

5TH-6TH GRADE LESSON

In the Hot Seat: The Process and Science of Decision-making

NUTSHELL

In this lesson, students work in groups to develop solutions to wildland fire dilemmas. They participate as a class in a mock town board meeting. Students work in small groups to create system diagrams that help them predict the consequences of legislation and develop more effective ways to resolve wildland fire issues.

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)
- Current conditions are a result of past events. Decisions about the use of prescribed fire and the suppression of wildland fire affect present and future society. (Subconcept 13)
- Decisions about fire management involve land managers, property owners, communities, and governments. The needs of each group should be taken into consideration. (Subconcept 22)
- 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)
- Homeowners have a responsibility to protect their property from wildland fire. The location, landscaping, maintenance, and design of a home can influence the threat of wildland fire to residents and their property. (Subconcept 27)
- Due to human land use and historical fire suppression, some of Wisconsin's fire dependent plant communities (e.g., oak savannas, pine barrens, prairies) have been

- reduced in size. Reintroduction of fire will be important to their existence. (Subconcept 30)
- The wildland/urban interface is an area where human structures exist among wildland fuels. As people move into fire prone areas, the potential for ignition of wildland fire increases, and buildings and other human-made objects become a possible fuel source. (Subconcept 32)

OBJECTIVES

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

- Justify personal choices when faced with dilemmas about the use of fire.
- Describe four wildland fire issues in Wisconsin.
- Explain how local governments can solve community problems.
- Use a system diagram to describe a problem, predict the consequences of actions, and develop appropriate solutions.
- Explain the roles of individuals, communities, businesses, and government in the management of wildland fire.

SUBJECT AREAS

Mathematics, Science, Social Studies

LESSON/ACTIVITY TIME

- Total Lesson Time: 255 minutes
- Time Breakdown:
 - Introduction.....20 minutes
 - Activity 145 minutes
 - Activity 220 minutes
 - Activity 360 minutes
 - Activity 460 minutes
 - Conclusion.....50 minutes

TEACHING SITE

Classroom

MATERIALS LIST

FOR EACH GROUP OF 3-4 STUDENTS

- Copy of Student Page  1, *Wildland Fire Dilemmas*

FOR EACH STUDENT

- Copy of Student Page  3, *Wildland Fire Council Agenda*
- Copy of Student Page  4, *Creating a System Diagram*

FOR THE SUN RIDGE TOWN BOARD

- Copy of Student Page  2, *Personal Meeting Record*

FOR THE WILDLAND FIRE COUNCIL

- One role-playing card made from Teacher Page  6, *Wildland Fire Council Role-playing Cards*

FOR THE TEACHER

- Copy of Teacher Pages  1A-B, *Fire Issues Overview*
- Overhead Transparency of Teacher Page  2, *Wildland Fire Issue – Fire Prevention*
- Overhead Transparency of Teacher Page  3, *Wildland Fire Issue – Wildland/Urban Interface*
- Overhead Transparency of Teacher Page  4, *Wildland Fire Issue – Fuel Buildup*
- Overhead Transparency of Teacher Page  5, *Wildland Fire Issue – Prescribed Fire*
- Overhead Transparency of Student Page  4, *Creating a System Diagram*
- Copy of Teacher Pages  7A-C, *System Diagram Answer Key*
- Overhead transparency of Teacher Page  8, *Behavior Over Time Graphs*

TEACHER PREPARATION

- Make overhead transparencies of Teacher Pages  2-5, Teacher Page  8, and Student Page  4.
- Locate the color version of Teacher Page  3, *Wildland Fire Issue – Wildland/Urban Interface* on the LEAF website at www.uwsp.edu/leaf, and make a color overhead transparency.
- Cut apart the role-playing cards on Teacher Page  6.
- Read Teacher Pages  1A-B, *Fire Issues Overview* and practice using the information in tandem with overheads of Teacher Pages  2-5.
- Review Student Page  3, *Wildland Fire Council Agenda* and familiarize yourself with the legislation.
- Read Teacher Pages  7A-C, *System Diagram Answer Key* and understand how the system diagrams are used to illustrate how the legislation works.
- You may wish to determine ahead of time which students will participate as the wildland fire council and which students participate as town board members.

