LEAF

Enriching Students.
Sustaining Forests.

The Wisconsin K-12 Forestry Education Program

Wisconsin K-12 Wildland Fire Lesson Guide

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Northeastern Area State and Private Forestry State Fire Assistance Program

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LEAF is a partnership program between

Wisconsin Department of Natural Resources - Division of Forestry

and

Wisconsin Center for Environmental Education

College of Natural Resources
University of Wisconsin-Stevens Point

LEAF - Learning, Experiences, & Activities in Forestry

The Wisconsin K-12 Forestry Education Program

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LEAF was created to help promote forestry education in Wisconsin schools. In 2001, Wisconsin K-12 forestry education stakeholders evaluated the current status of and the needs for Wisconsin-based K-12 forestry education. A variety of programs existed, but voids were identified in delivery and dissemination of educational materials and services. To offer a more unified effort, stakeholders supported the development of a comprehensive program that would enhance existing efforts.

During the spring of 2001, legislation was written to establish the LEAF Program as a partnership between the Wisconsin Department of Natural Resources - Division of Forestry and the Wisconsin Center for Environmental Education at the College of Natural Resources, University of Wisconsin-Stevens Point. Funding for the program is provided through a surcharge on the sale of seedlings from Wisconsin Department of Natural Resources - Division of Forestry nurseries.

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A RATIONALE FOR WILDLAND FIRE EDUCATION IN WISCONSIN

Wildland fire is a major issue that federal, state, and local agencies have to deal with. Nationally, large forested areas of the West and South have burned as a result of drought, hot weather, fuel load, and human carelessness. Here in the Great Lakes Region, our fire regimes, population density, and culture differ from those of the Western and Southern United States. Although historically Wisconsin has experienced major catastrophic fire events, conditions in recent years have limited large-scale fire. Even so, Wisconsin Department of Natural Resources fire crews annually respond to 1,500 fires that burn more than 5,000 acres. Catastrophic fires, such as the Cottonville Fire in Adams County in 2005, still threaten lives, property, and resources.

The wildland/urban interface is increasing in Wisconsin as each year 3,000 new parcels are carved out of existing forestland holdings (based on 2000 to 2005 average). On many of these parcels, homes and cabins are being built. More and more people are moving into forested areas, and estimates predict that housing density in Wisconsin's forested regions will continue to rise. If Wisconsin experiences a large catastrophic fire event, the cost in property alone would be extremely large.

How do most of these fires start? Ninety percent of all wildland fires in Wisconsin are started by humans. As more individuals move into the wildland/urban interface, the number of fires and the possibility for catastrophic fires increase. Burning debris, sparks from equipment such as chain saws and all-terrain vehicles, and campfire/ash disposal are the most common ways that humans cause fire. Each of these modes of fire generation is preventable. Education is necessary to develop an informed and caring citizenry who will take action to prevent useless fires and who support the use of prescribed burning as a management tool.

The LEAF wildland fire materials were created to assist Wisconsin teachers in developing safe and responsible citizens who inhabit or visit wildland areas. The topic of wildland fire has great potential to captivate and interest students. Wildland fires are front-page news events. They are visually and physically powerful natural phenomena with a complex history and a complex role in today's society. Students of all ages tend to be engaged by the awesome nature of wildland fire.

The topic of wildland fire has great potential for integration into many subject areas. The exploration of fire involves hard science disciplines as well as the social sciences. Wildland fire issues are complex, and their resolution requires an understanding of the environment, economics, social policy, and human behavior. The study of wildland fire can help students understand issues in both a landscape and historical context.

When discussing wildland fire, it is very important that both the positive and negative aspects of wildland fire be presented. An understanding of ecological fire (prescribed fire) requires students to use reason and look beyond the danger of fire. This becomes important because the acceptance and use of prescribed fire is necessary to sustain ecosystems and reduce the risk of future catastrophic wildfires.

INTRODUCTION TO THE GUIDE

The ***LEAF Wisconsin K-12 Wildland Fire Lesson Guide*** provides educators with lessons designed to teach students basic wildland fire principles. There is one wildland fire lesson for each unit of the ***LEAF Wisconsin K-12 Forestry Education Lesson Guide*** (K-1, 2-3, 4, 5-6, 7-8, 9-12). Subject areas addressed in the lessons may include English Language Arts, Geography, Health, Mathematics, Science, Social Studies, and Visual Arts. The *Wisconsin Model Academic Standards* were referenced and helped guide the development of the material. The standards, subject areas, and multiple intelligences that each lesson encompasses are listed in the appendix.

The ***LEAF Wildland Fire Lesson Guide*** is based on principles outlined in the ***LEAF Conceptual Guide to K-12 Wildland Fire Education in Wisconsin***. The Conceptual Guide has two main parts – a conceptual framework and a scope and sequence. Together they outline wildland fire education concepts appropriate for Wisconsin's K-12 students and the grade level at which they should be taught. All the information in the Conceptual Guide is organized under four themes – "What Is Wildland Fire?," "Why Is Wildland Fire Important?," "How Do We Manage Wildland Fire?," and "What Is the Future?" (see pages iv to ix).

BACKGROUND SECTION

At the beginning of each lesson in this guide, you will find useful background information for teaching the activities in that lesson. In addition to the lesson-specific background information, this guide contains in-depth wildland fire information on pages 152 to 163. Users of this guide will find the information helpful in expanding personal knowledge of wildland fire science, history, and management.

WEBSITE CONNECTION

Supporting materials for teaching about wildland fire are available on the LEAF website. Resources include full color digital maps and images, in-depth background information, links to web resources, and more. The wildland fire web pages will be updated and enhanced over time, so visit often for the newest materials.

Go to *www.uwsp.edu/leaf* and navigate to the Wildland Fire Resources section.

OTHER LEAF MATERIALS

As Wisconsin's K-12 forestry education program, LEAF's mission is to provide Wisconsin's educators with high quality forestry education materials for use in the classroom and field. This is achieved through workshops, special events, and curriculum consulting.

This ***LEAF Wisconsin K-12 Wildland Fire Lesson Guide*** is a supplement to the ***LEAF Wisconsin K-12 Forestry Education Lesson Guide*** (LEAF Guide). The LEAF Guide is comprised of six grade specific units: K-1, 2-3, 4, 5-6, 7-8, and 9-12. You will find descriptions of the units and lessons on page 178. The LEAF Guide is obtained by participating in a LEAF workshop. Workshop participants receive forestry background information and practical experience using the LEAF Guide. Workshops vary in length and format, sometimes including an option for graduate credit and/or hands-on field experiences.

LEAF WISCONSIN K-12 URBAN FOREST LESSON GUIDE

The *Urban Forest Lesson Guide* uses the places we live to provide a context for understanding forests. Lessons are designed to be used in conjunction with the *LEAF K-12 Forest Lesson Guide*. A section called "LEAF Links" is included in each urban forest lesson and describes when and how to link the urban forest lesson to original LEAF guide lessons.

VISIT OUR WEBSITE AT WWW.UWSP.EDU/LEAF

The LEAF website is a great source for information and resources. On it, you will find:

- Workshops offered
- Information on LEAF special events
- On-line tree identification key
- LEAF lesson enhancements
- Educator opportunities
- On-line publications
- Field experience providers
- School forest information and assistance

LESSON FORMAT

Lesson Grade Level and Title

BIG IDEAS
The subconcepts covered in the lesson as defined by the *LEAF Wildland Fire Conceptual Framework*. (Subconcept Number)

OBJECTIVES
Knowledge and skills students acquire as a result of doing the lesson.

SUBJECT AREAS
List of subjects addressed in the lesson.

LESSON/ACTIVITY TIME
Total time required to complete the lesson and breakdown of time required for each lesson component.

TEACHING SITE
Recommended location for teaching.

NUTSHELL
Brief summary of the lesson.

BACKGROUND INFORMATION
Information that supports, accentuates, and expands on the information addressed in the Procedure.

PROCEDURE
INTRODUCTION
A short discussion or activity that sets the mood for the rest of the lesson.

ACTIVITIES
Step-by-step instructions for the process involved in teaching the concepts.

CONCLUSION
A wrap-up and review of concepts of the lesson.

VOCABULARY
Key terms used or introduced in the lesson.

MATERIALS LIST
Items needed to complete the lesson. Listed as per student, group of students, class, or teacher.

TEACHER PREPARATION
Preparation needed before teaching the lesson.

SAFETY PRECAUTIONS
Necessary precautions to teach the lesson safely.

SUMMATIVE ASSESSMENT
Culminating questions or activities that have students apply learned information or skills to new situations.

REFERENCES
List of materials used in creating the lesson.

RECOMMENDED RESOURCES
Additional books, websites, or materials that will enhance the lesson.

KEY TO SYMBOLS USED THROUGHOUT THE LESSONS
 Teacher Page

 Student Page

 Teacher Page (Key)

2ND-3RD GRADE LESSON

SmokeyToons: A Look at Fire and Human Behavior

NUTSHELL

In this lesson, students examine ashes from paper to describe the changes that fire can cause. They also learn the elements necessary for fire to exist by studying a burning candle. Students then distinguish the difference between good and bad fire situations and learn what they can do to prevent bad fire situations. In conclusion, students create a cartoon that conveys a fire prevention message.

BIG IDEAS

- In Wisconsin, there are two main types of wildland fire – wildfire and prescribed fire. Wildfires start without the intent of the landowner or land manager and are uncontrolled and unwanted. Prescribed fires are contained and are planned to meet the goals of a landowner or land manager. (Subconcept 1)
- The ignition of wildland fire can be caused by human activity (e.g., debris burning and other outdoor burning, machine sparks, children playing with matches, power lines, fireworks) or natural sources (e.g., lightning, spontaneous combustion). Human activity is responsible for most wildland fires in Wisconsin. (Subconcept 2)
- Fire requires oxygen, heat, and fuel to exist. Collectively these elements are known as the fire triangle. Under most conditions, the three elements can be manipulated to slow or stop the spread of fire. (Subconcept 3)
- Individuals have the responsibility to start and stop fires in safe and effective ways. Citizens who illegally start a fire or carelessly allow a fire to escape may be penalized with fines and even imprisonment. (Subconcept 26)

OBJECTIVES

Upon completion of this lesson, students will be able to:

- Describe the physical changes fire can cause.
- List the three elements fire needs to exist.
- Distinguish the difference between a good fire and a bad fire.
- Identify activities that can cause destructive wildfire.
- Identify actions they can take to reduce the risk of destructive wildfire.

SUBJECT AREAS

English Language Arts, Health, Science, Visual Arts

LESSON/ACTIVITY TIME

- Total Lesson Time: 105 minutes
- Time Breakdown:

Introduction	10 minutes
Activity 1	15 minutes
Activity 2	10 minutes
Activity 3	20 minutes
Conclusion	50 minutes

TEACHING SITE

Classroom

BACKGROUND INFORMATION

A fire can have positive effects or potentially dangerous effects. Positive fires are those that are safe and do not cause the loss of life, property, or natural resources. Potentially dangerous fires exist when humans don't take every precaution to monitor and prevent fires from becoming dangerous. For a fire to start and continue to burn, three elements must be present – heat, fuel, and oxygen.

(Continued on page 24.)

MATERIALS LIST

FOR EACH STUDENT
- Copy of Student Page **1**, *The Fire Triangle*
- Copy of Student Page **2**, *Make It Safe!*
- Copy of Student Page **3**, *How Do I Draw a Cartoon?*
- Pencil and paper
- Red colored pencil or marker

FOR EVERY 2 TO 3 STUDENTS
- Bowl of paper ashes

FOR THE CLASS
- Overhead projector (optional)

FOR THE TEACHER
- Candle
- Lighter
- Jar that fits tightly over the candle
- Cartoon from a newspaper
- Overhead transparency of Teacher Page **1**, *Make It Safe! Answer Key* (optional)

TEACHER PREPARATION

- Burn five to 10 pages of white paper in a clean, fireproof receptacle such as a grill, barrel, or metal bowl. Be sure to use paper free of paint, glue, and other forms of decoration, coloring, or plastic. Let the ashes sit for at least two hours and transfer them to a sealed container. Bring the container to class with enough bowls or similar receptacles to provide an ash sample to each group of two to three students.
- Find a stout, stable candle and a clear glass jar that fits over it. Be sure that the candle and jar fit together snugly. Test the candle's stability, light it, and place the jar over the candle to make sure that the seal is tight enough to cause the candle to extinguish in a short period of time.
- Make an overhead transparency of Teacher Page **1**, *Make It Safe! Answer Key* (optional).

