Using Fire Data

Description

Some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions. These predictions come from analyzing data, such as the locations, magnitudes, and frequency of the natural hazards. Technologies that arise in response to these predictions are both local and global. Wildfires can be considered a natural hazard when there is severe impact to air quality, ecosystems, human resources/systems, and loss of life. Students will look at wildfire frequency and fuels density data to understand when wildfires are considered hazardous, and what we should do to prevent and mitigate their impacts.

Objectives

Student Objectives	Analyze and interpret wildfire data for trends.	Core Activity: Make meaning
	Use data to inform the ways we can mitigate impacts of wildfire.	Youth Key Practice: Youth engage with complex sociological systems
Educator Objectives	Use local examples and student observations to make statewide connections.	Key Educator Practice: Frame the work locally and globally
	Attend to student questions from observing the graphs.	Key Educator Practice: Attend to the unexpected

Key Vocabulary

Wildfire, fuel, oxygen, heat source, hazardous, fire suppression, thinning, prescribed burning, cultural burning, fire prevention

---

Instructions

Time

1 hour, 30 minutes

Materials

- Whiteboard
- Markers
- Printed copies of the using fire data graphs:
    - California annual average acres burned
    - Lake county acres burned
    - Change in tree density per hectare
    - Controlled burn understory, Mendocino National Forest (photo)

Getting Ready

- Print enough copies of the using fire data graphs for each student or pair of students, or project on a screen.
- Select an age-appropriate Lake County Office of Education Lake County Strong: Math - Lake County Fires lesson.

Facilitation

Part One

A fire needs three things: fuel, oxygen, and a heat source. If a fire runs out of any of these things, it will stop. Create a “fire triangle” on the whiteboard or other surface easily viewable by the entire group. Together list some examples of each, and write the examples next to the corresponding label on the fire triangle.

- Don’t limit the list to wildland fuels; for example, gasoline, birthday candles, and coal can be included. When the list is fairly long, ask which fuels occur in wildland fires and underline them.
- Don’t limit the list to ignition sources for wildland fire; for example, spark plugs and static electricity can be included. Underline the heat sources that can start wildland fires without human help (lightning and volcanic activity).

In small groups, have students brainstorm all the ways they have seen a fire get put out. In the large group, take some observations, and ask students which of the three components of making fire the action affects.

- Example: Putting water on the fire impacts the heat source.
- Example: Putting a fire blanket on top of the flames deprives the fire of oxygen.
- Example: When a fire hits a big road, this cuts off the fuel source.

In the same small groups, have students brainstorm factors that affect how hot and how fast a fire burns, and therefore how much acreage is affected. In the large group, take some observations, and ask students which of the three components of making fire the action affects.

- Example: When you have a thunderstorm, that impacts the heat source.

- Example: When you try to start a fire and blow air on it, that adds oxygen.
- Example: When the season has been dry (drought), that impacts the fuels.

Ask students to discuss in their small group: Based on the Statewide annual acres burned graph on page 1, what patterns do students notice? Ask a volunteer to explain how their small group was able to figure out the graph's trend. Ask the small groups: Is the Lake County acres burned graph on page 2 burned similar or different when you compare it with the graph of what's happening across California? Explain your answer.

Allow 15-20 minutes for students to complete the age-appropriate Lake County Office of Education Lake County Strong: Math - Lake County Fires lesson.

From the data we can see that Lake County, as well as the state of California, is experiencing more acres burned in recent years. Have students recall the math activity and point out when the largest fires were in the graph. As a large group, discuss what data is needed about fuels, heat sources, and oxygen in order to understand more about when, where and why wildfires happen at levels that are considered hazardous.

- Heat source example: windy weather downing powerlines, thunderstorm frequency
- Air/oxygen example: windy weather frequency
- Fuels example: amount of fuels, location of fuels

Part Two

We will look at the change in fuels in California. Allow 10-15 minutes for students to read the San Francisco Chronicle's This one fact will completely change how you think about California wildfires (pages 10-11) article. In their small group, discuss the question: How does having more trees, or fuel, impact wildfires?

