



To Burn or Not to Burn, That is the Question

A Look at the Yellowstone Fires of 1988

By: Shelly Turk



Grade Level: 10-11

Time Allotment: Two 45 minute class periods

Overview: In 1988, the largest fires in history consumed hundreds of thousands of acres in Yellowstone National Park. Using video and Internet, students will determine the causes of the fires, different fuels' reactions to fire, management decisions, firefighting techniques, and the outcome of the fires.

Subject Matter: Science

Learning Objectives:

Students will be able to:

- Explain how fire reacts with different fuels.
- Determine the causes of the 1988 Yellowstone fires.
- List firefighting techniques.
- Describe the aftermath and ecological outcomes of the fire.

Standards:

From the Montana State Standards for Social Studies:

(Available on-line at www.opi.state.mt.us)

Standard 1: Design, conduct, evaluate and communicate scientific investigations.

Standard 2: Demonstrate knowledge of properties, forms, changes and interactions of physical and chemical systems.

Standard 3: Demonstrate knowledge of characteristics, structures and function of living things, the process and diversity of life, and how living organisms interact with each other and their environment.

Standard 5: Understand how scientific knowledge and technological developments impact society.

Media Components:

VIDEO

Yellowstone Aflame: Fires of '88. Finley-Holiday Film Corp., CA. 1989.

WEB SITES

Wildland Fire. The Official Website of Yellowstone National Park. Oct. 20, 2003.

<http://www.nps.gov/yell/nature/fire/index.htm>.

This site gives detailed information on the 1988 fires in Yellowstone including causes and outcomes. Another section details the number, location, and status of fires during the most recent summer months.

Materials:

25 matches

Five metal buckets containing a **small** amount of varying fuel types:

- Bucket #1: Green pine needles and leaves
- Bucket #2: Dead, dry pine needles and dry leaves
- Bucket #3: Dead, dry pine needles and leaves, dampened with water
- Bucket #4: Pine needles, bark, and small twigs, all partially burned.
- Bucket #5: Larger log or piece of wood.

Five plastic 5 gallon buckets filled with water, one for each metal bucket of materials.

One copy of the worksheet per student. (See attached.)

Prep for Teachers:

- Prior to teaching this lesson, bookmark the site used in the lesson on each computer in your classroom.
- Prep the video so that it is at the desired location for the video portion of the lesson. See cues under Step 1 in Learning Activity.
- Gather the fire experiment materials and prepare a work area, preferably a large, paved, open area away from buildings and cars.
- Ask several parents or other staff members to assist on the first day with the experiment.

When using media, provide students with a FOCUS FOR MEDIA INTERACTION, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites, or other multimedia elements.

Introductory Activity:

Step 1. Take your students to your pre-planned open area outside. Split the students into five fairly equal groups and assign each group to one bucket containing fuel and one

bucket full of water. Spread the groups out over the area so that they are not very close to one another. Assign one to two adult volunteers (parents or other staff) to each group to supervise.

Step 2. Ask your students how fires get started and whether or not fire is easy to start. (*Answers may include matches, sparks, lightning, electricity, etc., and it is easy to start fires with dry materials, harder with wet.*)

Step 3. Give each group five matches. Tell each group they have five minutes to try to start their fires. They may only burn the fuels that are in the buckets—no adding kindling! Ask the adult supervisors to be actively involved with safety. Tell the students to begin after strategizing the best way to start their fires. (*Strategies might include blowing on the sparks.*)

Step 4. After the five minutes are up, tell the students to stop. Ask each group how successful they were in starting their fire and why they did well or not. (*Answers should include dry, smaller materials ignited quickly and burned, while wetter, burned, or larger fuels were difficult to start.*) Have each group visit each bucket and look at the results. Ask the students if any of them used strategies for starting their fires like blowing on them and the results. (*Answers will vary.*) Ask the students if these differences in fuel types occur in nature. (*Answer should be yes.*)

Step 5. Ask the adults to pour the water carefully into the buckets and extinguish any fire or sparks that may still be present. Ask a few adults to stay behind and make sure all fires are out before the buckets are cleaned out and brought in to the school. Tell the students to return to their classroom.