SAFETY PRECAUTIONS

- When examining the ashes in the introductory activity, students should not place the ashes in their mouths or rub their eyes with their hands. Be sure that students understand that all of the ashes must stay in the bowl. You may wish to allow students to wash their hands after the exercise.
- When using the candle in Activity 1, be sure that the candle is visible but out of reach of all students. It should be in a stable location away from flammable materials. Be sure that students to not touch or play with the candle.

There must be heat to start and continue a fire, fuel to burn, and oxygen to facilitate combustion. These three elements are referred to as the fire triangle. The removal of any one of these three elements will extinguish a fire. When working with any fire, an adult needs to keep watch on the fire, have a shovel and water available, and know how they can extinguish the fire. A shovel can be used to remove fuel from the area, remove oxygen by smothering the fire with dirt, and smothering flames by patting them with the blade. Water on a fire not only removes heat, but also blocks the flow of oxygen to the fuel and decreases the flammability of surrounding fuels.

For more information on wildland fire, see the Wildland Fire Background starting on page 152.

PROCEDURE

INTRODUCTION – FIRE CAN CAUSE BIG CHANGES

1. Seat students in groups of two or three. Tell the class that they are going to learn about a very powerful and dangerous, yet very important part of nature – fire. Tell students that you are about to pass around an object inside a bowl, and they will need to work with the other students in their group to answer three questions about it. Write the following questions on the board:

   - What is it?
   - What was it before?
   - What happened to it?

2. Give each group a bowl that contains ashes from paper. Tell students that they can touch the contents, but all the contents must stay in the bowl. As students look at the ashes, encourage them to discuss and answer the questions.

VOCABULARY

Burn Barrel: A metal receptacle, most often a barrel, used for burning waste outdoors. Waste includes materials legal to burn such as wood and paper and materials illegal to burn such as plastic and metal.

Fire Triangle: The three elements (i.e., fuel, oxygen, heat) necessary for combustion to occur.

Fuel: Any material that can burn.

Wildfire: A wildland fire that ignites and spreads without the intent of the landowner.

3. Once all groups have finished, have some students share their answers to the questions. Add the following discussion questions to help students build on their answers:

   - What is it? *(Ash.)*
   - What was it before? *(Paper.)*
   - What happened to it? *(It burned.)*
   - What is the difference between the paper at the beginning and the ashes at the end? *(Paper is whole, white, strong, and doesn't smell. The ashes are small, black, fragile, and have an odor.)*
   - Are the differences easy to see? *(Yes. The ashes are very different from paper.)*
   - Do the ashes serve the same purpose as the paper? *(No. You cannot write or draw pictures on the ashes. Fire has not only changed the way the paper looks and smells, but also what it can be used for.)*
   - What other things do you think fire can change? *(Fire can cause big changes in objects such as chairs and desks, buildings such as houses and schools, living things such as trees and animals, and even large areas such as cities and forests.)*

4. Collect the bowls from the groups and have students return to a class seating arrangement.

   Tell the class that fires are both powerful and dangerous because they have the ability to cause very big changes in many of the things that we need to live. Fires can burn cities and forests, leaving both people and wildlife without homes.

   Tell the students that they are going to learn about what fire needs in order to burn and what type of situations lead to bad fires.

ACTIVITY 1 – WHAT DOES FIRE NEED?

1. Show the students a candle. Tell them that there are three things that need to be present in order to have fire. Tell them that the three things can be represented by a triangle. Draw a large triangle on the board.

2. Ask the students what the candle is made of. *(Wax.)* Ask the students if the wax will burn. *(Yes.)* Ask the students if the candle would still burn if it were made of stone. *(No.)* Tell students that fire needs fuel to burn and the wax is the fuel. Write "fuel" on one side of the triangle you have drawn on the board.

3. Direct students' attention back to the candle. Ask the students why, if the candle is made of wax, it is not burning. *(It has not been lit.)* Ask the students what the candle needs in order to burn. *(Heat.)* Explain that heat is another side of the triangle. Write "heat" on another side of the triangle on the board. Then light the candle. Point out that the flame they see is a very small fire.

4. Tell the students that you are about to place a glass jar over the candle. Ask the class to guess what will happen. Have different students offer scenarios and have each give a good reason. For example, if a student says that the oxygen will run out, ask the student to explain why and guess how long it will take.

   Place the jar over the candle making sure that it fits tightly against the surface it is sitting on. When the flame extinguishes, have students explain what happened. *(The flame needs oxygen. It used all of the oxygen in the jar. When the oxygen ran out, the flame went out.)* Write "oxygen" on the third side of the triangle on the board.

5. Relight the candle. Ask the students to focus on the candle and ask them the following questions:

   - Where does the oxygen come from? *(The air in the room. The atmosphere. Oxygen is present in the air that we breathe.)*
   - What is the fuel that the fire is burning? *(The fire is burning the wick and candle wax.)*
   - How did the candle light (i.e., what provided the candle the heat it needed to light)? *(The heat came from the lighter – a spark and a flame.)*

   Hold the lit candle up so that it appears to be inside the triangle. Tell the students that the flame on the candle would not exist if the air around it did not contain oxygen, if it did not have fuel (the wick and wax) to burn, and if it did not have heat (the lighter) to light the candle. Remind the students that the flame cannot exist without all parts of the fire triangle (i.e., oxygen, heat, and fuel).

6. Hand each student a copy of Student Page **1**, *The Fire Triangle*. Ask the students to fill in the blank in the sentence, "The oxygen that fire needs is found in the _ _ _ all around us." *(Air.)*

   Have the students list different materials that can act as fuels. *(Wood, paper, trees, leaves, houses, etc.)*

   Have the students fill in the blank in the statement, "Most fires in Wisconsin are started by _ _ _ _ _ _." *(People.)*

ACTIVITY 2 – GOOD FIRE, BAD FIRE

1. Have students raise their hands if they have been at a campfire or sat by a fire in a fireplace.

   Tell students that fire has many uses; have students think of a few. *(Heat [e.g., a fireplace], light [e.g., a candle], cooking [e.g., a gas stove or campfire], and recreation [e.g., a campfire]).* Tell the class that each of these uses serves a purpose for a person or group of people – to keep warm, to eat, to relax, etc.

2. Tell the class that they have learned that fire can be useful and they also know that it is powerful and can be very dangerous. Place the titles "good fire" and "bad fire" on the board. Ask the class to help you distinguish between a fire that is useful and one that is dangerous. Start with good fire and have students brainstorm a list of words to describe a good fire. *(Safe, responsible, small, campfire, controlled, not dangerous, and useful.)* Next, brainstorm a list of words that describe bad fire. *(Dangerous, destructive, hot, out of control, hurt, death, and afraid.)*

   Have students use the words to write complete sentences that answer the question, "What is the difference between a good fire and a bad fire?" Have students share what they have written. Write the sentences on the board. The sentences should be similar to those listed below.

   - A good fire is safe and useful.
   - A good fire is started and used by a responsible adult.
   - A bad fire is started irresponsibly.
   - A bad fire is dangerous (it can destroy living and nonliving things).

3. Tell the class that they know that fire is powerful and dangerous (i.e., has the potential to cause great changes). They know that it is useful in different ways (e.g., to light a dark room). They know what fire needs to exist (i.e., oxygen, heat, and fuel). And, they have just learned the difference between useful and dangerous fires.

   Tell the class that they are now ready to learn how bad fires start and how they can be prevented.

ACTIVITY 3 – HOW CAN WE PREVENT DESTRUCTIVE FIRES?

1. Remind the class that most destructive wildfires (bad fires) are started accidentally by people. Tell the class that they have the ability to stop activities that can cause bad fires.

   Give each student a copy of Student Page **2**, *Make It Safe!* Lead the class in identifying the dangerous situations in each picture. Some of the pictures contain more than one dangerous situation. As students identify what makes the situation dangerous, have them circle the portion of the picture with a red colored pencil or marker.

   Dangerous Situations Key:

   - *Picture 1:* There are no people present around the campfire. There is wood outside the fire ring. There is no shovel or bucket of water to extinguish the fire.
   - *Picture 2:* The boy is playing with matches.
   - *Picture 3:* There is no one near the burn barrel and a fire is burning. Debris is too close to the burn barrel. There is no water source present. There is no screen over the barrel.
   - *Picture 4:* Children are playing with fireworks without an adult present. There is no water source present.

2. Once students circle the dangerous situations in each picture, ask them what could be done to make each of the pictures safe. Remind students that good fires are useful and controlled and they are started and used by a responsible adult. Ask the class to identify a few responsible adults that they know. *(Parents, guardians, teachers, older siblings, etc.)* Help students identify safe activities similar to those pictured on Teacher Page **1**, *Make It Safe! Answer Key*. You may wish to show students the key on an overhead projector.

3. After you have finished discussing dangerous and safe fire situations, have students write statements about safe fire use at the bottom of the Student Page **2**, *Make It Safe!* Students will use these ideas for the cartoon they create in the concluding activity, so having several ideas will be helpful. Suggestions include: share what you know with other people, always be careful around fire, find an adult if you see an unsafe fire, use fire responsibly, don't play with matches, don't play with fireworks unsupervised, don't leave fire unattended.

CONCLUSION – SMOKEYTOONS

1. Tell students that they are going to share what they know with other people by drawing a cartoon about safe fires. Ask students if they have ever read cartoons in the newspaper, in books, or in magazines. Show them a cartoon that you cut out of the newspaper. Have them share the name of some of the cartoons that they read.

   As students share ideas, ask them to help you define what a cartoon is. Ideas should include:

   - A cartoon is a series of drawings
   - The drawings are in a sequence of "boxes"
   - Cartoons have characters
   - The characters interact with one another
   - The character's thoughts and ideas are written inside "bubbles"
   - Cartoons are shorter than stories
   - Some cartoons are funny
   - Some cartoons have good messages

2. Hand a copy of Student Page **3**, *How Do I Draw a Cartoon?* to each student. Have students read the cartoon and answer the question, "How Do I Draw a Cartoon?" You may wish to help students answer the question by asking them how many scenes the cartoon has, what the scenery shows, who the main characters are, and what happens to them.

   Once the class has discussed the question, tell them that there are three guidelines for creating a good cartoon. Write the following guidelines on the board. You may want to have students copy them on the back of the student page as well.

   - A cartoon is short (about three scenes with only one sentence per character per scene)
   - A cartoon has interesting, easily identifiable characters (e.g., cats and dogs)
   - A cartoon has a very clear message (e.g., don't play with matches)

3. Tell students that they are all going to create their own cartoons about fire safety. Tell the class that the first thing that they need to do is pick a fire message that they would like to help other people understand. Have students look back at the messages they wrote at the bottom of Student Page **2**, *Make It Safe!* for ideas.

4. Give each student a blank piece of paper and pencil. Have each student pick one message about which to write their cartoon. Have them write the message at the top of the page.

5. Next have students brainstorm what each scene is going to be about and identify the characters in it. Have students think about the different characters that they can choose from. Ideas can include real people (e.g., themselves, members of their family, friends, firefighters, police officers), animals (e.g., rabbits, dogs, birds) or made-up characters (e.g., Spider-Man, Pokémon). Encourage students to write their ideas down.

   You may wish to provide students with the following example:

   For a cartoon with the title "Share What You Know With Other People," scene 1 could be a child playing with matches, scene 2 could be Smokey Bear telling the child that playing with matches is very dangerous and could cause a bad fire that destroys a forest and all the animals in it, and scene 3 could be the child and Smokey walking through a forest full of animals.

6. Have students draw their cartoons in pencil. If time allows, have them add color to the cartoons. As students are working, walk around the room and help them come up with characters, develop scenes, and arrange the drawings in their scenes.

7. Before class is over, showcase some of the students' cartoons. Encourage students to go home and improve their cartoons. Ask them to be creative by thinking of a title, inventing characters, coloring, etc. Also remind them to share what they learned with their family.

FORESTERS IN THE CLASSROOM

Wisconsin Department of Natural Resources fire personnel make classroom visits. To find a staff member in your county, go on-line to *www.dnr.state.wi.us/staffdir/SearchCounty.asp*, click on your county, and type "fire" into the subject box.