VOCABULARY

Crown Fire: A fire that spreads across the tops of trees or shrubs.

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 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).

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.

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

Fuel: Any substance that contributes to the growth or spread of fire.

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

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).

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.

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.

BACKGROUND INFORMATION

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

Prescribed fires are used to mimic ecological or “natural” fires that have been part of some 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 include such things as restoring animal habitat, reducing fuels to prevent dangerous wildfires, killing tree seedlings invading prairies, and controlling pests and diseases.

The risk of wildland fire is increasing as more humans move into the wildland/urban interface. During the first five years of the 21st century, 3,000 forest parcels changed hands annually in Wisconsin. Many of these parcels had homes, hunting cabins, or vacation homes built on them. Increased habitation in areas of higher fire risk has and will continue to increase the risk of wildland fire.

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

SYSTEM DIAGRAMS

A system is made up of interacting activities or parts, which when combined produce some new outcome. The activities or parts of a system are connected and joined together by a web of relationships. System diagrams show the relationships between activities or parts that exist and the influence of each part on the overall system. As a problem solving strategy, system diagrams help analyze problems and evaluate solutions.

PROCEDURE

INTRODUCTION – THE TWO TYPES OF WILDLAND FIRE

1. Tell students that during the next few class periods they will be working together to vote on solutions to issues that a Wisconsin community is having with wildland fire.

Have students define the term wildland fire. You may wish to use the following questions to generate discussion:

- Have you seen or heard of forest fires or grass fires?
- What do you know about them?
- How do wildland fires start? How do they stop? (*Wildland fires start in many ways. They can be caused by natural factors such as lightning or human factors such as people burning leaves. Wildland fires stop when humans put them out or conditions change so they burn themselves out.*)

- Did wildland fires occur in Wisconsin before Europeans arrived? (*Yes. Native Americans utilized fire to alter the forest to increase habitat for wild game. Lightning and other natural factors also caused fires to start.*)
- Are all wildland fires bad? (*No. A wildland fire that does not endanger human lives or property is not necessarily bad. It can help maintain some ecosystems like prairies by clearing saplings. Without fire, a prairie will eventually revert to shrubs and trees.*)

Guide the class to the following definition – Wildland fire is an outdoor fire that is fueled mostly by plants (including trees). There are two main types of wildland fire – wildfire and prescribed fire. Wildfires start without the intent of the landowner and are uncontrolled and unwanted. They often destroy lives, property, and natural resources and must be put out by firefighters. Prescribed fires are planned and controlled to meet land management goals such as providing habitat for wildlife.

2. Write “wildfire” and “prescribed fire” next to each other on the board. Ask the class to brainstorm adjectives that describe each type of fire. Write the adjectives under each heading. Offer suggestions if necessary. Wildfire can be described with words such as dangerous, destructive, out of control, and accidental. Prescribed fire can be described with words such as planned, controlled, helpful, and ecological.

NOTE: In order to emphasize the difference between wildfires and prescribed fires you may wish to use the terms “good fire” and “bad fire” or describe them as the “two sides of fire.”

ACTIVITY 1 – WILDLAND FIRE DILEMMAS

1. Divide the class into groups of three or four students. Hand each group a copy of Student Page  1, *Wildland Fire Dilemmas*. Have the groups discuss the four dilemmas and decide on an action that would solve the dilemma. Have them explain the action on the back of the worksheet.

Walk from group to group and be sure that all group members are given the opportunity to suggest actions. Emphasize that there may be a number of correct answers and that all opinions should be considered.

