

Dear Educator,

It's always wildfire season somewhere in the U.S., and Smokey Bear is counting on you and your students to be part of the solution by using fire responsibly and reducing human-caused wildfires. As the nation's symbol for wildfire prevention since 1944, Smokey Bear has worked with teachers for generations to make students aware that safeguarding our nation's wildlands is a personal responsibility through his message, "Only YOU can prevent wildfires."

Building on this tradition, the Ad Council, the National Association of State Foresters, and the USDA Forest Service have teamed up with the curriculum specialists at Young Minds Inspired (YMI) to create this free educational program about wildland fire science and wildfire prevention that takes a forensic science approach to spark the interest of sixth- through eighth-grade students.

Smokey's Wildfire Prevention Detectives combines standards-based classroom activities and study projects to meet your curricular objectives in physical and environmental science. The program supports diverse learning styles and reinforces skills in data analysis, weighing evidence to draw a conclusion, identifying causal relationships, problem solving, and cooperative learning. We've also created two wildfire prevention digital whiteboard activities to further tap the interest of your students.

While the materials in this program are copyrighted, you have permission to reproduce them for use in your school. (The materials may not be reproduced for commercial purposes or adapted for use in other materials.) Make as many copies as necessary for all your students, and be sure to share the materials with other teachers. Please return the enclosed reply card to let us know your opinion of this program, or comment online at www.ymiclassroom.com/SmokeyBear.html or at SmokeyBear@adcouncil.org. We depend on your feedback to continue providing free educational programs that make a real difference in the classroom.



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Young Minds Inspired



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YMI is the only company developing free, innovative classroom materials that is owned and directed by award-winning former teachers. Visit our website at www.ymiclassroom.com to send feedback and download more free programs. For questions, you can contact YMI toll-free at 1-800-859-8005, or by email at feedback@ymiclassroom.com. Or contact SmokeyBear@adcouncil.org.

Smokey's Wildfire Prevention Detectives



Target Audience

This program is designed for students in grades six through eight.

Program Objectives

- To promote wildfire prevention and firesafe behavior.
- To demonstrate for students how investigators use science to trace the origin and cause of wildfires.
- To explain the role prescribed fire can play in wildlands management.
- To identify when wildland fires are beneficial and when they are damaging.
- To introduce the values and history behind the Smokey Bear public awareness campaign, and invite students to contribute to this campaign.

Program Components

All components of the program are available online at www.ymiclassroom.com/SmokeyBear.html and at www.SmokeyBear.com/curriculum. Components marked with an asterisk (*) below are available *only* online.

- A two-page teacher's guide
- Four student activity sheets
- Spanish translations of the four student activity sheets*
- A wall poster to display in your classroom
- Two digital whiteboard activities*
- A campfire safety guide in English and Spanish*
- A standards alignment chart*
- The Smokey Bear mobile app (for iPhone and Android)*
- A reply card/online feedback form for your comments

How to Use This Program

Photocopy the teacher's guide and student activity sheets before displaying the wall poster in your classroom. Visit www.ymiclassroom.com/SmokeyBear.html to access the program's digital whiteboard activities and to download the campfire safety guide and other online components, including a convenient listing of all websites and other Internet resources referred to in the program. Provide photocopies of the four activity sheets and the campfire safety guide to all your students.

Introductory Lesson: Fight or Light?

To provide your students with background information about wildfire and wildland fire science, visit www.naturalinquirer.org/Fight-or-Light-a-99.html for a lesson developed by the USDA Forest Service for the Summer 2010 issue of *Natural Inquirer*, a forest science journal for middle school students. Titled “Fight or Light?,” this lesson provides an historical perspective on scientific research that has shown how small, prescribed fires benefit certain wildland ecosystems and help reduce the damage wildfires cause by decreasing the ground-level fuel that sustains them.