SUMMATIVE ASSESSMENT

1. Tell students that Spider-Man is a comic book character who has superpowers that help him move like a spider. He uses them to fight crime. Ask students to talk about Spider-Man's superpowers and think of some superpowers that would help a superhero fight fires.

2. Have students create a cartoon comic book character that has superpowers for fighting fire. Have students create a history for the character and develop a fire safety message around the character.

RECOMMENDED RESOURCES

ACTIVITY GUIDES

FireWorks Curriculum: Featuring Ponderosa, Lodgepole, and Whitebark Pine Forests by Jane Kapler Smith and Nancy E. McMurray. (Fort Collins, CO: U.S. Department of Agriculture Forest Service, Rocky Mountain Research Station, General Technical Report RMRS-GTR-65, 2000.) The FireWorks Curriculum is a compilation of fire lessons for grades K-10. Some of the information is specific to western fire regimes but many of the activities convey basic information about fire safety and fire behavior that is useful for younger students. A free copy of the curriculum is available at *www.fs.fed.us/rm/pubs/rmrs_gtr65.html*. Workshop participation is required to obtain additional materials needed for some lessons.

Smokey and Friends: What You Can Do to Prevent Forest Fires by Lifetime Learning Systems, Inc. (2002). This booklet is a small but well organized and effective collection of Smokey Bear fire prevention activities. This and other Smokey resources are available for free at *www.smokeybear.com/resources.asp*.

Wildland Fire Primer: A Guide for Educators prepared by John Owen and Pat Durland. (Boise, Idaho: U.S. Department of the Interior Bureau of Land Management, National Interagency Fire Center, 2002.) The Wildland Fire Primer presents the concepts and messages that the National Interagency Fire Center determines necessary for effective wildland fire education. The guide is well organized and provides a comprehensive overview of the fundamentals of wildland fire education.

WEBSITES

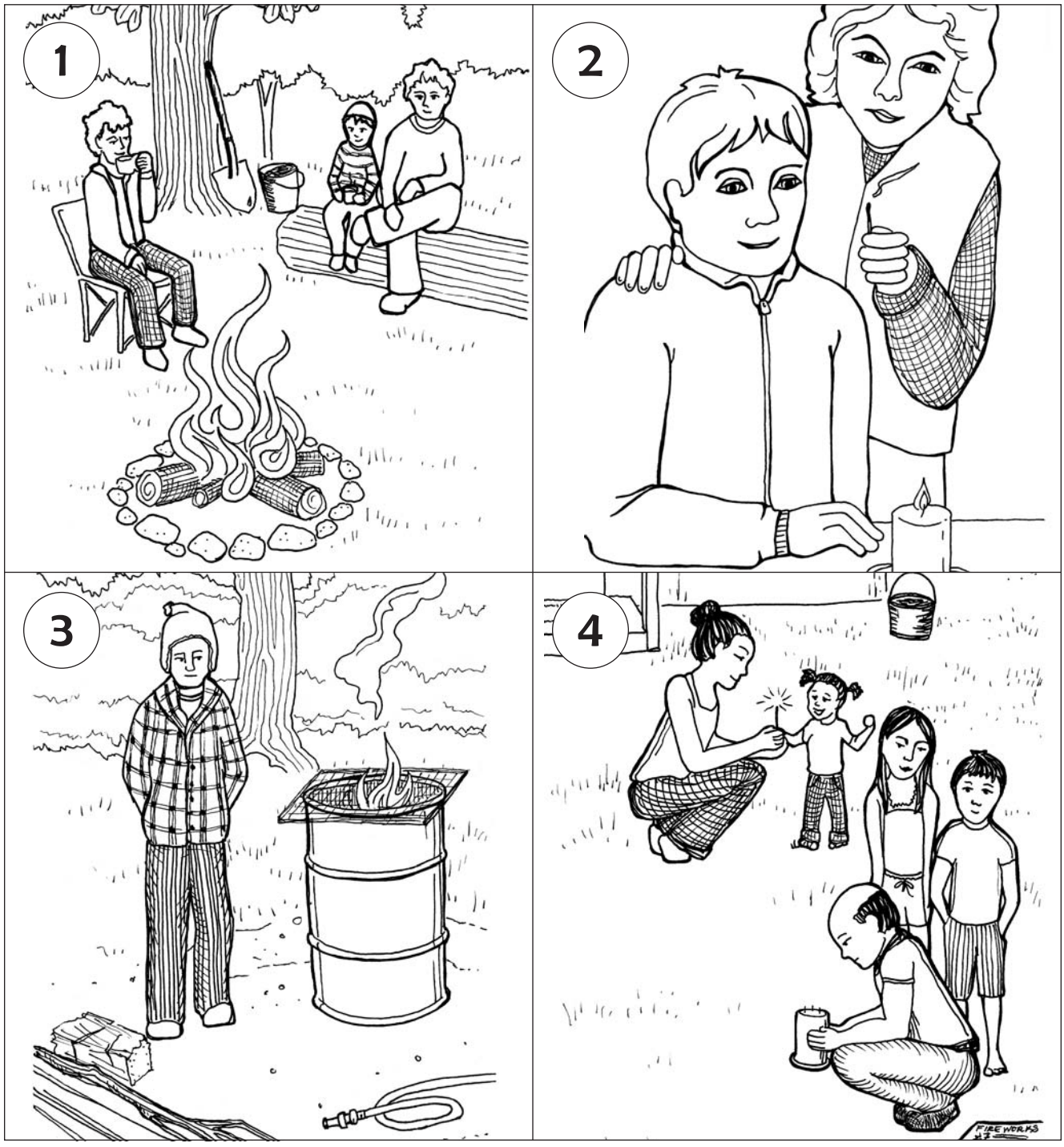
FEMA for Kids: Wildfires
www.fema.gov/kids/wldfire.htm
The Federal Emergency Management Agency provides links to a variety of classroom resources for fire prevention and fire safety.

Minnesota Department of Natural Resources Wildfire Prevention Education
www.dnr.state.mn.us/education/wildfire/index.html
The Minnesota DNR's wildfire prevention education page provides links to a variety of educational resources for teaching about fire prevention and the use of prescribed fire.

Project Learning Tree
http://plt.org
The Project Learning Tree website has a resources section featuring special initiatives including fire education. The fire initiative page includes links to a fire education curriculum, a glossary of wildland fire terms, and links to information on current wildland fire issues.

Wisconsin Department of Natural Resources Fire Prevention and Safety
www.dnr.state.wi.us/org/land/forestry/Fire/fire-ps.htm
The Wisconsin DNR fire prevention and safety page has links to fire statistics, issue summaries, and public service announcements.

MAKE IT SAFE! ANSWER KEY



THE FIRE TRIANGLE

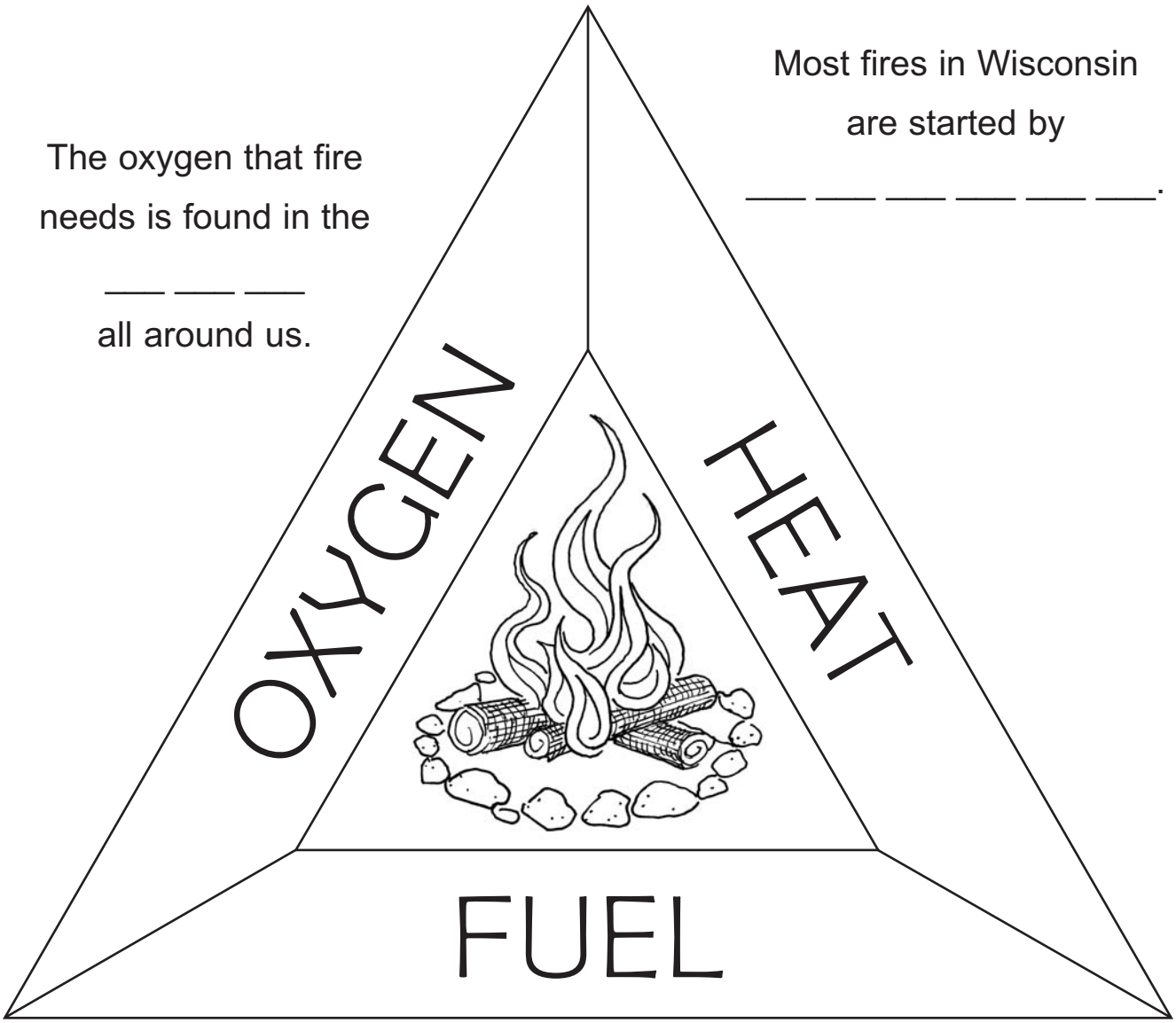
The oxygen that fire needs is found in the

___ ___ ___

all around us.

Most fires in Wisconsin are started by

___ ___ ___ ___ ___ ___.



List 4 different materials that can act as fuel.

1) _____

2) _____

3) _____

4) _____

MAKE IT SAFE!

HOW DO I DRAW A CARTOON?

Cartoons are very short stories. They make people laugh and send a message. They have three main parts: 1) characters, 2) words, and 3) scenery. Read the cartoon below and identify how the characters, words, and scenery are used to share the message – **Don't Play With Matches!**

WILDLAND FIRE BACKGROUND

DEFINING WILDLAND FIRE

THE TWO SIDES OF WILDLAND FIRE

Wildland fire includes two types of fire – wildfire and prescribed fire. Wisconsin **wildfires** can start through human causes such as debris burning or arson, or through natural causes such as lightning. Naturally caused wildfires are somewhat rare in Wisconsin, with most wildfires resulting from human activities. Wildfires can take lives, destroy homes and property, and leave charred landscapes. Although not planned by the landowner, wildfire can also have positive effects by helping to maintain fire dependent ecosystems.

Prescribed fires are used to mimic ecological or "natural" fires that have been part of ecosystems throughout history. Prescribed fires are ignited and controlled by land managers. When used safely and correctly they produce outcomes desired by landowners. The outcomes can include such things as restoring animal habitat, reducing fuels to prevent dangerous wildfires, and controlling pests and diseases.

COMBUSTION

Combustion is the act of burning and is a form of oxidation. Oxidation occurs when oxygen is combined with another substance. The rusting of iron ($2Fe + 3O_2 = Fe_2O_3$ + energy) is an example of oxidation. The combustion of gasoline ($2C_8H_{18} + 25O_2 = 16CO_2 + 18H_2O$ + energy) is also oxidation. As you can see in the equation, the combustion of gasoline releases energy. The energy is released from the breaking of the carbon-hydrogen bonds that hold organic compounds together. The energy released is the heat we feel when a fire burns.