- Answers: Burns longer and hotter, spreads the fire further, taller fires, etc

Students should observe the Change in density per hectare graph on page 3 and share with their small group: What do you notice? What do you wonder? What questions do you have? This study explains the graph: "Across this historical survey area, we estimate that total tree density has increased by nearly 40%…." This means that there are 40% more trees where scientists collected data now than in the 1930s. In the large group, discuss: Based on reading from the text, what could cause the 40% increase in tree density between the 1930s and the 2000s?

- Answer: "Wildfires burn hotter in these forests in large part because of the buildup of fuel after more than a century of fire suppression."

Reflection

Ask students: If there is too much fuel, what technologies can be implemented today to help reduce the amount of fuels for fire?

- Answers: thinning, prescribed burning, cultural burning, fire prevention around human habitats, using drones to measure density

Students can see from the data that too much fuel can increase the intensity of a wildfire. Share the Mendocino National Forest photo on page 4. Ask students: What do you notice about this photo? What things do you wonder? The photo is an example of a prescribed burn where students can see it is reducing fuels for fire at a low intensity.

Additional Uses and Modifications

During the reflection, extend this activity by bringing in data that can show how, in combination with too much fuel and other factors, changing climate conditions are contributing to an increased occurrence of wildfires. Find data related to temperature, precipitation, and/or annual average acres burned predictions in Lake County from Cal-Adapt's Local Climate Change Snapshot.

Youth-Driven Pathway Facilitation

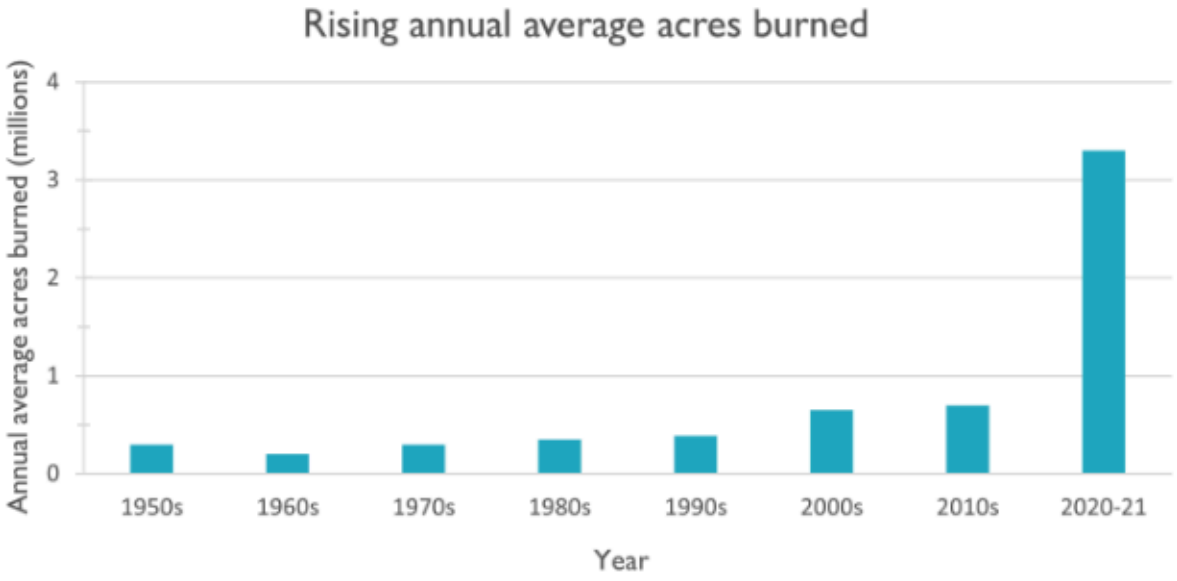
For educators facilitating the youth-driven pathway, this is one of the activities you can do after your team has completed the Real vs. Ideal activity and identified the environmental issue it would like to focus on. Following the Real vs. Ideal activity, the goal is for your youth team to explore publicly-available data to see what's already known about their topic and how well it aligns with their own experiences. This process is often referred to as "ground-truthing".