Activity 1: Find the Source

In this activity, students use the investigative techniques of a wildfire detective to analyze data and identify a wildfire’s point of origin. Begin the activity by taking students to www.SmokeyBear.com/wildfires.asp to learn how many wildfires have burned in the U.S. so far this year and how many are currently burning. Then explain that, to determine the cause of a wildfire, investigators first need to locate its *point of origin*. In “Investigation #1,” students plot coordinates to map the area burned in a wildfire and use these data to identify the point of origin. Reprint a second copy of the activity sheet and have students plot coordinates for a new point of origin for their classmates or parents to locate. In “Investigation #2,” students analyze burn pattern pictures to gather additional clues to a wildfire’s point of origin. To build on this activity, have students visit www.interfire.org/features/wildfires2.asp to learn more about how investigators gather evidence to locate a wildfire’s source.

Answers: Investigation #1 — 1. This wildfire began at coordinate I1 and spread northwest, igniting spot fires to the north and northeast; 2. Careless campers at Doyles River Cabin may have caused the fire. 3. The winds blowing to the northwest contributed to the fire’s spread. **Investigation #2** — 1-B, southeast; 2-A, southwest; 3-C, south.

Activity 2: Arson or Accident?

This activity challenges students to interpret evidence collected by a wildfire investigator to determine if a wildfire was caused by an arsonist. Have students read the description of the investigation and fill out the Investigator’s Checklist. Encourage them to stretch their thinking as they weigh the evidence. Point out that fire investigators rely on the scientific method: *Question, Research, Hypothesize, Test, Analyze, and Draw a Conclusion*. Ask students to cite examples from the fire investigation for each step of the scientific method — for example, *Test*: The investigator noticed embers glowing, so he tested the temperature of the fire pit. To build on this activity, have students visit <http://science.howstuffworks.com/wildfire-arson.htm> to learn more about how investigators determine if a wildfire was caused by arson. You can also take them to www.youtube.com/watch?v=XBPFK-lvrPE to see a wildland fire investigator at work.

Answers: Checklist — 1.Yes; 2.Yes; 3.Yes; 4.Yes; 5.Yes; 6.No; 7.No; 8.No; 9.No; 10.No. **Conclusion** — *The evidence indicates that the wildfire was an accident. It is likely that the young people seen heading for the campsite did not extinguish their campfire properly before leaving.*

Activity 3: Anatomy of a Burn

This activity introduces students to the science behind prescribed fire. Students learn that fire plays a part in certain forest and grassland ecosystems. They also learn that you can fight fire with fire, because prescribed fires help decrease damage from wildfires by reducing the amount of vegetation available to fuel a fire.

Start the activity with a class poll to see who agrees that some wildland fires are useful. Then take students to www.nifc.gov/prevEdu/prevEdu_communicatorGuide.html and click on chapter 2 for more background on the benefits of prescribed fire. Distribute the activity sheets and have students complete “Investigation #1” by reconstructing the sequence of events around a prescribed fire to create a presentation that explains how prescribed fire can help restore and protect certain wildland ecosystems.

Have students complete “Investigation #2” by identifying the listed features of the illustrated prescribed fire. Then review the basic principles of the Fire Triangle, a graphic that shows how heat, oxygen, and fuel must all be present for a fire to start and continue burning. (See www.SmokeyBear.com/elements-of-fire.asp for background.) Remind students that managing a prescribed fire involves controlling one or more of these three elements, and discuss as a class how burn teams use the principles of the Fire Triangle to keep a prescribed fire under control. In the illustration, for example, how do the stream, the roads, and the foam in the brush truck each break the Fire Triangle in a different way?

To build on this activity, have students research how prescribed fire is used in your state. For example, is there a certain plant or animal that needs a habitat created by fire? Students can present their findings in a case study format, outlining the objectives of a specific prescribed fire and how it was managed.

Answers: Investigation #1 — 1-D; 2-B; 3-E; 5-A; 8-C. **Investigation #2** — A-10; B-1, 4, and 8; C-3; D-5, 6, and 7; E-1, 4, 8, and 9. Some of the answers will be used more than once in the activity.