Combustion can also be viewed as the opposite of photosynthesis. In photosynthesis, plants create energy from sunlight by combining water and carbon dioxide to make sugar and oxygen ($6CO_2 + 6H_2O = 6H_{12}O_6 + 6O_2$). In combustion, the sugars are broken down. The energy is released as heat, and CO_2 and H_2O are the major components of smoke.

It is important to keep in mind that this is a very simple understanding of combustion and that thousands of chemical reactions are taking place during a wildland fire. But, put simply, the heat from a fire can be seen as the same energy that plants took from the sun. Photosynthesis and combustion (as well as respiration) are the major parts of the carbon cycle – a cycle essential to all life on earth.

THE FIRE TRIANGLE

Fire behavior can be defined as the manner in which fire reacts to the environment. For fire to ignite and spread, three elements must be present – heat, fuel, and oxygen. There must be heat to start and continue the combustion process, fuel to burn, and oxygen to facilitate combustion. The three elements can be seen as sides of the fire triangle. If any one of the sides is removed, the fire will extinguish.

HEAT TRANSFER

For fire to spread, heat must move from one piece of burning fuel to another. This movement is called **heat transfer**. Heat is transferred by **radiation**, **convection**, and **conduction**. Radiant heat is heat that travels in a wave. It is the heat that warms you as you sit near a campfire or a warm stove. Convection heat is heat that moves as heated air or gas. It is the heat that rises off of a campfire or above a boiling pot of water. Conduction is heat that moves through a material. Think of a metal spoon as it comes out of a hot cup of tea. Each type of heat transfer can warm, dry, and ignite fuels.

FUEL CHARACTERISTICS

Fuel characteristics determine how intense a wildland fire burns and how far it spreads. These characteristics include the type of fuel, its chemistry, size, and shape. The quantity of fuel and the way it is arranged also influence fire behavior.

Examples of fuel include trees and tree litter, grass, shrubs, and logging slash. Light fuels, such as grass, burn very fast and hot, while heavy fuels, such as logging slash, burn for long periods of time. Light fuels dry much faster. Their moisture varies throughout the day as temperature, humidity, and wind speed changes. Often the fire danger increases during the day and decreases as night approaches.

Often, the most dangerous characteristic of fuel can be the arrangement. Fire can occur as **ground fire** (burning organic material in the soil), as **surface fire** (burning the fuels found directly on the surface of the earth), and as **crown fire** (fire that moves through the tops of trees). Fuels that reach from the ground to the crowns of trees are called **ladder fuels**. Ladder fuels can cause fire to escalate from a surface fire to a crown fire. When fire enters the crowns of trees, it becomes very dangerous and uncontrollable.

WEATHER AND TOPOGRAPHY

Weather and topography are major influences on fire behavior. Weather is constantly changing because of local, regional, and continental influences – making it difficult to predict fire behavior. Weather influences can dry fuels and cause fire to spread. The three most common weather characteristics that determine when fire danger is high are moisture in the air, temperature, and wind. As precipitation and humidity decrease, fuels become more susceptible to fire. High temperatures and winds can quickly dry fuels and feed flames.

Fuel arrangement and weather patterns are influenced by topography. The landscape can influence which fuels get direct sunlight, which fuels receive more moisture from rainfall, and which areas have more exposure to wind. Landscape features can also channel wind currents, causing extreme changes in fire behavior. Heat travels upward and can preheat and ignite fuels, causing fire to move very quickly up slopes.

EXTREME FIRE BEHAVIOR

Extreme fire behavior creates very dangerous fire situations. It can lead to wildfires that may be unpredictable and uncontrollable. Extreme fire behaviors include torching, crowning, and spotting. **Torching** occurs when a surface fire ignites the crowns of individual trees and shrubs as it advances. This type of fire is spread by an advancing surface fire. **Crowning** occurs when a fire moves into the crowns of trees. **Spotting** occurs as fires produce sparks or embers that are carried away from the fire by convection or wind currents. Spots occur as new fires start outside of the original fire area, usually ahead of the advancing fire.

THE FIRE SEASON

In Wisconsin, most dangerous wildfires occur during the months of March, April, and May. This time of year, known as the **fire season**, is especially dangerous because much of the landscape is absent of living plants, and trees have not yet grown leaves. Green plant material helps maintain moisture levels on the ground, in the shrub layer, and in the forest canopy. Without green plants, dry climate conditions, winds, and increasing temperatures can quickly dry plant material found in grassy and forested areas, creating dangerous fire conditions.

Spring is not the only time of year people in Wisconsin need to be cautious of wildfire. Dry spells throughout summer and fall can also lead to dangerous fire situations. Dangerous fire situations occur when **relative humidity** is low, winds are strong and/or constant, temperatures are high, and fuels are readily available to burn. Fire conditions are constantly monitored by the U.S. Forest Service and the Wisconsin Department of Natural Resources - Division of Forestry. (At the time of printing, the following websites contained up-to-date information on fire conditions – *http://activefiremaps.fs.fed.us* and *www.dnr.state.wi.us/org/land/forestry/Fire/index.htm*.)

FIRE ECOLOGY

Wildland fire harms some species and benefits others, while some species remain unaffected. The interaction between fire and different species causes short and long-term changes in ecosystem functions, forest structure, and ecosystem composition.

Wildland fire influences **ecosystem functions**. Ecosystem functions support life. They include the fixation of energy, the flow of energy through food webs, and the cycling of matter. A very hot fire can remove seed sources and sterilize soil. In such cases, it may take years for a forest to return. A wildland fire that is less extreme can mineralize (decompose) organic material such as leaves, sticks, and logs very quickly – making nutrients available to plants. The process of decomposition that normally occurs on the forest floor can take years, and even decades, without wildland fire. Wildland fire can clear forest trees, shrubs, and other organic material. This increases sunlight penetration and stimulates plant growth, fixing energy into an ecosystem through photosynthesis.

New plant growth after wildland fire provides food to many types of animals. Food webs can be dramatically altered by wildland fire.

Wildland fire changes **forest structure**. Forest structure is the vertical and horizontal spacing of trees in a forest. Vertical layers are the overstory and the understory. Horizontal spacing is the density of tree cover across the landscape. The overstory consists of the largest trees in the forest that capture direct sunlight. The understory consists of smaller trees, shrubs, and herbaceous plants. Below the understory is the leaf litter and the topmost, organic-rich soil layer known as duff. All aspects of forest structure can be altered by wildland fire. For example, over time, fire could change a dense mixed hardwood forest into an oak savanna with widely spaced trees and a grassy understory.

Wildland fire changes the **composition** of an ecosystem. The type and distribution of plants and animals in an area is altered by wildland fire. Many plants cannot survive wildland fire. Maple species are a good examples of plants that cannot survive fire. Plants can also be resistant or resilient to wildland fire. A good example of a resistant plant is a large oak tree. The thick bark on an oak tree protects the living **cambium** from fire's heat. When many other trees and plants die in a wildland fire, large oak trees will remain. Another good example of a resilient plant is a jack pine tree. Wildland fires often destroy entire jack pine stands. Individual jack pine trees cannot survive the heat of a wildland fire. However, jack pine cones open and release seeds during periods of high heat ensuring that jack pine trees will recolonize after a fire.

In general, wildland fire in Wisconsin influences ecosystems in predictable ways. The following summaries of ecosystem responses to fire apply to ecosystems in Wisconsin that are fire dependent and fire tolerant. Though there are often exceptions, the summaries are very useful for understanding the ecological role of fire.

FIRE EFFECTS ON VEGETATION

- Increase in species diversity.
- Increase in biomass production.
- Short-term increase in annual and biennial species.
- Increase in flower, seed, fruit, or nut production.
- Improved forage quality, both in nutrition and palatability.
- Long-term shift in dominance away from plants with most of their biomass above ground to plants with most of their biomass below ground.

FIRE EFFECTS ON ANIMALS

- Initial drop in numbers and species resulting from mortality among invertebrates, reptiles, and small mammals.
- Eventual increase in animal numbers and species resulting from the increase of plant productivity and improved habitat structure.
- Should a species be totally removed or driven out from a site after a fire, it will recover only if individuals from another site are close enough to recolonize it.

FIRE EFFECTS ON SOIL

- Reduction in litter, duff, and humus layers above the mineral soil surface, resulting in warmer soil temperatures.
- Increase in fertility and organic matter within the mineral soil resulting from increased plant root and soil microorganism activity.

WISCONSIN FIRE DEPENDENT ECOSYSTEMS

Fire has been an important part of forest and grassland ecosystems in central and eastern North America for 25 to 30 million years. Many plants and animals have adapted to survive and flourish after wildland fires. For the past five to six thousand years, half the state of Wisconsin has been covered by fire dependent and fire tolerant ecosystems such as prairies, sedge meadows, oak savannas, and pine barrens. Periodic distributed fire has created a mosaic of ecosystems across the landscape – with some ecosystems isolated from wildland fire and others periodically exposed. Wisconsin's ecosystem diversity depends on the periodic occurrence of wildland fire. For more information on specific Wisconsin fire dependent ecosystems, see the LEAF website fire section at *www.leafprogram.org*.

WILDLAND FIRE AND SOCIETY

HUMANS AND FIRE

For wildfires to occur, a source of ignition is needed. In Wisconsin, human activities cause the majority of wildfire ignitions. On average, 97 percent of wildfires each year in Wisconsin are caused by humans. Outdoor burning, sparks from railroads, machinery, and many individual and group activities that occur in rural, forested or grassland areas can cause accidental wildfires. Often these activities involve fireworks, campfires, off-road vehicles, and use of gas-powered tools such as lawnmowers and chain saws. In some instances, wildfires are caused by natural sources such as lightning and microbial activity.

FIRE REGIMES

Regions in Wisconsin differ in **climate**, **topography**, **land cover**, **land use**, and land use history. These differences create distinct fire regimes. A **fire regime** is a cultural and biological system that defines the distribution, intensity, and frequency of fires in a given area. As suggested by the definition, there are two components to a fire regime – human activity and natural processes.

Both human and natural influences change over time. Forest **succession** and **climate change** are examples of natural processes that cause changes on the landscape over time. **Species introduction** and **land conversion** are examples of human activities that cause change.

The relationship between humans and the landscape is complex. It is well understood that today's human activities will influence future fire regimes. We are currently living in fire regimes shaped by the activities of human populations that came before us. An understanding of fire regimes, including both natural and human history, is necessary to manage ecosystems and to reduce the risk of catastrophic fire.

WISCONSIN'S HUMAN FIRE HISTORY

After the recession of the last glaciers, approximately 10,000 years ago, Native American populations migrated into Wisconsin. By the late 1400s, Wisconsin's native population was estimated at 60,000 people. Native people used fire to corral and hunt animals, to create animal habitat, and to clear areas for agriculture. These fires played a partial role in influencing Wisconsin's land cover. In the south, these fires expanded grasslands, prairies, and savannas. In the north, the many small fires cleared trees and shrubs, making way for sun-loving trees and plants. This expanded the patchwork of tree stands with different ages, structures, and compositions that were common across northern Wisconsin.

As European settlers moved to Wisconsin, they began to log, farm, and build towns. The widespread logging in the north and the conversion of the prairies in the south changed the fire regimes. In the north, many small fires were allowed to burn by populations who felt that as long as the fires weren't near their homes, they were only helping clear more farmland. On occasion, the small fires turned into large, intense fires fueled by the dead trees and slash left behind after logging. The extent and intensity of the fires was much greater than the fires started by Native American populations.

The most significant fire in Wisconsin's history was the Peshtigo Fire of 1871 that burned in Wisconsin and Michigan. The fire killed as many as 1,500 people and burned 1.5 million acres. In 1887, a wildfire nearly wiped out the city of Marshfield. In 1894, the Comstock Fire burned 64,000 acres in Barron and Washburn Counties, and the Phillips Fire burned 100,000 acres in Price County. Many other larger fires ravaged the state during this time, but the only documentation is in survey notes, personal journals, and newspaper clippings. Prior to 1930, it is estimated that some 2,500 fires burned half-a-million acres each year.

