THE WATERSHED

Burning Questions: Exploring Changing Wildfire in Idaho

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OVERVIEW

Fire is a climate impact that is very relevant to Idahoans, and almost every student has a fire or smoke story. In this hands-on lesson, students investigate how wildfire behaves in three different Idaho ecosystems—and how those patterns are shifting due to climate change. Working in small groups, they explore photos and plant materials, build a model of their ecosystem, and simulate how fire spreads. Finally, they choose real-world actions people can take to adapt and share a short summary of their findings with the class. Lesson can be scaled for grades 4-12 and covers several Earth Science standards.

Note: our on-site lesson includes "artifact boxes" with different plant and ecosystem pieces. Feel free to contact us to learn more about how to create these artifact boxes (watershed@cityofboise.org) or facilitate this lesson without the information highlighted between slides 9-10.

OBJECTIVES

Students will …

- Define and describe the concept of a fire regime, including how fire behaves differently in various Idaho ecosystems
- Investigate and compare different fire regimes using visual and physical evidence
- Identify how climate change is altering fire regimes in Idaho
- Construct a physical model of how fire moves through a changed ecosystem using a fire box.
- Connect fire changes in their ecosystem to real-world actions people can take.

LENGTH OF LESSON

1.5 hours

GRADE LEVELS

4th-12th grade

STANDARDS COVERED

4-ESS3.21
5-ESS-3.1
MS-ESS-3.3, MS-ESS-3.5
HS-LS-2.6, HS-ESS-3.3, HS-ESS-3.6

MATERIALS

Fire PowerPoint, fire tins (aluminum baking pans), aluminum tins to hold ecosystem supplies, sand or dirt (for base of fire tin), fuels to add to ecosystem supplies, fire artifact

boxes, historical fire regime packets, changing fire regime packets, fire action articles staged in case there is time, fire extinguisher, lighters poster boards, markers, sieve.

Facilitator note: set-up and clean-up for this lesson are hands-on. Consider setting aside at least 20 minutes for set-up.

SET-UP

- Stage outside space for fire boards. Have a fire extinguisher and lighter ready. Put a large poster note on each table. Make sure the poster is folded into thirds, to help students fill in their sections. Divide the first section in half with a marker
- Check that fire boxes and fire artifacts are stocked. Each fire box is labeled on the bottom with supplies.
- Divide class up for at least one fire regime per small group. If necessary, create two groups for different regimes.

Content Section 1: Intro and Fire Ecology 101 (10 minutes)

Slide 1: Hi everyone! My name is [Your Name], and I work at the WaterShed Climate and Water Education Center. One of the big topics we think about a lot at the WaterShed is wildfire—how it affects our land, our water, and our communities.
And I'm guessing a lot of you have experience with wildfire, too. Even if you haven't seen a fire up close, you've probably smelled the smoke or had to stay inside because of bad air quality.

Slide 2: Wildfires in recent memory
It makes sense that Idahoans are getting more experience with wildfire. Wildfire season here is 70 days longer than it was just ten years ago. That means more smoke, more fire, and more impacts on our daily lives.
Not only are fire seasons longer—they're also getting more intense. Fires today are often bigger and more severe than they used to be.

You can share a personal story here if you'd like. For example: "How many of you have ever had a recess, sports practice, or field trip canceled because of wildfire smoke? I grew up in Boise, and that never happened to me when I was your age. This is something that has changed in just one generation.

Or, just continue:
Here are a few recent wildfires that have affected our area:

Photos (clockwise from left)

- 2016 Table Rock Fire
- Typical smoky summer day
- Smoke plume from Pioneer Fire at Idaho City 2017
- Valley Fire, 2024

Since wildfire is something many of us experience now, I want to hear *your* stories.

Turn to a partner and share a memory or experience you've had with wildfire—either directly (like seeing flames) or indirectly (like smelling smoke or missing an outdoor activity).
Each person will get **one minute to share**, and then we'll come back together.

Facilitators: Ask 3 students to share out their stories. Connect their stories to as much fire science as you are comfortable with
Points to potentially weave in:

- **WUI** (wildland urban interface): 43% of all new homes in the US were built in the WUI
- **Warmer, drier conditions** make fires more likely in the Sagebrush Steppe, where we live.
- Talking point about **evacuations**: It is becoming more common for students and Idahoans to have stories about evacuations due to a fire. If a student shares something like this, you can simply validate it by saying something like, "That sounds like it is really scary. As we have bigger and more frequent wildfires in our state, more Idahoans have stories like yours of being evacuated.

Thank you for sharing your stories. It's clear that wildfire isn't just something happening far away—it's something that affects many of us here in Idaho. And experts say this year is likely to bring another intense fire season.

Since wildfire will probably keep being part of our lives, it's helpful to understand how it works—especially how it moves through different types of ecosystems. That knowledge can help us make better decisions, protect people and places we care about, and be more prepared. So, for the next five minutes, I'm going to give you a basic lesson in fire ecology, which is the is the study of how fire starts, spreads, and affects plants, animals, and ecosystems.