Activity 4: Help Smokey Bear Spread the Wildfire Prevention Message!

In this activity, students use the science they have learned as Wildfire Prevention Detectives to create a Smokey Bear public service announcement (PSA) that will educate others. The activity also reinforces language arts skills by providing an opportunity to explore persuasive text and visual media and advertising techniques. Have students work in small groups to plan their PSA. They can find additional tips for creating a PSA at www.janegoodall.ca/documents/MakingaPSA.pdf and www.ehow.com/how_2241597_create-public-service-announcement-film.html. Set a deadline for each group to present their PSA to the whole class.

Resources

- www.SmokeyBear.com
- www.adcouncil.org
- www.fs.fed.us
- www.stateforesters.org
- www.ymiclassroom.com



Smokey's Wildfire Prevention Detectives

Activity 1 Reproducible Master

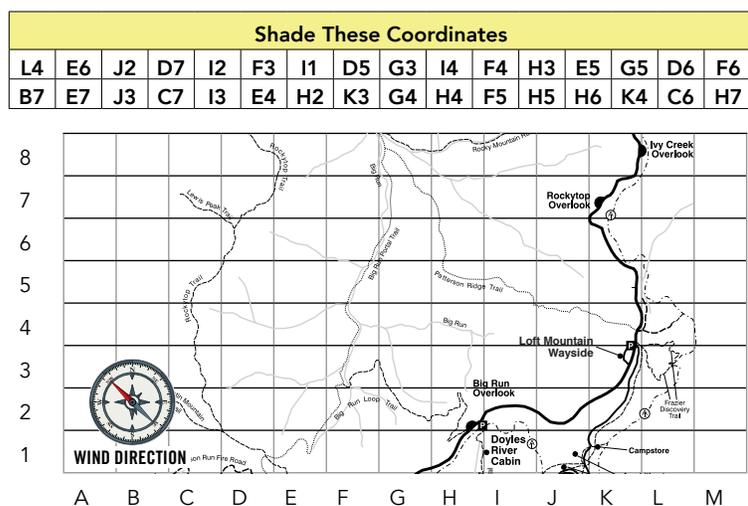
Find the Source

It's not easy to investigate a wildfire. Most investigations start while firefighters are still battling the blaze, so safety is paramount. In addition, firefighting equipment can affect the fire scene, rain can wash away evidence, and there's the risk that trees damaged by the fire could fall onto the investigator.

Wildfire investigators use the scientific method to gather and analyze clues about the cause of a wildfire. The first thing they determine is the point of origin — the spot where a fire started. And that's your first assignment as part of Smokey's Wildfire Prevention Detectives team!

INVESTIGATION #1: Plot the Origin

To identify a wildfire's point of origin, investigators map the area that burned in the fire and look for a V-shaped pattern. The point of origin is usually found at the point of the V. Members of your Wildfire Prevention Detectives team have been reporting map coordinates for areas burned in a wildfire. Shade in the boxes for these coordinates to determine the pattern of this wildfire and its likely point of origin. Remember: The path of a wildfire is influenced by weather (wind), topography (land features), and vegetation (fuels).



- Based on the pattern you have mapped, what are the coordinates of this wildfire's point of origin? _____
- What is near this location that may provide a clue to what started the wildfire? _____

- What factor contributed to the spread of this wildfire? _____

INVESTIGATION #2: Fire's Fingerprints

Wildfire investigators also use burn patterns to help locate a wildfire's point of origin. They know that the burned side of a partially burned object usually points toward the origin of the fire. Your Wildfire Prevention Detectives team located several partially burned objects when they were mapping this wildfire. Three of these objects and their map coordinates are shown below. Using the principle that the burned side of an object points toward the fire's origin, identify which direction the burned side of each object is pointing.