In the southern part of Wisconsin, the occurrence of fire was reduced due to agriculture. The conversion of land to agriculture and the decrease in fire reduced habitat for many of the large animals that lived in southern Wisconsin at the time. Bison, elk, and cougar that depended on the grasslands, prairies, and savannas were **extirpated** from the landscape.

With the hiring of E. M. Griffith as superintendent of forestry in Wisconsin in 1904, fire control efforts began in earnest. In 1905, Griffith appointed 249 town fire wardens around the state. Over the next 50 years, federal and state agencies, as well as county governments, developed the infrastructure for statewide fire control. A cooperative system of fire towers, radio communications, chartered aircraft, plows, tankers, and paid and volunteer fire fighters was put into place. Through the 1920s, 1930s, and 1940s, fire control efforts gained another powerful tool – fire prevention. In 1944, scattered prevention efforts were unified and nationalized with the use of Smokey Bear. His story and message helped fire prevention and control efforts become more effective.

Today, it is accepted that the effectiveness of fire prevention and suppression has had an impact on forest and grassland ecosystems that depend on fire to maintain their existence. Forest and grassland ecosystems that depend on fire have been severely reduced in size. Periodic fire thins many forests by clearing small trees and shrubs. In the absence of fire, some forests have grown thick with small trees that can fuel very intense wildfires.

In recent years, forest management has proven to be an effective way to reduce fuel buildup and decrease the risk of catastrophic fire. Prescribed fire has been shown to be a safe way to reduce fuel buildup as well as manage fire dependent ecosystems. The safe and correct use of prescribed fire and forest management is increasing, but their benefits are often unknown or misunderstood by the public.

THE COTTONVILLE FIRE

On May 5, 2005, Wisconsin's largest wildland fire in 25 years burned in Adams County, Wisconsin. Since 1932, there have been 41 major fires in the Adams County area. Jack and red pine cover much of this area and are extremely flammable during low moisture periods. Ignition of the fire was started by a human who was burning debris during a dry, warm, and windy day. The fire escaped his control and spread for 11 hours. The fire burned 3,410 acres, 30 homes, 60 outbuildings, and millions of dollars worth of timber. Suppression costs of the fire alone cost more than $287,000. This fire may have been avoided if the individual had followed the guidelines listed on the burning permit he was issued.

WILDLAND FIRE MANAGEMENT

AGENCIES RESPONSIBLE

In Wisconsin, wildland fire management is achieved through cooperation among Wisconsin citizens and municipal, county, state, and federal agencies. The cooperation of local police and fire departments with state and national agencies is essential to wildfire control. In Wisconsin, local fire departments, the Wisconsin Department of Natural Resources, the U.S. Forest Service, the U.S. Fish and Wildlife Service, and agencies from neighboring states all cooperate to manage wildland fire. All these agencies depend on funding from local, state, and federal taxes.

Wildland fire management uses the principles of fire behavior and an understanding of human fire practices to eliminate unwanted fires and promote beneficial ones. The goal of wildland fire management can be cultural (e.g., to protect historic sites from wildfire), ecological (e.g., to use controlled fire to maintain animal habitat), and economic (e.g., to protect property).

WILDFIRE PREVENTION

Wildfire prevention is a strategy used to reduce damage from fire through education, engineering, and enforcement methods. These fundamental steps help prevent accidental ignitions and reduce fire **risks** and **hazards**.

For more than 50 years, Smokey Bear has been at the forefront of wildfire education. Though the Smokey Bear prevention programs are the most visible, many other fire prevention programs exist for K-12 students. A variety of state and national agencies have developed educational materials that advance fire safety messages, help students understand fire ecology, promote the benefits of prescribed fire, and advertise career opportunities in wildland fire management.

It is important that both children and adults understand that outdoor fires can ignite and spread very rapidly. Throughout Wisconsin's history, many destructive fires were started accidentally and grew quickly beyond the control of citizens and sometimes even firefighters. The Cottonville Fire in May of 2005 is a modern example of an accidental ignition, attempted control by a landowner, and a fire that grew rapidly out of control.

Education and engineering methods are used in tandem to protect communities from the risks of wildfire. The Firewise Communities program has been very successful in educating homeowners about the proper location, construction, and landscaping of homes to reduce the risks of wildland fire.

The state of Wisconsin enforces forest fire regulations and restrictions. The regulations make the following activities unlawful:

- Burning without a permit, if required
- Burning materials other than wood, leaves, brush, grass, cardboard, and dry paper
- Failure to extinguish fires
- Allowing fire to escape
- Arson
- Destruction of property
- Negligent handling of burning material

Burning debris is the number one cause of accidental fire in Wisconsin. Burning permits are required in many parts of the state to conduct outdoor burning. Burning permits are free and can be obtained by contacting a local DNR office, emergency fire warden, or local fire official.

WILDFIRE SUPPRESSION

Wildfire suppression involves both **presuppression** activities and the active **suppression** of unwanted fire. Without presuppression preparation, the control of wildfire can be difficult or impossible.

Presuppression activities are conducted to reduce wildfire risk and prepare fire suppression forces. Presuppression activities include the construction and maintenance of roads, airports, and water infrastructure, the training of fire suppression teams, the management of fire prone forests, and the development and testing of suppression equipment.

When a wildfire occurs, fire suppression forces act to protect human life, property, and natural resources – in that order of priority. To accomplish these goals, fire suppression teams use three main strategies – evacuation, fire containment, and structural protection.

Evacuation is conducted to protect human life in and around a fire area. The first evacuation priority is to evacuate people from the fire area and fire path. In many instances wildfires have already engulfed or are threatening homes as firefighters arrive on the scene. Evacuation is often difficult because people do not want to leave their possessions. Fire evacuation requires that an area be designated and maintained to supply evacuees with food, shelter, and information. The shelter is often the area where officials communicate with local residents. To ensure the safety of local residents, news media, and sightseers, the fire perimeter needs to be secured. Local and state police often post officers at all entry roads into a fire area.

As evacuation efforts begin, an incident command center is established to coordinate fire suppression resources and provide information to the news media. Fire suppression teams then plan and initiate fire containment strategies to slow and stop the spread of wildfire. In Wisconsin, a widely used fire containment strategy is fuelbreak construction. Creating a “fuelbreak” or “fireline” involves removing the flammable organic matter found on or near the surface of the ground (e.g., plants, leaves, sticks, and black soil) to expose the mineral soil. Surface fires do not spread in mineral soil. Breaks are constructed to contain the lateral spread of fire. They can be constructed by crews using specialized hand tools or with heavy equipment.

Fire containment also involves the use of water and fuel reduction. The application of water reduces fuel temperatures and limits the oxygen available to a fire. Water can be applied on or in front of the fire using aircraft, heavy trucks, pumps from nearby water sources, and backpack water cans. Removing fuels in front of a fire reduces the fire intensity and improves the effectiveness of water use and line construction.

Fuels can be removed by clearing vegetation, but are also removed by lighting surface fires in the wildfire path. The fires burn away much of the ground level fuel, and when lit correctly, can deprive the wildfire of oxygen.

In tandem with evacuation, fire suppression crews protect structures, placing priority on homes and other buildings that have adequate defensible space. Suppression crews create breaks around structures and apply water from aerial drops by airplanes, heavy trucks, or local water sources. The effectiveness of structural protection depends on building and landscape design, housing patterns, and the intensity and behavior of the fire.

PRESCRIBED FIRE

Prescribed fire is an effective management tool that land managers can use to manipulate vegetation. Fire can be used to create and maintain animal habitat and reduce the risk of wildfire from an overabundance of fuels.

Prescribed fire is essential to the health of many Wisconsin ecosystems. For the 5,000 years prior to European settlement, half the state was covered by fire dependent ecosystems. Today, though, there is a higher frequency of fires and the size of the fires is much smaller, averaging about 10 acres in size. Wisconsin's pre-European history was characterized by infrequent, but very large fires (often greater than 10,000 acres). The large fires sustained ecosystems such as prairies and oak savannas.

Aggressive fire suppression policies protect property and investments and make much of Wisconsin's landscape safe for homes and businesses. This has come at a cost to native ecosystems. As fire has been removed from the landscape, ecosystems have changed, often limiting habitat for certain plants and animals and creating dangerous fire conditions due to the buildup of fuels.

In Wisconsin, an estimated 12,000 to 22,000 acres are purposefully burned using prescribed fire each year. By controlling the timing, frequency, and intensity of fire, fire managers have shown that they can create and sustain fire dependent ecosystems. Through rigorous safety precautions such as monitoring weather and fuel conditions, notifying adjacent landowners, and having suppression crews on-hand, fire managers have shown that prescribed fire is also very safe.

THE WILDLAND/URBAN INTERFACE

Over the last few decades, more and more people have abandoned city and suburban living for a more rural setting. In Wisconsin, new rural houses serve as permanent or seasonal homes and are often found in forested areas. Unfortunately, not everyone adapts to the fire danger that exists in wildland areas and protects their home and property correctly.

Today, not only do firefighters have to deal with the wildland fuels, but the structures that are mixed in with them as well. This area has come to be known as the Wildland/Urban Interface (WUI) and it is one of the biggest challenges to wildland and structural fire agencies. The simple fact is that in the event of a large fire, there will not be enough resources to protect every home.

Put yourself in the driver's seat of a fire truck at the scene of a large fire. Depending on the area, hundreds of homes may be threatened over the course of the fire. Your first priority is the safety of your personnel and citizens in the area. You may have many homes assigned to you to attempt to protect either before or after the fire front passes.

With the water you have, you can probably wet down two or three homes before having to refill your truck with water. On top of all this, you have limited visibility due to smoke, constant radio communications, the confusion of a panicked citizenry evacuating the area, and others trying to enter the area to get a firsthand look. Since time will not allow you to give attention to all the structures in your area before the fire arrives, you must determine where you can safely send your vehicle and personnel.

Unfortunately, even though housing in the WUI is increasing, the number of available firefighters and equipment is not increasing at the same rate. Oftentimes, firefighters in fire prone areas are working as volunteers and may not be fully aware of the potential problems in a community they are helping to protect.

Homeowners and fire officials can form a partnership to increase safety in the WUI. In this situation, homeowners take principle responsibility for assuring low home ignitability. Fire officials provide technical assistance as well as emergency response. The ideal situation is for homes to be designed, built, and maintained to withstand a wildfire without the intervention of the fire department. Homeowners can achieve this by following **Firewise practices**.

Firewise practices focus on three main areas to help property be compatible with the surrounding land – access, the surrounding vegetation and the structure itself.

ACCESS

Would firefighters be able to get to your home if there were a fire in the area? Driveways should be at least 12 feet wide with 14 feet of overhead clearance. Driveways longer than 150 feet or with sharp curves may need to be closer to 20 feet wide. A locked or closed gate can make entry to property impossible.

THE SURROUNDING VEGETATION
How easily can a fire spread from the adjacent vegetation to your home? The area within approximately 30 feet around all structures is thought of as a home's **defensible space**. If modified properly, this area can keep low-intensity surface fire from reaching structures. It can also provide a relatively safe area for firefighters to work in if they are able to help protect a home. This area should be kept mowed short, raked free of fallen leaves and needles, and green throughout the growing season. Remember that spring is when most wildfires occur in Wisconsin; cleanup at this time of year is essential.

THE STRUCTURE ITSELF
How flammable is your home? Any building on a property is potential fuel in a wildfire including garages, campers, and storage sheds. Anything attached to a structure is part of the structure. Roofs, rain gutters, and decks are natural traps for leaves, pine needles, and embers from a fire. These areas should be kept free of all material that could allow an ember to smolder and start a fire. Do not store flammable materials or allow debris to fill in under decks and overhangs. Chimneys, eaves, and vents should be kept covered with wire mesh to keep embers from blowing into structures.

To learn if your community is at risk, visit *www.fws.gov/fire/downloads/listedriskcomm.pdf*.

CAREERS IN WILDLAND FIRE

As development in rural, forested, and grassland areas increases, so does the need for professionals working in the field of wildland fire management. In addition, the effectiveness of prescribed fire and its increased use by many land managers requires professional training.