Slide 4: Fire Ecology 101: How would wildfire behave here?

- Ask students to describe how fire might behave in the landscapes on the slide. Emphasize if they point out vegetation, climate, or ignitions.
- Tell them that they have identified parts of a fire regime, which tell us about the typical pattern of fire in a place. Every ecosystem on earth has a fire regime. Even the tundra with the polar bears is shaped by fire.

Slide 5: Fire Regime
A fire regime is the pattern of fire in a place over time.
It tells us:

- How often fires happen
- How big or intense they are
- Where and when they usually burn

Fire regimes are shaped by things like:

- The climate
- The plants and trees that can burn (fuel)

- How often something starts a fire, like lightning or people

Slide 6: Fire Regime Examples
Different ecosystems have different fire regimes. In places like the tundra, there isn't much vegetation, lightening is rare, human populations are low, and the climate is wet. That's why it is rare for that ecosystem to have fires.

Slide 7: Idaho's Fire Regimes
We're lucky to live in Idaho—it's home to all kinds of ecosystems, from dry deserts to snowy mountains to big forests. Because of this, Idaho has many different fire regimes. On this map, each color shows a different fire regime. We won't have time to study them all, but today, we'll focus on three that are important to our region—ones you're likely to see or be affected by:

- **Ponderosa Pine forests**
- **Sagebrush steppe**
- **Lodgepole Pine forests**

Activity 1: Ecosystem Observations (2 minutes)

Now it's your turn to become an expert! In a moment, you'll be working in teams at your tables. Each team will investigate one of these fire regimes. You'll use pictures, plants, and other clues to figure out how fire moves through your ecosystem—and how that's changing.

Slide 8: Instructions for first activity
I won't be walking you through each of these steps, so it will be up to you and your group to become our group experts and share. To help you keep track of your thoughts, you'll be using the poster that is on your tables. Your first job is to look through only the 1st page of your packet, up to the stop sign. You should **make observations** and takes notes in this first part of your poster (show the students an outline)

Facilitators: If you draw the layout of their poster on the board, this helps students keep track of where they are in the investigation process.

Once students are given instructions, hand out packets to students labeled "Fire Regime". Give groups ~2 minutes to do the first page. Circulate around the room while students are working. When groups are done, move on.

Activity 2: "How would fire move through your ecosystem?" (~7 minutes)

Slide 9: Instructions for second activity
Now we're going to investigate the rest of your packet as well as some additional clues, with the goal of answering the question **"How does fire move through your ecosystem?".** You can label the second half of your paper with the question to help you keep track of your ideas, because you'll be sharing out what you learned with the class. You can also continue adding observations.

In a little bit, I'm going to pass out a box that has photos and plant samples to help you better understand how fire moves through your ecosystem. Go ahead and begin looking through the rest of your packet.

Facilitators:
Circulate throughout the groups to answer questions and encourage discussion. Using the pictures in the packet, ask students guiding questions such as:

"Do you think fire would spread quickly or slowly here?"
"Would it burn hot, or stay low to the ground?"
"What clues in the photos helped you decide?

Students will raise their hand and let you know they are ready for their fire artifact box. *You can ask them to share a quick summary of what they've learned so far and then give them their artifact box. Tell them to continue adding information to their poster based off what they find.*

Share Out: 1 min per group, ~6 minutes

Give groups a 2-minute time check to prepare to share their answers.

Ask groups to share the answer to the question "How would fire move through your ecosystem?" using 1 object and 1-2 sentences to share what they learned. Call out one ecosystem at a time and have both groups from the ecosystem share for one minute. Click through the ecosystem slides so there is a visual to help ground the observations. . If there are two groups per ecosystem, consider asking the second group "What else would you like to add?" instead of asking them the same question.

Correct misconceptions and make sure that groups hit main points. Information about fire regimes of each location is found on the final page, under the "Educator Background" section. *This information is for instructor background, and it is not necessary to add all this information.* The main point you'll want to make sure each ecosystem covers is:

Slide 10: Ponderosa Pine
Make sure that between the two groups, this big idea is explicitly covered:
In historic ponderosa pine forests, frequent, low, slow-moving fires clear out small plants and brush while leaving the tall, thick-barked trees standing.

Slide 11: Lodgepole Pine
Make sure that between the two groups, this big idea is explicitly covered:
In typical lodgepole pine forests, infrequent but intense crown fires would sweep through and kill most trees at once, clearing the way for new lodgepole pines to sprout from their fire-activated cones.

Slide 12: Sagebrush Steppe
Make sure that between the two groups, this big idea is explicitly covered:

Activity 3: How has your ecosystem changed? (10 minutes)

In typical sagebrush ecosystems, fire moved slowly and occurred about every 100 years, allowing sagebrush and the wildlife that depend on it plenty of time to regrow between burns.

Slide 13: Changing Fire Regime
Now that we've learned how fire naturally moves through different ecosystems, we're going to learn about how your fire regimes are changing.

I'm going to hand out more information that will help you learn how humans are changing the patterns of fire in your ecosystem. Label the second part of your poster "How is fire changing in our ecosystem?" and use the information in your packet to answer this question.