1. Tree charred on one side.

- Found at coordinate B7
- The charred side is pointing:
 - northwest
 - southeast
 - south



2. Rock covered with soot on one end.

- Found at coordinate L4
- The soot-covered side is pointing:
 - southwest
 - north
 - northeast



3. Log charred on one end.

- Found at coordinate H7
- The charred end is pointing:
 - east
 - north
 - south

Smokey's Wildfire Prevention Detectives

Activity 2 Reproducible Master

Arson or Accident?

More than 75,000 wildfires are reported to the National Interagency Fire Center (www.nifc.gov) each year. Some are caused by lightning, and in some parts of the West, lightning is the main cause of wildfires. Nationwide, however, nine out of ten wildfires are caused by people. Usually, the cause is careless behavior like unattended campfires, misuse of matches and fireworks, discarded cigarettes, burning leaves and yard debris on dry, windy days, and sparks from vehicles and equipment. Unfortunately, some people set wildfires deliberately. These are called *arson fires*.

ASSIGNMENT: Weigh the Evidence

You need evidence to determine the cause of a wildfire. Imagine that you are the Wildfire Detective assigned to investigate a campsite that is believed to be the point of origin of a recent wildfire. It's your job to decide if the wildfire was arson or an accident.

When you arrive on the scene, you don't detect the smell of gasoline or any other accelerant that might have been used to start the fire, and you don't see any "pour patterns" on the ground that would have been left by a burning liquid. You do see many signs of human activity — footprints, at least two different sets of tire tracks, remains of exploded fireworks, and several discarded cigarettes. You also notice the remains of a campfire. Carefully, stirring the ashes, you uncover some glowing embers; when you blow on them, flames are produced.

The firefighters who put out the wildfire tell you that the smoke was not black, and you know that black smoke is usually a sign of burning gasoline or some other accelerant. They also tell you that the fire was reported by a witness who says he saw a group of young people driving in the direction of the campsite earlier in the day. To finish up your investigation, you contact the local power company to find out if there are any reports of downed lines in the area, and check with the local weather service for reports of lightning strikes in the area. Negative on both counts.

Now use this checklist to summarize the evidence you've gathered.

Investigator's Checklist	Yes	No
1. Are there tire tracks or footprints near the fire scene?		
2. Are there matches at the fire scene?		
3. Are there any discarded cigarettes at the fire scene?		
4. Are there any fireworks at the fire scene?		
5. Did witnesses observe anyone near the fire scene?		
6. Did witnesses observe black smoke at the fire scene?		
7. Is there any smell of gasoline or other accelerants at the fire scene?		
8. Are there liquid pour patterns at the fire scene?		
9. Are there any reports of lightning strikes in the area?		
10. Are there any reports of downed power lines in the area?		

Based on the evidence, what do you think was the cause of the fire and why?



To find out more about how you and your family can prevent wildfires and be safe outdoors, go to www.SmokeyBear.com/be-smart-outdoors.asp.

Smokey's Wildfire Prevention Detectives

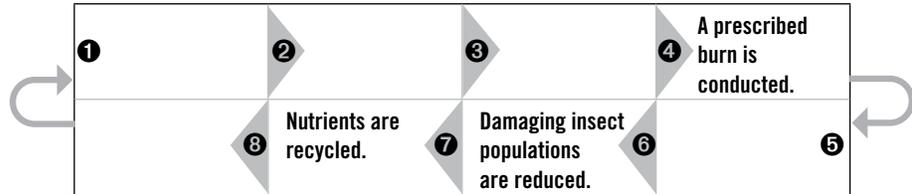
Activity 3 Reproducible Master

Anatomy of a Burn

Not all fires are harmful and destructive. In fact, a prescribed fire, also called a controlled burn, is actually beneficial. Just as doctors prescribe medicine to improve their patients' health, forest managers sometimes prescribe fire to improve a forest's health. Fire can reduce some populations of damaging insects, recycle nutrients to the soil, and encourage certain kinds of plant growth. Prescribed fire can also reduce the amount of fuel (vegetation) available to feed a wildfire. In this way, prescribed fire helps prevent wildfires from becoming large and damaging.