There are many career paths available in wildland fire management ranging from highly technical careers in research to education and public policy. Careers in wildland fire management include the following fields:

- **Forest Management:** Forestry professionals manage forested areas to reduce the risk of catastrophic fires, produce timber, and sustain forest services.
- **Range Management:** Rangeland professionals manage grasslands for livestock production and habitat conservation.
- **Fire Suppression:** Wildland and structural firefighters control accidental wildfires to protect lives, property, and natural resources.
- **Fire Education:** Communication and education professionals help people take positive actions to prevent destructive wildfire, protect their communities, and ensure that fire remains a part of the ecological landscape.
- **Fire Ecology:** Biologists study and manage ecosystems to sustain native plant and animal communities.
- **Research and Development:** Scientific researchers develop and test technologies and innovations to suppress fires, protect homes, and protect firefighters.
- **Land Use Planning:** Natural and human resource professionals work cooperatively to determine methods and policies to make human communities more compatible with fire prone landscapes.

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APPENDIX

GLOSSARY

BIAS: An opinion or belief that strongly favors one side of an issue.

BURN BARREL: A metal receptacle, most often a barrel, used for burning waste outdoors. Waste includes materials legal to burn such as wood and paper and materials illegal to burn such as plastic and metal.

CAMBIUM: The growing part of a trunk of a tree.

CLIMATE: Weather conditions for a region including temperature, precipitation, and wind.

CLIMATE CHANGE: The long-term fluctuations in precipitation, temperature, and wind caused mainly by variations in earth's orbital rotations, volcanic activity, human land use practices, and the combustion of fossil fuels.

COMPOSITION: The species in a community.

CONDUCTION: Transfer of heat through a material.

CONVECTION: Transfer of heat through a liquid or gas.

CROWN FIRE: A fire that spreads across the tops of trees or shrubs.

CROWNING: The movement of fire from a surface fire into the crown of trees. This is usually accomplished through ladder fuels.

CUTOVER: Land that has been logged. This term is often used as "the Cutover," which refers to northern Wisconsin after it was heavily logged during the period from the 1850s to the 1920s.

DANGEROUS: Something that can hurt you.

DEFENSIBLE SPACE: The area within 30 feet of a structure.

ECOSYSTEM FUNCTION: A function that supports life including the fixation of energy, cycling of matter, and flow of energy through food webs.

EXTIRPATED: The extinction of a species from a specific area.

FIRE BEHAVIOR: The manner in which a fire reacts to its environment.

FIRE INTENSITY: The amount of heat released per second as a wildland fire burns in a specified area; calculated by measuring the flame length, rate of spread, and heat per unit area.

FIRE PREVENTION: A variety of actions taken to decrease the risk of ignition of wildland fires; accomplished through education, engineering, and enforcement of laws.

FIRE REGIME: A cultural and biological system that defines the size, distribution, intensity, and frequency of fire in a given area.

FIRE SEASON: The periods of the year when wildland fires are likely to occur; there are two main fire seasons in Wisconsin – spring (March to June) and fall (September to November).

FIRE TRIANGLE: The three elements (i.e., fuel, oxygen, heat) necessary for combustion to occur.

FIREWISE BUILDINGS: Buildings designed with features that reduce the risk of the building burning in a wildfire. Firewise buildings use fire resistant materials, have open areas without fuels surrounding the house, and have good access roads.

FIREWISE PRACTICES: Actions homeowners can take to protect their homes from wildfire.

FOREST STRUCTURE: The vertical and horizontal spacing of trees in a forest. Vertical layers are the overstory and the understory. Horizontal spacing is the density of tree cover across the landscape.

FOREST THINNING: The removal of some of the trees in a forest; often done to reduce the risk of wildfire.

FUEL: Any material that can burn; any substance that contributes to the growth or spread of fire.

FUEL CHARACTERISTICS: Properties including quantity, chemistry, compaction, continuity, moisture content, and size.

GROUND FIRE: A fire that burns the organic material in the soil layer such as peat or duff.

HAZARD: Potential for a fire to start and spread.

HEAT TRANSFER: Energy transfer by radiation, convection, or conduction.

IGNITE: To cause something to start burning.

INFORMED DECISION: Deciding how to act on something after learning more about it.

KNOWLEDGE: Awareness and understanding of facts.

LADDER FUELS: Fuels which provide a vertical path for fire to move from ground level to the crowns of trees.

LAND CONVERSION: The change of an area from one land use to another.

LAND COVER: The ecological features present across the landscape such as forest, urban area, and field.

LAND USE: The human activities occurring across a landscape such as forest management, land development, and agriculture.

LIKERT SCALE: A rating system used to determine a person's perception of an issue. For example, a number system from 1-5 is used and "1" indicates a respondent strongly agrees with the statement and "5" indicates a respondent strongly disagrees.

NEWS ANCHOR: A person at a television station who reads the news and connects stories to reporters on the scene.

PERCEPTION: The feelings, attitudes, views, and judgments that a person has about something or someone.

PHENOMENON: An observable fact or event.

PRESCRIBED FIRE: A fire used to deliberately burn wildland fuels under specific conditions to meet desired management goals (e.g., fuel management, disease and pest control, wildlife habitat).

PRESUPPRESSION: Activities undertaken to prepare for fire suppression; includes the construction of access roads, preparation of suppression strategies, and training of suppression teams.

PROP: An object used by an actor or actress in a play.

PUBLIC OPINION SURVEY: A survey used to measure public understanding and perception of an issue.

RADIATION: Heat that travels in a wave.

RATE OF SPREAD: The speed (feet per minute) at which a wildland fire moves into new fuels.

RELATIVE HUMIDITY: The ratio of the amount of water vapor in the air at a specific temperature to the maximum amount that the air could hold at that temperature, expressed as a percentage.

RESPONSIBLE ADULT: A grown-up who takes care of something and uses it safely.

RISK: Potential for a fire to ignite.

SAFE: Something that won't hurt you.

SAMPLE POPULATION: The subgroup of a target population that is actually studied.

SAMPLING: The process of selecting a group of people to be studied from within a larger population being studied.

SCIENTIFIC METHOD: A method of research in which a problem is identified or observed, a hypothesis is formulated, and the hypothesis is tested.

SCRIPT: The words that actors read during a play.

SPECIES INTRODUCTION: The arrival and establishment of organisms that are not native to an ecosystem.

SPOTTING: The ignition of new fires outside of the original fire area caused by wind-blown sparks or embers.

SUCCESSION: The gradual change from one biological community to another.

SUPPRESSION: The act of confining and extinguishing a wildland fire.

SURFACE FIRE: A fire that burns fuels on the forest floor such as leaf litter and small vegetation.

SYSTEM DIAGRAM: A tool that helps describe how complex systems work; they are helpful in showing how a change in one factor may affect another factor.

TARGET POPULATION: The group of interest in a research project.

TOPOGRAPHY: The relative elevation and configuration of features in a landscape.

TORCHING: The ignition and flare-up of a tree or small group of trees, usually from bottom to top.

WILDFIRE: A wildland fire that ignites and spreads without the intent of the landowner.

WILDLAND FIRE: An outdoor fire involving primarily vegetative fuels.

WILDLAND/URBAN INTERFACE: An area where human structures are in close proximity to wildland fuels.

WISCONSIN MODEL ACADEMIC STANDARDS

LEAF Wildland Fire lessons address Wisconsin Model Academic Standards in English Language Arts, Environmental Education, Mathematics, Science, Social Studies, and Visual Arts. On the following pages, you will find the standards listed by lesson along with an explanation of how they are addressed by each lesson.

K-1ST GRADE LESSON: MY FEELINGS ABOUT FIRE

VISUAL ARTS A.4.1
Visual Memory and Knowledge

Standard is: Develop a basic mental storehouse of images.

Students give examples of events in their lives that relate to emotions and share examples of safe and dangerous situations.

VISUAL ARTS I.4.1
Personal and Social Development

Standard is: Use art to understand how they feel.

Students indicate their feelings with emotion cards as they look at the pictures of safe and dangerous fire situations.

VISUAL ARTS I.4.3
Personal and Social Development

Standard is: Talk or write about feelings in a work of art.

Students discuss their feelings related to pictures of safe and dangerous fire situations.

2ND-3RD GRADE LESSON: SMOKEYTOONS: A LOOK AT FIRE AND HUMAN BEHAVIOR

SCIENCE D.4.4
Properties of Earth Materials

Standard is: Observe and describe changes in form, temperature, color, speed, and directions of objects and construct explanations for the changes.

Students examine ashes made from burning paper and describe how fire changed the paper to ash.

VISUAL ARTS E.4.3
Visual Communication and Expression

Standard is: Communicate basic ideas by producing popular images and objects such as folk art, traditional arts and crafts, popular arts, mass media, and consumer products.

Students produce comic strips to convey a fire prevention message.

VISUAL ARTS K.4.3
Making Connections

Standard is: Use what they are learning about life, nature, the physical world, and people to create art.

Students use the information they have learned about to create comic strips that convey a fire prevention message.

4TH GRADE LESSON: THE PESHTIGO THEATER COMPANY PRESENTS: THE LIFE OF FIRE

ENGLISH LANGUAGE ARTS A.4.1
Reading and Literature

Standard is: Use effective reading strategies to achieve their purposes in reading.

- Read aloud with age-appropriate fluency, accuracy, and expression
- Discern how written texts and accompanying illustrations connect to convey meaning

Students design a play set from a script and picture and act out the play by reading a script.

ENGLISH LANGUAGE ARTS C.4.2
Oral Language

Standard is: Listen to and comprehend oral communications.

- Recall the content of stories after hearing them, relate the content to prior knowledge, and answer various types of factual and interpretive questions about the stories

Students answer questions after each scene in a play and discuss the answers.

ENGLISH LANGUAGE ARTS C.4.3
Oral Language

Standard is: Participate effectively in discussion.

- Volunteer relevant information, ask relevant questions, and answer questions directly
- Reflect on the ideas and opinions of others and respond thoughtfully
- Ask for clarification and explanation of unfamiliar words and ideas

Students answer and discuss questions after each scene in a play.

SOCIAL STUDIES A.4.4
Geography: People, Places, and Environments

Standard is: Describe and give examples of ways in which people interact with the physical environment including use of land, locations of communities, methods of construction, and design of shelters.

Students participate in a play and discussion that explores the role humans have played in wildland fire and how it has altered our environment.

SOCIAL STUDIES A.4.8
Geography: People, Places, and Environments

Standard is: Identify major changes in the local community that have been caused by human beings, such as a construction project, a new highway, a building torn down, or a fire; discuss reasons for these changes; and explain their probable effects on the community and the environment.

Students participate in a play and discussion that explores how human communities have been altered by wildland fire.

5TH-6TH GRADE LESSON: IN THE HOT SEAT: THE PROCESS AND SCIENCE OF DECISION-MAKING

ENVIRONMENTAL EDUCATION B.8.10
Energy and Ecosystems

Standard is: Explain and cite examples of how humans shape the environment.

Students are faced with a series of dilemmas about human actions and fire and must make decisions on how best to respond.

ENVIRONMENTAL EDUCATION D.8.1
Decision and Action Skills

Standard is: Identify options for addressing an environmental issue and evaluate the consequences of each option.

Students are faced with a series of dilemmas about human actions and fire and must make decisions on how best to respond.

ENVIRONMENTAL EDUCATION D.8.4
Decision and Action Skills

Standard is: Explain the political, legal, and budgetary options for resolving local, state, and national environmental issues.

Students participate in mock town council meeting and lobby for and determine the consequences of the passage of certain legislation.

ENVIRONMENTAL EDUCATION D.8.5
Decision and Action Skills

Standard is: Explain how personal actions can impact an environmental issue.

Students are faced with a series of dilemmas about human actions and fire and must make decisions on how best to respond. Discussion that follows helps students understand the impact of each action.

SCIENCE A.8.6
Science Connections

Standard is: Use models and explanations to predict actions and events in the natural world.

Students use system diagrams to represent how events and outcomes are related.

SOCIAL STUDIES D.8.4
Economics: Production, Distribution, Exchange, Consumption

Standard is: Describe how investments in human and physical capital, including new technology, affect standard of living and quality of life.

Students participate in a mock town meeting where they try to pass legislation that will cost their community money, but will provide for increased safety and quality of life.

SOCIAL STUDIES E.8.5
The Behavioral Sciences: Individuals, Institutions, and Society

Standard is: Describe and explain the means by which groups and institutions meet the needs of individuals and societies.

Students participate in a mock town meeting and learn how the government provides for the needs of citizens and the betterment of society.