Facilitators: Hand out second packet, titled "Changing Fire Regime" while the group labels their boxes. Click the PowerPoint slide to have the instructions available from slide 14.

Activity 4: Modeling a changed fire regime (5-10 minutes)

Circulate to groups and ask questions, correct misconceptions, and have them explain their notes and drawings. More information can be found on the explainers for slides 15-17, or on the "Educator Background".

Groups will raise their hand when they are finished with their changing fire regime packets.
When groups finish, bring them the fire tins. Draw a line in the sand and let students know that their job is to represent the historic fire regime on one side (from the first packet) and the changing fire regime on the other side (the information from the second packet). To represent the ecosystem, they will have an aluminum tin with supplies. Explain that the matches represent trees, and they have various fuels to build their before and after. Ensure that the lodgepole group has a "special tool" (snow) and that the sagebrush group understands the fuels that represent their cheatgrass.

Give students 5-10 minutes to build their before and after boxes. As in previous steps, circulate to check for understanding.

Give the groups a 1 minute warning. Then, have groups line up to go out the door to the back patio.

Bring one ecosystem at a time to a picnic table. Have the students gather around a table. Ask groups to explain the changes in their ecosystem. Reinforce what they've discussed with the model (for example: oh, so cheatgrass is an invasive grass that dries early? And that's represented here, in your model?).
Then, prepare to light the boxes, one ecosystem at a time.
Set expectations before lighting:

- Watch carefully.
- We're observing like scientists.
- No touching the fire box unless asked.

Ignite the boxes and make observations about the burns. Consider adding context such as:
Carpet of fuel
Ladder fuel
Crown fire

Slide 15: Ask the group to come back together in the classsroom one last time. Going by individual ecosystems, spend a few minutes reinforcing the changes that have been seen in each ecosystem. Refer back to what was seen in their fire boxes
Using the slides, make sure the below main points are hit:

Slide 15: We know that in **Ponderosa Pine forests** fires usually occur every 5-7 years. However, people have been putting out these naturally occurring fires for over 100 years. This is called fire suppression. When we change the patterns of fire, we see different trees. So, this Ponderosa Forest in McCall now looks like this. This increases the fuel load, which changes the fires from low intensity and slow moving to high intensity, hot, and fast-moving fires.

Slide 16: In **Lodgepole Pine forests**, climate change is causing snow to melt earlier in the year. This makes the forest drier for a longer time**,** which increases the chance of big wildfires.

These forests are full of closely packed trees, which means there's a lot of fuel for fire (click twice on the picture to see). Normally, the cold temperatures and moist soil from snow help keep fires from starting easily.
But when the climate changes, the fire regime changes too. That means fires can happen more often, burn hotter, and become harder for forests to recover from.

Slide 17: In the **Sagebrush Steppe,** invasive plants like cheatgrass are growing in the spaces between native sagebrush. Cheatgrass was accidentally brought to the United States in the 1800s and has now spread across much of the West.
It grows earlier and faster than native plants and has shallow roots that quickly soak up water. That means it "cheats" native plants out of the water they need to grow.

Cheatgrass dries out early in the summer, creating a layer of dry fuel across the land. This dry carpet helps fire spread much more quickly and easily than it could in a healthy sagebrush ecosystem.

Activity 4: If time Playing the role of a fire scientist (10 minutes, with a wrap-up)

Slide 18: Each ecosystem is being affected in different ways—like fire suppression in Ponderosa forests, invasive plants in the Sagebrush Steppe, and earlier snowmelt in high mountain forests. But they all share one big challenge: warming temperatures from climate change are making fires worse across all of them.

Hotter weather dries out plants and trees, making them more likely to catch fire. It helps fast-burning plants like cheatgrass spread, dries out the dense Lodgepole Pine forests,

and makes it easier for fire to move through Ponderosa forests that have become overcrowded.

Activity 4: Playing the role of a fire scientist (10 minutes, with a wrap-up)

We've seen how these ecosystems have changed—and how those changes affect fire. For your final activity, your team will take on the role of wildfire experts. Your job is to give advice to the Forest Service, decision-makers, and your community about how to respond to the changing wildfire risks in your ecosystem.

Each group will get an article about one potential management option to help you start thinking. Work together to read through the information and decide what actions you would recommend. Feel free to be creative—you don't have to stick to the recommendations in your article.

Conclusion

You'll have five minutes to prepare your policy recommendations—and then you'll share them with the group.

NOTE: If low on time, just ask each group "You are now a wildfire expert for your ecosystem. Spend a few minutes talking with your group to decide what actions you would recommend to people concerned about changing wildfire"

Slide 21: Fire has always shaped Idaho's forests, rangelands, and shrublands, clearing out old growth and making room for new life. But today, climate change, invasive species, and a century of putting out nearly every fire have changed the way fire behaves. We need to work with fire instead of against it—using science, careful planning, and community action to keep ecosystems healthy and protect people from dangerous, out-of-control wildfires.