INVESTIGATION #1: The Causal Chain Reaction

How fire is used depends on the type of forest in which it is used. You're part of a wildland fire management team explaining how prescribed fire can help a certain forest stay healthy. You'll need a graphic for your presentation showing how this forest becomes overgrown without fire, and how prescribed fire reduces excess vegetation. Use the graphic organizer on the right to outline the stages of this process by placing items from the Wildland Lifecycle list in the correct boxes to complete the sequence of events.



Wildland Lifecycle

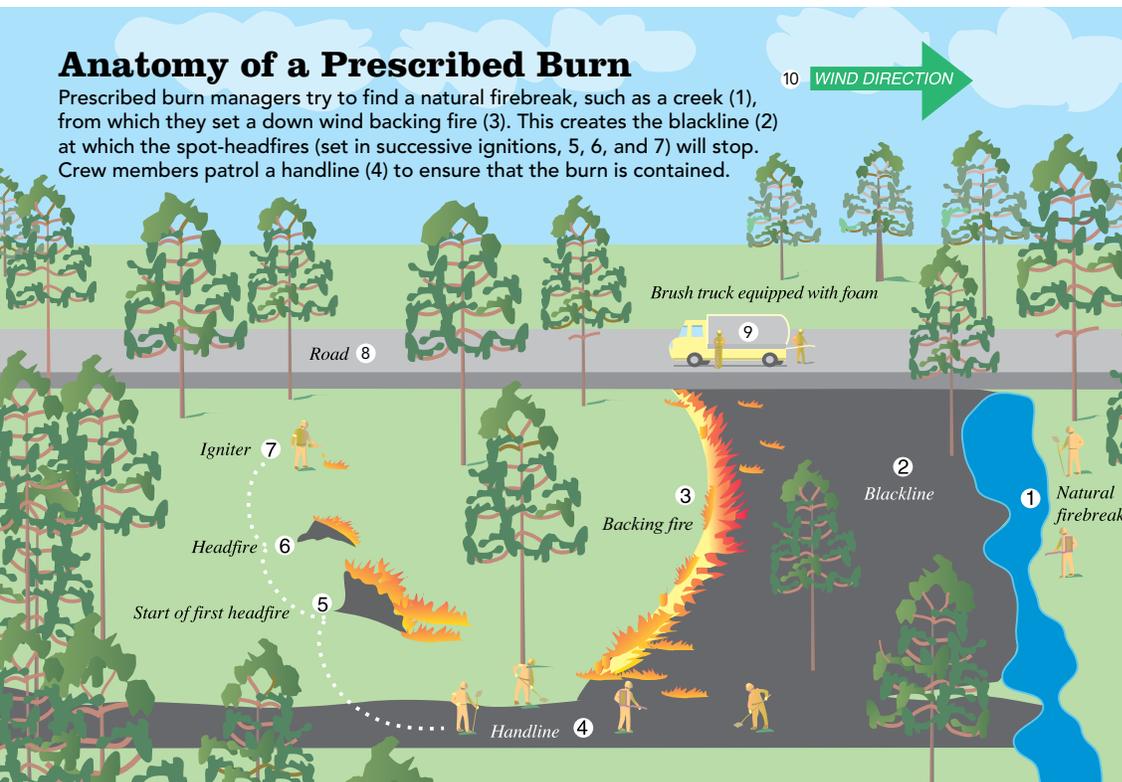
- Fuel build up is removed from the forest floor.
- Open spaces between mature trees become overgrown with plants.
- New grasses, shrubs, and trees begin to grow.
- Leaves, branches, and plants build up on the ground.
- Certain plants can't germinate (sprout).

INVESTIGATION #2: Anatomy of a Burn

Now you're the prescribed fire Burn Boss. Use this illustration to show your team what they need to know to conduct a successful prescribed burn. Match the items on the checklist below with the correct numbered items on the illustration. Some numbers can be used more than once.