7TH-8TH GRADE LESSON: NATURAL PHENOMENA INVESTIGATORS (NPI)

ENGLISH LANGUAGE ARTS A.8.1
Reading and Literature

Standard is: Use effective reading strategies to achieve their purpose in reading including using texts to find information, make decisions, and to select, summarize, and analyze orally and in writing.

Student groups read a variety of textual information to find pertinent information, draw conclusions, and report their findings orally to their investigation group and class.

ENGLISH LANGUAGE ARTS A.8.4
Reading and Literature

Standard is: Read to acquire information including the use of technical resources such as charts, tables, travel schedules, timelines, and manuals.

Students interpret data from a variety of sources including tables, written logs, maps, and background information.

ENGLISH LANGUAGE ARTS B.8.1
Writing

Standard is: Create or produce writing to communicate with different audiences for a variety of purposes including writing a clear and pertinent response to verbal or visual materials that communicate, explain, and interpret the reading.

Student investigation groups review a variety of materials to develop a statement that reflects the circumstances leading to a fire. They are given additional materials and must adjust their statement based on additional knowledge.

ENGLISH LANGUAGE ARTS C.8.1
Oral Language

Standard is: Orally communicate information, opinions, and ideas effectively to different audiences for a variety of purposes.

Student investigation groups are asked to make a statement to the class about their findings.

ENGLISH LANGUAGE ARTS C.8.3
Oral Language

Standard is: Participate effectively in discussion including explaining and advancing opinions by citing evidence and referring to sources.

Students in investigation groups participate in discussions to debate findings and come to a consensus on what to report to the class.

ENGLISH LANGUAGE ARTS F.8.1
Research and Inquiry

Standard is: Conduct research and inquiry of self-selected or assigned topics, issues, or problems and use an appropriate form to communicate the findings, including using multiple sources.

Students research several topics related to wildland fire using a variety of resources provided and work in teams to develop position statements on each.

ENVIRONMENTAL EDUCATION A.8.4
Questioning and Analysis

Standard is: Use critical thinking strategies to interpret and analyze gathered information.

Students use critical thinking to analyze data, primary sources, maps, and definitions to investigate the spread and control of a wildland fire.

ENVIRONMENTAL EDUCATION A.8.5
Questioning and Analysis

Standard is: Use the results of their investigations to develop answers, draw conclusions, and revise their personal understanding.

Students make predictions about the spread of a wildland fire and then use data, primary sources, maps, and definitions to investigate the wildland fire and postulate why their predictions may not have been correct.

MATHEMATICS A.8.1
Mathematical Processes

Standard is: Use reasoning abilities to evaluate information, perceive patterns, identify relationships, evaluate strategies, and justify statements.

Students work in investigation teams to identify relationships, evaluate strategies, and justify statements using primary source documents.

MATHEMATICS D.8.2
Measurement

Standard is: Demonstrate an understanding of basic measurement facts, principles, and techniques.

Students measure the rate of the spread of the fire using locations on a map and the map scale of miles. They compute the rate in feet per minute.

MATHEMATICS E.8.4
Statistics and Probability

Standard is: Use the results of data analysis to make predictions, develop convincing arguments, and draw conclusions.

Student investigation groups use a variety of data, maps, primary sources, and definitions to predict, draw conclusions, and develop convincing arguments to be shared with the class.

SCIENCE C.8.6
Science Inquiry

Standard is: State what they have learned from investigations, relating their inference to scientific knowledge and to data they have collected.

Students discuss information in investigation teams and present their findings to the class.

SCIENCE H.8.3
Science in Social and Personal Perspectives

Standard is: Understand the consequences of decisions affecting personal health and safety.

Students discuss post-fire dilemmas and examine the pros and cons of each action.

9TH-12TH GRADE LESSON: WILDLAND FIRE ISSUES AND EDUCATION

ENGLISH LANGUAGE ARTS F.12.1
Research and Inquiry

Standard is: Conduct research and inquiry on self-selected or assigned topics, issues, or problems and use an appropriate form to communicate their findings.

- Formulate questions addressing issues or problems that can be answered through a well-defined and focused investigation.
- Develop research strategies appropriate to the investigation, considering methods such as questionnaires, experiments, and field studies.
- Evaluate the usefulness and credibility of data and sources by applying tests of evidence including bias, position, expertise, adequacy, validity, reliability, and date.

Students develop, conduct, and analyze the results of a survey to test hypotheses they have written.

ENVIRONMENTAL EDUCATION A.12.3
Questioning and Analysis

Standard is: Evaluate personal investigations and those of others, critiquing procedures, results, and sources of data and suggest improvements to the investigation.

Students conduct a survey and analyze the results. They discuss bias in surveys and how that could be eliminated.

ENVIRONMENTAL EDUCATION A.12.4
Questioning and Analysis

Standard is: State and interpret their results accurately and consider other explanations for their results.

Students analyze data collected from a survey and interpret the findings of the study.

SCIENCE C.12.1
Science Inquiry

Standard is: When studying science content, ask questions suggested by current social issues, scientific literature, and observations of phenomena; build hypotheses that might answer some of these questions; design possible investigations; and describe results that might emerge from such investigations.

Students use the scientific method to generate a hypothesis about a wildfire social phenomena and generate questions as part of a survey to test their hypothesis.

SCIENCE C.12.3
Science Inquiry

Standard is: Evaluate the data collected during an investigation, critique the data-collection procedures and results, and suggest ways to make any needed improvements.

Students conduct a survey and analyze the results. They discuss bias in surveys and how that could be eliminated.

WISCONSIN MODEL ACADEMIC STANDARDS

Standard	K-1st Grade Lesson	2nd-3rd Grade Lesson	4th Grade Lesson	5th-6th Grade Lesson	7th-8th Grade Lesson	9th-12th Grade Lesson
ENGLISH LANGUAGE ARTS						
A.4.1			✓			
A.8.1					✓	
A.8.4					✓	
B.8.1					✓	
C.4.2			✓			
C.4.3			✓			
C.8.1					✓	
C.8.3					✓	
F.8.1					✓	
F.12.1						✓
ENVIRONMENTAL EDUCATION						
A.8.4					✓	
A.8.5					✓	
A.12.3						✓
A.12.4						✓
B.8.10				✓		
D.8.1				✓		
D.8.4				✓		
D.8.5				✓		

(Continued on page 174.)

WISCONSIN MODEL ACADEMIC STANDARDS

Standard	K-1st Grade Lesson	2nd-3rd Grade Lesson	4th Grade Lesson	5th-6th Grade Lesson	7th-8th Grade Lesson	9th-12th Grade Lesson
MATHEMATICS						
A.8.1					✓	
D.8.2					✓	
E.8.4					✓	
SCIENCE						
A.8.6				✓		
C.8.6					✓	
C.12.1						✓
C.12.3						✓
D.4.4		✓				
H.8.3					✓	
SOCIAL STUDIES						
A.4.4			✓			
A.4.8			✓			
D.8.4				✓		
E.8.5				✓		
VISUAL ARTS						
A.4.1	✓					
E.4.3		✓				
I.4.1	✓					
I.4.3	✓					
K.4.3		✓				

SUBJECT AREAS

	ENGLISH LANGUAGE ARTS	GEOGRAPHY	HEALTH	MATHE-MATICS	SCIENCE	SOCIAL STUDIES	VISUAL ARTS
K-1ST GRADE LESSON My Feelings About Fire							
2ND-3RD GRADE LESSON SmokeyToons: A Look at Fire and Human Behavior							
4TH GRADE LESSON The Peshtigo Theater Company Presents: The Life of Fire							
5TH-6TH GRADE LESSON In the Hot Seat: The Process and Science of Decision-making							
7TH-8TH GRADE LESSON Natural Phenomena Investigators (NPI)							
9TH-12TH GRADE LESSON Wildland Fire Issues and Education							

MULTIPLE INTELLIGENCES

Multiple Intelligences can be thought of as different modes of learning and retaining information. Generally, everyone has all the multiple intelligences, but in varying strengths. Students excel when they have an opportunity to express themselves in their preferred intelligences, but also need to have opportunities to strengthen other areas. The table below lists each of the Wildland Fire lessons and the multiple intelligences that are addressed.

V-L: VERBAL-LINGUISTIC
Using language to express ideas and concepts, thinking symbolically and reasoning abstractly, and the ability to create conceptual verbal patterns.

L-M: LOGICAL-MATHEMATICAL
Skillfully able to think logically, inductively, categorically; recognize patterns; and work with abstract concepts.

V-S: VISUAL-SPATIAL
Perceiving images and spatial elements and representing those expressions effectively.

B-K: BODILY-KINESTHETIC
Creatively using the whole body to illustrate ideas and concepts.

M-R: MUSICAL-RHYTHMIC
Discriminating among musical components and using instruments or the voice to express understanding.

INTER: INTERPERSONAL
Demonstrating empathy toward or appreciating the thoughts and feelings of others.

INTRA: INTRAPERSONAL
Analyzing one's own thoughts and motivations and expressing understanding of those thoughts and feelings through behavior.

NAT: NATURALISTIC
Sensing patterns in and making connections with nature and the environment.

	V-L	L-M	V-S	B-K	M-R	Inter	Intra	Nat
K-1st Grade Lesson - My Feelings About Fire	✓	✓	✓			✓		✓
2nd-3rd Grade Lesson - SmokeyToons: A Look at Fire and Human Behavior	✓	✓	✓			✓	✓	✓
4th Grade Lesson - The Peshtigo Theater Company Presents: The Life of Fire	✓	✓		✓		✓	✓	
5th-6th Grade Lesson - In the Hot Seat: The Process and Science of Decision-making	✓	✓	✓			✓	✓	
7th-8th Grade Lesson - Natural Phenomena Investigators (NPI)	✓	✓	✓			✓	✓	
9th-12th Grade Lesson - Wildland Fire Issues and Education	✓	✓				✓		

LESSON CONNECTIONS TO THE *LEAF WILDLAND FIRE CONCEPTUAL GUIDE*

The objectives of each lesson in the ***LEAF Wisconsin K-12 Wildland Fire Lesson Guide*** are based on subconcepts outlined in the ***LEAF Conceptual Guide to K-12 Wildland Fire Education in Wisconsin***. This chart identifies the subconcepts covered by each lesson.

	Theme 1: What Is Wildland Fire?												Theme 2: Why Is Wildland Fire Important?							Theme 3: How Do We Manage Wildland Fire?						Theme 4: What Is the Future?											
Sub-concept	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K-1st		✓																								✓										
2nd-3rd	✓	✓	✓																							✓										
4th	✓	✓	✓				✓							✓	✓											✓										
5th-6th	✓	✓											✓									✓				✓	✓			✓		✓				
7th-8th	✓	✓	✓		✓											✓																✓				
9th-12th		✓											✓					✓									✓					✓	✓			

LEAF WISCONSIN K-12 FORESTRY EDUCATION LESSON GUIDE OVERVIEWS

This ***LEAF Wisconsin K-12 Wildland Fire Lesson Guide*** is a supplement to the ***LEAF Wisconsin K-12 Forestry Education Lesson Guide*** (LEAF Guide). The LEAF Guide is comprised of six grade specific units: K-1, 2-3, 4, 5-6, 7-8, and 9-12. The LEAF Guide is obtained by participating in a LEAF workshop. Workshop participants receive forestry background information and practical experience using the LEAF Guide. Workshops vary in length and format, sometimes including an option for graduate credit and/or hands-on field experiences.

K-1 UNIT

5 CLASSROOM LESSONS, 1 CAREERS LESSON, 3 FIELD ENHANCEMENTS

The K-1 Unit is an introduction to trees and forests. Students learn about the parts of a tree, what forests are, and why they are important.

LESSON 1 - TREE HARDWARE
Students are introduced to the parts of a tree and its life stages through songs, games, and role playing.

LESSON 2 - WHAT'S IN A FOREST?
Students learn about living and nonliving parts of a forest by playing a game and creating artwork.

LESSON 3 - MY FAVORITE FOREST USE
Students discover the value of forests by studying *Tree Spy* collages and singing a song.

LESSON 4 - FOREST PRODUCT TIME MACHINE
Students explore historical uses of forest resources and compare them to present-day goods by surveying pictures and creating drawings.

LESSON 5 - ANIMALS NEED FORESTS, TOO
Students find out what forests do for animals and play a game to search for basic needs.

