If not crops, is any livestock ranged near you?

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Grassland

Agriculture

Features: Few trees, lots of direct sunlight, and

- dominated by non-native, annual gr. Elevation: Up to 1,000 ft

Common species: Oat grass, cheatgrass, ripgut brome, yellow star-thistle, and medusahead. Fire Factors: Seasonal grasses dry out and die

annually. Grass fuels burns quickly and easily

Shrubland/ Chaparral

- Features: Low-growing brush and shrub species that are densely packed together when mature. Drought tolerant. Lots of sunlight. Elevation: 1,000-2,000 ft
- mmon species: Manzanita, evergreen oaks, chamise

Fire Factors: Highly flammable vegetation which often contain oils and waxes. Highest temperature fires.

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Oak Woodland

- Features: Spaced out oak trees in rolling hills. Open canopy with lots of sunlight to the grassy understory.
- Elevation: 1,000-2,000 feet Common species: Live oak, valley oak, blue oak, gray pine, and annual grasses. Fire Factors: Traditionally, lower intensity fires occur here. Low-intensity fire can benefit oak trees in multiple way.

Non-native Mediterranean grasses spread through the grasslands and woodlands starting in the 1800's from European immigrant introduction. Non-native species do not occur naturally in an area but are introduced through accidental or deliberate human activities. These grasses are seasonally dry and highly flammable. Grass forms continuous, horizontal fuel.

Fire Factors continued: Chaparral is evergreen vegetation that is found at middle elevations, covering 8.5 million acres of California. It is often uniform fuel, where the plants are the same species mix, height, and spacing. Fire can pass very quickly and burn hot through these landscapes. When a fire passes through a chaparral area, fire spreads through the shrub canopy burning the whole area. Chaparral vegetation is well adapted to fire and regenerates readily after fire, either through sprouting from stem bases or from soil-stored seed. Fire that is too frequent is harmful to this ecosystem, causing it to convert to grassland.

Blue oaks are the most heat and drought-tolerant oaks. Frequent, low-intensity fire helps to remove insect pests, reduces competition for light and water, and improves acorn output.

Mixed Conifer rres. Many evergreen, cone-bearing trees. Dense t structure in areas without recent fire ation: Approx. 2.000 ft + mon species: Ponderosa pine, white fir, douglas agar pine, incense cedar, and California black oak factors: Thick insulating bark and self pruring ns to keep low 24

Not every area fits neatly into just one of these landscapes. The area where one plant community meets and changes into the next is an ecological transition zone. Fire Factors continued: Tree species that are most tolerant of fire are the ponderosa pine, incense cedar, and sugar pine. Drought stress and pests, such as bark beetles and disease, put pines at risk of die-off. Stands of dead ponderosa pine trees fill the middle and lower Sierra Nevada mountains. Thick conifer forests are at risk from high-severity fires.

Paradise, located at approximately 1,800 feet, is in a transition zone between the lower elevation grassy woodlands, the upper elevation conifers, and the live oak-chaparral dominant canyons.

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Forest health, structure, and the presence of certain plants in a landscape gives us clues about that ecosystem's relationship with fire. These clues could tell you, for example, how recently a fire has burned there, which species benefit from or are sensitive to fire, or if a lack of fire has made the forest unhealthy. Knowing how our landscapes have been shaped by fire in the past, helps us to live more sustainably and safely with fire in the future.

Picture: Taken from the Paradise lookout along Skyway Road.



Key Word Review 🍗

Fire is a natural and critical process for maintaining healthy and resilient forests. How are humans a part of this natural process? We will learn about this by using the Forest Health Guidebook for the lesson activity.

Review key words from the lesson and check for understanding.

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Access the Forest Health Guidebook online: https://buttefiresafe.net/forest-health-guidebook/

Contact the Butte County Fire Safe Council for a physical copy for your students.



Assessment:

Using the Butte County Forest Health Guidebook, students make a side-by-side graphic to demonstrate features of a healthy versus unhealthy forest. Contact the Butte County Fire Safe Council if you would like a physical guidebook for each student. You may want to save this activity for another class period or have students start it as homework. To access the Forest Health Guidebook online, go to:

https://buttefiresafe.net/forest-health-guidebook/

The Forest Health Guidebook is intended to give Butte County landowners information and recommendations to create a forest management plan, to improve forest health and reduce wildfire risk. The handbook is filled with photographs, art, and student-friendly examples of healthy forests. Each forest section contains background information, signs of health, strategies for maintaining or improving health, proper care after a wildfire, Traditional Ecological Knowledge connections, and a local success story. It also demonstrates the differences between good fire and harmful fire, and the impact each could have on a forest. Students will review and base their activity on one section:

- Blue Oak Zone (Pages 2-10)
- Sierran Mixed Hardwood (Pages 11-19)
- Mixed Conifer Woodland (Pages 20-28)

Comparing Forest Health

Students make a side-by-side sketch to compare a healthy versus unhealthy forest. In addition to illustrations, students will bullet point or describe elements for each side. The guidebook depicts examples of healthy and unhealthy forests by illustrating the species present, forest density and structure, evidence of past fires, or relationships with animals.

<u>Option 1:</u> The whole class focuses on the forest zone closest to where you live. The activity could also be shortened by working with a partner, with one student illustrating healthy and the other unhealthy. If you have an example on your school campus, your class could head outside to sketch and discuss whether they think the area is healthy or unhealthy.

<u>Option 2</u>: Divide the class into three and have one-third of your class learn about each forest zone. After students are finished with their diagrams, make groups of three with a student

representing each zone. Students share their findings and compare similarities and differences between forest zones.

Evaluation:

Forest Comparison	Good	Fair	Poor
Visual	Students make an illustration and	Students make an illustration and	Sketches do not include written
	include three or more written points about forest health.	include one or two written points about forest health.	points about forest health.
Comparison and Sharing	Students can give three or more examples of a similarity or difference between forest zones.	Students can give one or two examples of a similarity or difference between forest zones.	Students cannot give an example of a similarity or difference between forest zones.
Explanation	Students can vocalize two or more examples of how fire can improve the health of their forest zone.	Students can vocalize one example of how fire can improve the health of their forest zone.	Students cannot vocalize an example of how fire can improve the health of their forest zone.

Lesson Extension Recommendations:

REDI Jedi Master Program Lesson 1: Landscape Patches, Patterns & Fire *Coming soon! Available Early 2022.*

FireWorks

Learn more about a plant, animal, or fungus in your local ecosystem and its relationship with fire.

Northern California Oak Woodlands Curriculum M.1.2 Who Lives Here? Adopting a Plant, Animal, or Fungus https://www.frames.gov/fireworks/curriculum/norcal-oak-woodlands

<u>Sierra Nevada Curriculum</u> M11 Who Lives Here? Adopting a Plant, Animal, or Fungus https://www.frames.gov/catalog/24552