Anatomy of a Prescribed Burn

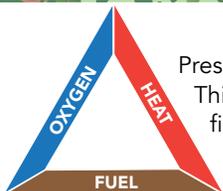
Prescribed burn managers try to find a natural firebreak, such as a creek (1), from which they set a down wind backing fire (3). This creates the blackline (2) at which the spot-headfires (set in successive ignitions, 5, 6, and 7) will stop. Crew members patrol a handline (4) to ensure that the burn is contained.



Prescribed Fire Checklist

- ___ Determine the wind direction so we can be sure the prescribed fire will travel where we want it.
- ___ Locate or construct obstacles that will prevent the prescribed fire from spreading too far.
- ___ Start with a fire that moves slowly against the wind to enlarge an area protected by obstacles.
- ___ Set small fires that move with the wind to expand the burn area.
- ___ Take safety measures on all sides of the prescribed fire to keep it under control.

To learn more about how you can prevent wildfires in your state, go to www.SmokeyBear.com.



Prescribed fire teams also need to know the basic principles of the Fire Triangle. This is a graphic that shows the three elements required to make and sustain a fire—oxygen, heat, and fuel. Remove any one of these, and the fire will die. In a class discussion, use the illustration to explain how prescribed fire teams use the principles of the Fire Triangle to manage a burn.



Smokey's Wildfire Prevention Detectives

Activity 4 Reproducible Master

Help Smokey Bear Spread the Wildfire Prevention Message!

Smokey Bear is the symbol of wildfire prevention and the star of the longest-running public awareness campaign in U.S. history. Since 1944, Smokey Bear has appeared on posters, billboards, and other public service announcements (PSAs) to spread the message, "Only YOU can prevent wildfires." The main goal of Smokey's PSAs is to reduce the number of human-caused wildfires by promoting safe behavior when using fire, but they also encourage a sense of personal responsibility for our country's forests and other wild spaces.



ASSIGNMENT: Create Your Own Wildfire Prevention PSA!

Work with a group to create a new PSA for Smokey Bear. Your PSA will target students in your school and help Smokey spread his message of fire prevention. Use this planning page for your project. As you complete each step, keep notes on a separate sheet of paper or on the computer.

STEP 1: Visit www.SmokeyBear.com and click on "Smokey's Journey" to learn about the campaign history and view past PSA campaigns. How has the campaign changed over the years and how has it remained the same?

STEP 2: What do young people today need to know about wildfire prevention? Come up with a list of at least five important things kids your age can do to prevent wildfires. Be sure to include these points in your PSA.

STEP 3: Discuss what kind of PSA your group will create. Will it be a poster, a song, a skit, a dance, a poem, a blog, a tweet, a banner on the school website, or an online video? Brainstorm and take notes on all your ideas.

STEP 4: PSAs are persuasive. That means they are good at getting people to feel a certain way. What words, images, facts, and advertising techniques will you use in your PSA to make people care about wildfire prevention?

STEP 5: Keep your PSA on track. Organize the roles in your group. Stick to your due dates.

Student Name	Task	Due Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

STEP 6: Here are some tips for producing your PSA:

- Stay focused.** Don't overload the viewer or listener with too many different messages.
- Check your facts.** It's extremely important for your PSA to be accurate. Any facts should be checked and verified. Document your sources in your notes.
- Develop a "hook."** A hook is whatever you use to grab your audience's attention. It can be something funny, a catchy tune, a shocking statistic, an emotional appeal — whatever makes your audience interested enough to watch or listen to the rest of your PSA (but keep it appropriate and within your school's rules of conduct).
- Know Smokey's message.** His message is one of personal responsibility, of using fire in the right place, at the right time, under the right conditions.

Decide how you will present your PSA to the class and to your school. Perhaps using the school audio/video equipment? If possible, track the reaction of your schoolmates with surveys or hits to the school website.