Learning Activity:

Step 1: Ask the students what they think causes a fire in nature. (*Answers may include lightning and human error.*) Ask them if there was a big fire in Yellowstone National Park, or near the towns of West Yellowstone or Cooke City, what they would protect. Would they try to save cabins and other structures? Would they put the fire out immediately, or let it burn? (*Answers will vary.*)

Step 2. Give each of your students a copy of the attached worksheet. Go over the questions on the worksheet with the students to prepare them for this step. Insert the video *Yellowstone Aflame: Fires of '88* into the VCR. Provide your students with a FOCUS FOR MEDIA INTERACTION, asking them to fill out the worksheet as the film plays. START the video at the very beginning. STOP the video after the picture shows burning trees and the narrator says, “From this day forward, the battle of the forest was lost.”

Step 3: Ask your students if they feel, at this point, if the fire had a positive or negative impact on Yellowstone Park. (*Answers will vary.*) Ask the students what they think the video meant by the phrase “Mother Nature cleaning house.” (*Answers will vary, but students should discuss how fire gets rid of dead wood and debris in the forest.*)

Step 4: Tell your students to take their worksheets to the computers and log on to *Wildland Fire* at <http://www.nps.gov/yell/nature/fire/index.htm>. Provide your students with a FOCUS FOR MEDIA INTERACTION, asking them to compare their thoughts on the impact of the fire with the statistics given on this site. Ask the students to fill out the second section of the worksheet while going through the results of the fire. Tell them to look about ½ way down the page for the pertinent section for the worksheet. (While students are doing this, fast forward the video to the second cue in Step 1. of Culminating Activity.)

Step 5: When the students are finished, ask them again if they still think the fire was positive or negative. (*Answers will vary.*) Tell the students that they are going to watch a last segment on the video that describes the aftermath of the fire so they can determine the outcome of the fires of 1988. Tell the students that they will notice a discrepancy in numbers of large animals killed in the fire between the web site they just looked at and the film. Tell them that the film was made one year after the fire, but the web site was created after more time, so is probably more accurate in numbers.

Culminating Activity:

Step 1. Insert the video *Yellowstone Aflame: Fires of '88* into the VCR. Provide your students with a FOCUS FOR MEDIA INTERACTION, asking them to fill out the third section of their worksheets by listing eight outcomes of the fire while watching the film. Tell the students that the video lists *more* than eight outcomes, but they only need to list eight. START the video right after the picture shows snow falling on the Yellowstone Park sign and the narrator says, "Fires would sputter for weeks, but now only the long, arduous mop-up process remained." STOP the tape when the credits roll and music is playing.

Step 2. Check for comprehension by asking the students to list some of the eight outcomes of the fire. (*Answers should include creation or larger meadows for grazing, minerals in ashes producing luxuriant plant growth, aspens, willows, and other trees depending on fire to regenerate a new generation of trees, new tree shoots providing a delicacy for elk, moose, sheep, and beaver, increasing the variety of plant and wildlife communities, birds thriving on insects that live in dead wood, eagles and hawks benefiting from hunting in new meadow areas, scientists being able to study ecological changes on a large scale, nutrients in ash sending a pulse of energy into the eco-system, lodge pole pine and other conifers regenerating because their cones only pop open during fires, and dead snags falling into rivers and streams, improving trout habitat.*.) If students were not able to get eight outcomes, rewind the tape to the cue in Step 1. and play the video again.

Step 3. Ask the students a last time if they thought the fires were positive or negative. (*Most students will probably say the fires were positive at this point.*) Ask the students if the outcomes of the fire outweighed the losses, such as buildings. (*Answers will vary.*) Ask the students if they changed their mind during the course of the lesson on whether or

not large fires do more good than harm, why they changed their opinion. (*Answers will vary.*)

Step 4. If you are doing this lesson in the fall, you can check to see how many fires burned in Yellowstone during the previous summer. Have the students log back on to *Wildland Fire* at <http://www.nps.gov/yell/nature/fire/index.htm> and click on “Yellowstone Prescribed Fire Pages” at the bottom of the page. Tell them to find out how many fires burned in Yellowstone last summer. (*Answers will vary, depending on the summer fire activity.*)

Step 5. Ask the students to hand their worksheets in to you.