While access to official data is important for community change work, they often don't tell the whole story. Ground-truthing is one important practice to help youth critically engage with publicly-available data. It allows youth to use their own observations "on the ground" and knowledge from their own lived experiences to validate, expand upon or push back against official data and the stories that are told using those data.

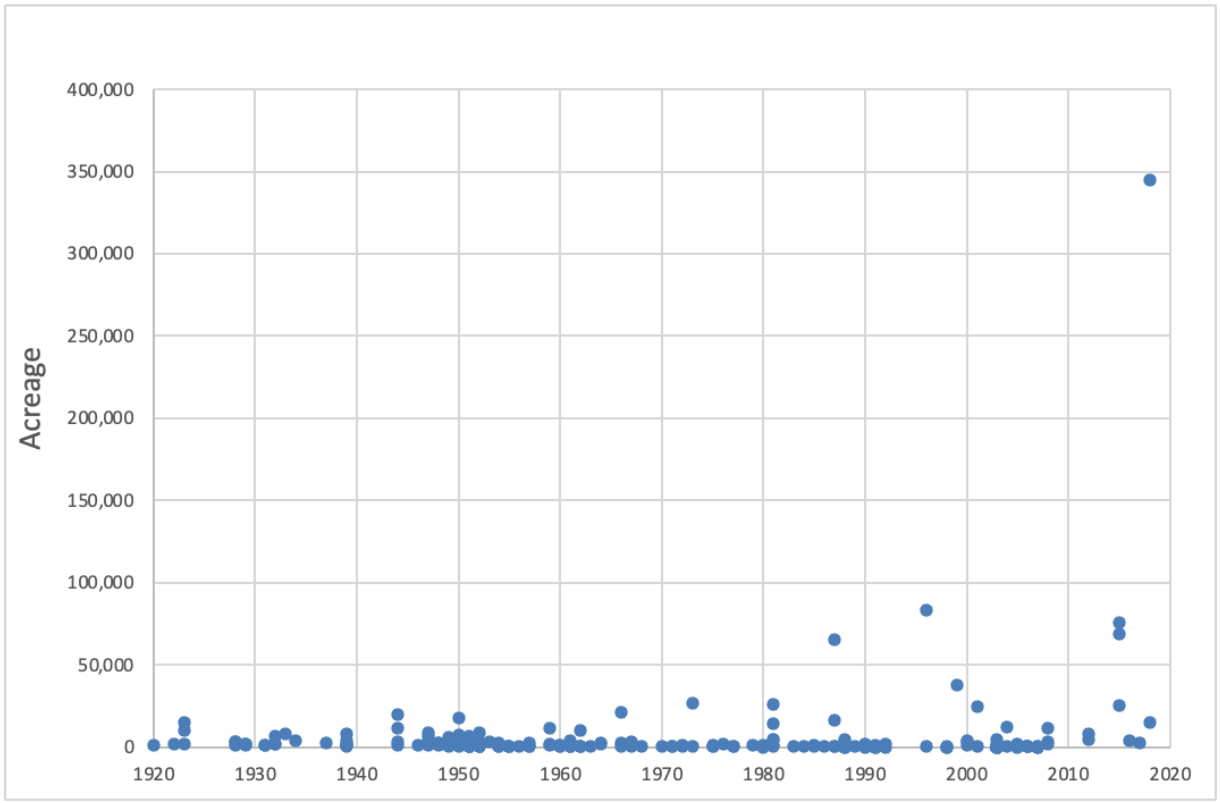
If your team has chosen wildfires or a related topic for their environmental issue, you can facilitate this activity with them more or less as written (remembering to adapt it as needed for your youth and their age range). However, if your team has chosen a different issue to focus on, you may want to facilitate one of the other data activities in this toolkit instead (e.g., Digging into Data, Water Quality Data Investigation, or Data Talks).