CAREERS EXPLORATION
Students learn about forestry-related careers, participate in a matching exercise, and draw their favorite career.

FIELD ENHANCEMENT 1 - ALL ABOUT MY TREE
Students adopt a tree and record their observations to create a class scrapbook.

FIELD ENHANCEMENT 2 - SENSING THE FOREST
Students use all their senses to discover the living and nonliving parts of a forest.

FIELD ENHANCEMENT 3 - SEARCHING FOR BASIC NEEDS
Students examine the needs of animals and evaluate if their playground can support various critters.

2-3 UNIT

6 CLASSROOM LESSONS, 1 CAREERS LESSON, 3 FIELD ENHANCEMENTS

The 2-3 Unit expands on basic ideas about forests and helps students understand their connection to forests. Students learn about energy flow, basic tree identification skills, forest products, and what it means to be a forest steward.

LESSON 1 - TO BE A TREE
Students use their knowledge of tree parts to learn basic tree identification skills. Basic needs and life stages of a tree are also emphasized through a game and drawing activity.

LEAF WISCONSIN K-12 FORESTRY EDUCATION LESSON GUIDE OVERVIEWS

LESSON 2 - WHAT MAKES A FOREST?
Students discover how living things are influenced by nonliving things through a matching activity, song or skit, and creating a class mural of Wisconsin forests.

LESSON 3 - FOREST ENERGY FLOW
Students learn about energy flow in the forest by role-playing producers, consumers, and decomposers.

LESSON 4 - FORESTS ARE IMPORTANT TO ME!
Students explore forest values and discover what forest products come from Wisconsin using a checklist. Creative writing and an art project help students examine why they value forests.

LESSON 5 - DECISIONS, DECISIONS
Students are introduced to the concept of forest management by creating a plan for their schoolyard. A card game and song highlight some of the people involved in forest management.

LESSON 6 - I CAN BE A FOREST STEWARD
Students find out what it means to be a forest steward and make decisions about good stewardship activities through an *I Spy*-like picture and board game.

CAREERS EXPLORATION
Students learn about professionals in Wisconsin with forestry-related careers, match jobs and duties, and draw themselves in a career that interests them.

FIELD ENHANCEMENT 1 - I CAN BE A FORESTER
Students get a taste of what foresters do by collecting and discussing data.

FIELD ENHANCEMENT 2 - OBSERVING FOREST INTERACTIONS
Students explore living and nonliving forest features on a hike and spend time observing and drawing parts of a forest.

FIELD ENHANCEMENT 3 - FOREST ENERGY SCAVENGER HUNT
Students follow the flow of energy in a forest by going on a scavenger hunt.

4 UNIT
7 CLASSROOM LESSONS, 1 CAREERS LESSON, 3 FIELD ENHANCEMENTS

The 4 Unit focuses on Wisconsin forest history. Students learn about the logging days, farming the Cutover, events that led to modern forestry, and why forests are important today.

LESSON 1 - NATIVE AMERICANS AND THE FOREST
Students read the journal of an early explorer to learn what Wisconsin forests were like before European settlement and how Native Americans used the forests.

LESSON 2 - FORESTS BUILT OUR STATE
Students explore the importance of forests to early settlers and learn how forests played a role in settling Wisconsin through a mapping activity.

LESSON 3 - HELP WANTED – LUMBERJACKS
Students examine the steps and people involved in an 1800s logging process by following a tree from northern Wisconsin to a house in Iowa.

LESSON 4 - BROKEN DREAMS
Students experience what it was like to farm in Wisconsin during the "Cutover" by role-playing and studying letters, photographs, and documents.

LESSON 5 - I SAW IT ON THE 6 O'CLOCK NEWS
Students learn about 150 years of events in Wisconsin that have led to the forests of today by participating in a live newscast.

LEAF WISCONSIN K-12 FORESTRY EDUCATION LESSON GUIDE OVERVIEWS

LESSON 6 - FORESTS ARE IMPORTANT TO YOU AND ME
Students discover reasons why Wisconsin forests are important to our quality of life through guided imagery, brainstorming, and an interactive media presentation.

LESSON 7 - SUSTAINING OUR FORESTS
Students are introduced to the sustainability and stewardship of forests by listening to a fable, brainstorming, reading situation cards, and creating an art project.

CAREERS EXPLORATION
Students learn about professionals in Wisconsin with forestry-related careers, play career bingo to learn about skills used in each profession, and describe and draw themselves in a career.

FIELD ENHANCEMENT 1 - UNLOCKING A FOREST'S PAST
Students uncover a forest's history by becoming detectives, collecting data, and making predictions about a forest.

FIELD ENHANCEMENT 2 - ARE FORESTS IMPORTANT TODAY?
Students find out why forests are ecologically, economically, and socially valuable by searching in a forest and playing scavenger hunt bingo.

FIELD ENHANCEMENT 3 - CARING FOR THE FUTURE OF FORESTS
Students learn what a tree needs to grow, how to choose an appropriate site, and how to properly plant a tree by putting one in their schoolyard.

5-6 UNIT
8 CLASSROOM LESSONS, 1 CAREERS LESSON, 3 FIELD ENHANCEMENTS

The 5-6 Unit connects the science of forests with human aspects. Students learn about forest layers, ecosystems, and energy flow. This information is related to the value of trees, forest ownership, and management.

LESSON 1 - ME AS A TREE
Students learn about a tree's functions, basic needs, life stages, and role in the forest community by comparing trees and humans.

LESSON 2 - WHAT MAKES A FOREST?
Students explore parts of forest ecosystems and forest layers through an interactive game and discussion.

LESSON 3 - FORESTS ARE ALWAYS CHANGING
Students examine forest succession, disturbances, and renewability by completing a sustainability worksheet and role-playing.

LESSON 4 - ECOSYSTEM EXTRAVAGANZA
Students are introduced to forest functions such as photosynthesis, energy flow, and the cycling of matter through reading and creating a diagram. The roles of producers, consumers, and decomposers in forests are also examined.

LESSON 5 - WE ALL NEED TREES
Students learn about the values of forests and their impact on the environment by categorizing values and writing and producing a commercial.

LESSON 6 - WHAT IS MANAGEMENT?
Students discover what's happened in Wisconsin's history that led us to modern forestry and about management techniques by creating a timeline and reading a "choose your own adventure" type story.

LESSON 7 - WHO OWNS IT?
Students observe how management goals of landowners impact forest ecosystems by studying a plat map and answering questions. They also learn about the roles individuals and groups play that affect forest management.

LEAF WISCONSIN K-12 FORESTRY EDUCATION LESSON GUIDE OVERVIEWS

LESSON 8 - WHOSE JOB IS IT?
Students learn about stewardship and how their choices affect the future of forests by participating in a mock school board meeting.

CAREERS EXPLORATION
Students become aware of careers that are forestry-related by listening to descriptions of them and playing charades.

FIELD ENHANCEMENT 1 - WOOD'S WORTH
Students make their own tree scale stick and use it to calculate the number of products that can be made from individual trees. They also go on a scavenger hunt to explore many ways that forests are valuable.

FIELD ENHANCEMENT 2 - STUDYING FOREST LAYERS
Students observe the structural layers of a forest and draw a color-coded picture. They also embark on two exploration activities to discover which animals can be found in each of the forest layers.

FIELD ENHANCEMENT 3 - COMPETITION IN A FOREST
Students learn how trees compete for their basic needs through observation and a simulation.

7-8 UNIT

8 CLASSROOM LESSONS, 1 CAREERS LESSON, 3 FIELD ENHANCEMENTS

The 7-8 Unit highlights a wide variety of topics related to Wisconsin's forests. Students learn about forest biomes, types of forests, biodiversity, forest management, forest trends, forest issues, forest products, and sustaining forests.

LESSON 1 - DISCOVERING WISCONSIN'S FORESTS
Students are introduced to the types of forests in Wisconsin and factors that affect their distribution through data comparison, a mapping activity, and video research.

LESSON 2 - BIODIVERSITY AND THE FOREST CONNECTION
Students analyze three ecosystems to determine their interconnections and create a Venn diagram. They also discuss the value of Wisconsin's forests in terms of biodiversity.

LESSON 3 - HOW FORESTS ARE MANAGED
Students explore forest management plans, multiple use, and sustainability through a simulation, video, and game.

LESSON 4 - FOREST MANAGEMENT ISSUES
Students examine forest management, factors that influence decisions, effects, and conflicts through brainstorming, discussion, and issue analysis.

LESSON 5 - MANY FORESTS, MANY VALUES, MANY REASONS
Students assess forest values and discover how forests shape the economy, environment, and society using games, story analysis, and brainstorming.

LESSON 6 - MAKING BROADER CONNECTIONS
Students make connections between forests of Wisconsin and forests worldwide and discuss challenges to Wisconsin's forests by tracing the life cycle of a product and playing Forest Jeopardy. They also participate in a sustainability simulation to learn about demand.

LESSON 7 - KEY STRATEGIES FOR OUR FUTURE
Students learn how science, technology, and collaboration are keys to sustaining Wisconsin's forests by analyzing articles. They then make predictions about the future by creating a *Fantasy Future Forest*.

LEAF WISCONSIN K-12 FORESTRY EDUCATION LESSON GUIDE OVERVIEWS

LESSON 8 - SUSTAINING OUR FORESTS: CITIZENS' ROLES
Students discover how people in Wisconsin practice good forest stewardship and debate their own choices through jigsaw readings and dilemma cards.

CAREERS EXPLORATION
Students learn about professionals in Wisconsin with forestry-related careers and examine the skills, education, and experience necessary for each type of job.

FIELD ENHANCEMENT 1 - TREE IDENTIFICATION
Students are introduced to dichotomous keys and tree identification vocabulary to identify common Wisconsin trees.

FIELD ENHANCEMENT 2 - FOREST MAPPING
Students work in groups to map features of a forest plot using data collection, tree identification, measurement, and ageing.

FIELD ENHANCEMENT 3 - FOREST DIVERSITY
Students study and collect data on three components of diversity that can be found in Wisconsin forests.

9-12 UNIT

5 CLASSROOM LESSONS, 1 CAREERS LESSON

The 9-12 Unit has an environmental science focus. Students learn about forest ecosystem processes, succession, the economics of forest products, and science and technology.

LESSON 1 - THE FOREST ODYSSEY
Students learn about forest ecosystem functions and processes by reading an Aldo Leopold essay, doing research, and creating an original science-based essay as a class.

LESSON 2 - A HISTORY OF SUCCESSION
Students explore how Wisconsin's forests have changed due to human and natural influences through a teacher presentation, readings, and a video. Current changes in Wisconsin's forests are discussed using a Wisconsin Land Cover Map.

LESSON 3 - FOREST BIODIVERSITY: TREE CASE STUDIES
Students study how Wisconsin's climate and natural history influence forest biodiversity. They use case studies to develop insights into the question, "What is a healthy level of forest biodiversity?" In groups, they create an original poster and presentation.

LESSON 4 - THE FOREST MARKETPLACE
Students identify factors that influence the supply of and demand for forest resources using basic economic principles. Using veneer as an example, students use graphs to describe markets in different geographic regions and examine the relationship between Wisconsin's forest resources and those of the rest of the world.

LESSON 5 - FOREST SCIENCE AND TECHNOLOGY
Students analyze the environmental impacts associated with wood, concrete, and steel by creating life cycle analyses. They study the roles that forest management, technology, and consumption play in sustaining forests and develop proposals to reduce the environmental impacts of wood use.

CAREERS EXPLORATION
Students learn about job opportunities in natural resource fields by creating a resume from the education and experiences of college students in Wisconsin.

LESSON FEEDBACK FORM (WILDLAND FIRE LESSON GUIDE)

We want to hear from you! Your comments and suggestions will contribute to the effectiveness of the *LEAF Wisconsin K-12 Wildland Fire Lesson Guide*.

Subject Areas and/or Grade Levels Taught _____

Name (optional) _____

School Name (optional) _____

School Address (optional) _____

School Phone (optional) _____

School Email (optional) _____

What recommendations do you have to improve the guide/lesson? **If comments relate to a specific part of a particular lesson, please list page numbers for reference.**

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Please send comments to: LEAF, WCEE/CNR UWSP, Stevens Point, WI 54481, leaf@uwsp.edu