Cross-Curricular Extensions:

SOCIAL STUDIES

Study an historical fire, such as the great Fire of London or the Chicago Fire, and discuss how fires in cities compare to fires in the wilderness. Are the outcomes as positive as forest fires can be?

MATH

Calculate the speed at which a forest fire can spread based on wind speed, humidity, and terrain. Determine how much $\frac{1}{4}$ of a million acres is and compare it to a known landmark, such as the size of a particular city or county.

MEDIA

Analyze the video used in this lesson and discuss the effectiveness of the narration and soundtrack. Did the music and voice over add or detract from the film?

Community Connections:

- Invite a park ranger into your classroom to discuss fire policies.
- Visit a forest area, specifically one that has been burned, and view the results, such as succession.
- Invite a fireman into your classroom to discuss fire safety, or invite the fireman to attend the Introductory Activity.

Going up in Flames Worksheet



Section One: Video

1. When did the Yellowstone fires start?
2. What percentage of the park burned, and was the fire limited to one area?
3. What were the causes of the fires?
4. Why were the fires allowed to burn?
5. When did the Park Service decide to suppress the fires?
6. A careless woodcutter started one of the biggest fires. What was the fire's name?
7. What were some firefighting techniques used? (Name five.)
8. What actually made the fires die down?
9. What did firefighters do after a fire left an area?
10. By August, how many fires were burning?
11. What was August 20th called?
12. What happened that day?

Section Two: Internet (Results of the Fires)

1. A total of how many fires burned in greater Yellowstone in 1988? (Look by the 4th picture on the left.)
2. How many of the fires were human-caused?
3. Ecosystemwide, how many acres were scorched, and how many actually burned?
4. How many structures were destroyed?
5. What was the estimated property damage?
6. How many miles of fire line and miles of bulldozer lines needed to be rehabilitated?
7. How many animals died?
 - Elk
 - Deer
 - Moose
 - Black Bears
 - Bison
8. What percentage of the ground was actually heated enough to burn belowground plant seeds and roots?

Section Three: Video (The outcomes)

List eight outcomes of the fire in Yellowstone:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Answer Sheet



Section One:

1. *Mid-June 1988*
2. *45%. No—it burned all over in mosaic or hopscotch like patterns.*
3. *Lightning, dry conditions or drought, humidity, human error.*
4. *The National Park Service had a policy of letting small, natural fires burn.*
5. *July*
6. *North Fork Fire*
7. *Cutting brush, fire breaks made, backfires set, helicopters brought in, lots of manpower, and aircraft dropping fire retardants and water.*
8. *Rains and snows arrived.*
9. *Removed burnt snags.*
10. *44*
11. *Black Saturday*
12. *More than 5 times more forest burned than the previous 16 days. Dry winds fanned the flames and over the next 3 days, ¼ million acres burned.*

Section Two:

1. *248*
2. *3*
3. *Scorched—1.2 million acres; burned—2,221,800 acres*
4. *67 structures were destroyed*
5. *\$3 million*
6. *665 miles of fire line and 137 miles of bulldozer lines*
7. *Elk: 345*
Deer: 36
Moose: 12
Black bears: 6
Bison: 9
8. *Less than 1%*

Section Three

1. *Burnt areas create larger meadows for grazing.*
2. *Minerals in ashes produce luxuriant plant growth.*
3. *Aspens, willows, and other trees depend on fires to regenerate a new generation of trees.*
4. *Tree shoots are a delicacy for elk, moose, sheep, and beaver.*
5. *The fires opened the forest canopy to new meadows and increased the variety of plant and wildlife communities.*
6. *Birds thrive on insects like termites that live in dead wood.*
7. *Eagles and hawks benefit from hunting in new meadow areas.*
8. *Scientists can study ecological changes on a large scale.*
9. *Nutrients in ash send a pulse of energy into the eco-system.*
10. *Lodge pole pines and other conifers depend on fire to regenerate. Their cones only pop open and spread seed during a fire.*
11. *Burnt trees will fall into rivers for decades, slowing the current and improving trout habitat.*