If none of these data activities align with your group's focus, you can search for other local data sources in the community resource list. If using another data source, use the instructions and the ground-truthing worksheet in "Activity 3.5: Data Ground-Truthing" on p. 112 of Stepping Stone 3 in the Community Futures, Community Lore Stepping Stones Toolkit for youth participatory action research (YPAR) from the UC Davis Center for Regional Change and School of Education.

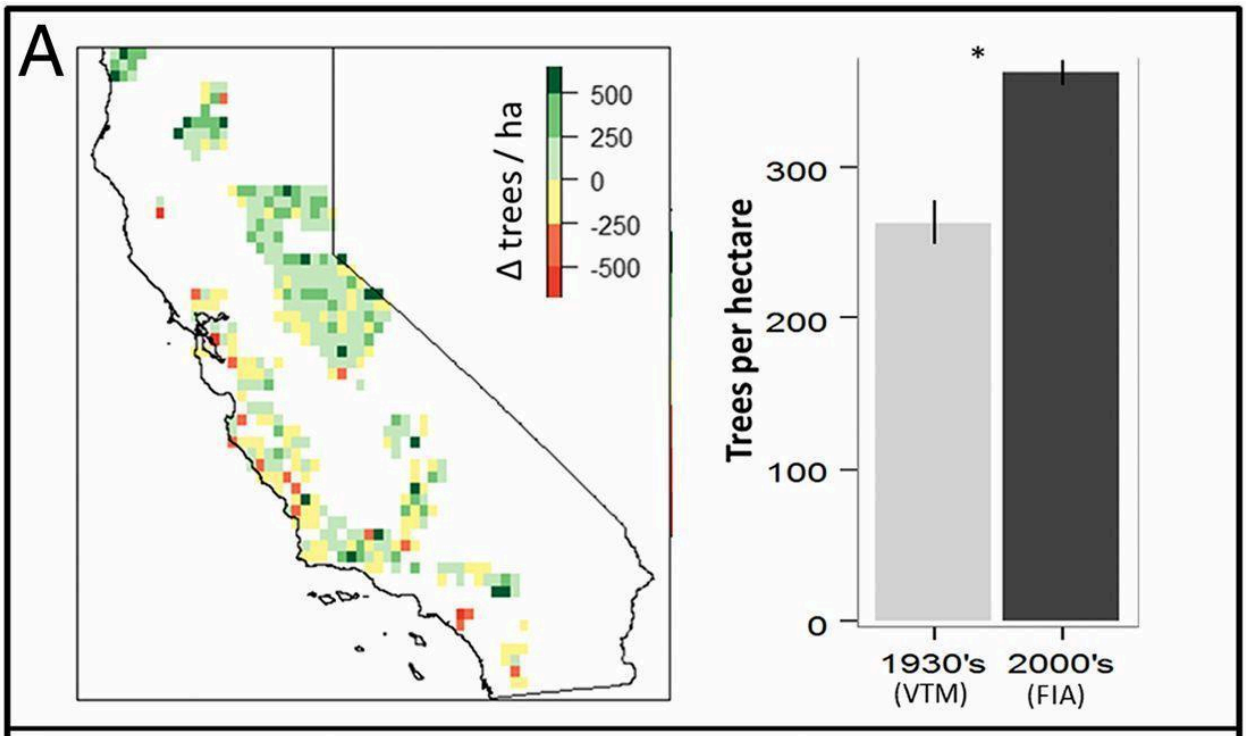
California annual average acres burned



Lake County acres burned



Change in tree density per hectare



Controlled Burn Understory, Mendocino National Forest



Prescribed fires, similar to the 36-acre controlled burn on Thursday, March 4, 2021, near Lake Pillsbury in Lake County, California, are an effective way of reducing fuel accumulations and mitigating future wildfire severity and behavior. Photo courtesy of the Mendocino National Forest.