2. Once all the groups have finished, allow several groups to explain the actions they decided to take and why. Proceed through each of the four dilemmas and have groups share their answers.
3. Once answers to all the dilemmas have been shared, work with the class to analyze the issue behind each dilemma. Use Teacher Pages  1A-B, *Fire Issues Overview* along with overheads of Teacher Pages  2-5, *Wildland Fire Issues* to guide the discussion. Use the information to help the class dissect each issue by identifying the causes and consequences.
4. After each issue is dissected, give the groups an opportunity to change or modify their answers. Discuss the changes. Have the class discuss their solutions. If needed, present the solutions outlined in Teacher Pages  1A-B, *Fire Issues Overview* for discussion as well.

ACTIVITY 2 – WORKING TOGETHER

1. Tell the class that personal dilemmas are often much easier to solve than the dilemmas faced by groups of people in communities, regions, or countries. The more people who are involved with a dilemma, the more differing opinions there are to potentially cause conflict. Give the class the following two examples of wildland fire issues and have them discuss how they might affect large groups of people. Facilitate the discussion by asking who is affected by the issues, who is responsible for solving the problem, and who pays to solve the issues.
 - The threat of destructive wildfire is always present in some regions of Wisconsin. In sandy, forested areas of west central and northern Wisconsin, some landscapes are thickly covered with red and jack pine trees. These forests are very susceptible to fire. *(People often live within these fire prone areas. Human life and property are at risk. Others may own forestland in this region for recreation or timber harvest. Wildland fire may cause economic loss. All Wisconsin citizens are affected by the cost of fire suppression and increased insurance cost. Although the Wisconsin DNR is responsible for suppressing wildfires, it is the landowner who is responsible for making their property less susceptible to the spread of wildfire. The cost associated with this lies with the landowner.)*

- The use of prescribed fire is necessary to keep certain ecosystems healthy. Fire renews ecosystems such as savannas, barrens, and prairies, providing habitat for plants and animals. Fire also reduces the dangerous buildup of fuels in some forests, decreasing the risk of destructive wildfire. *(Everyone is affected by this issue. The use of prescribed fire can improve ecosystems, but it does come with a financial cost. If done by state or local agencies, taxpayers incur the cost. The cost of using prescribed fire, however, is much lower than the cost of putting out a major wildfire. No one person is responsible for solving the problem.)*
2. Ask the class to describe how groups of people (in cities, counties, states, countries) work together to make decisions about wildland fire issues. Facilitate the discussion by asking them how people get their opinions heard, who develops solutions, and who takes actions to solve problems. Write their ideas on the board.
- Work to include the following ideas in the discussion:
- **Government:** City, county, state, and federal governments work to resolve issues that affect large groups of people
 - **Voting:** Government officials are elected by the people they represent; people vote to resolve issues
 - **Working together:** Government officials create councils made up of a variety of people to help develop solutions to issues
 - **Enacting laws:** Government officials decide the actions to take by voting on legislation that creates laws and regulations
 - **Participation:** Solutions to problems require the participation of businesses, organizations, and citizens
3. Explain to the class that having many people's ideas is necessary for a democratic government to exist. In a democratic government, decisions are made directly or indirectly by a majority of citizens (more than 50 percent) through a fair voting process. Often the citizens elect government officials who work to develop solutions. The officials often create groups to research issues, develop solutions, and take action to solve problems.
- Tell the class they are going to participate in a democratic process to help solve a community's wildland fire problems.
- ### ACTIVITY 3 – THE SUN RIDGE TOWN BOARD
1. Explain to the class they are all going to play roles in a community's decision-making process. The community, Sun Ridge, has a town government that is run by an elected group of officials – the Sun Ridge Town Board.
- The town board has created a wildland fire council to deal with local fire problems. The wildland fire council is composed of government officials, business representatives, concerned citizens, and other interested organizations.
- Students will play roles in the town board and the wildland fire council. The wildland fire council will explain the issues to the town board. The town board will vote on legislation to help solve the issues. Each bill that receives a majority vote (more than 50 percent) will become law.

- Hand each of the role-playing cards on Teacher Page  6, *Wildland Fire Council Role-playing Cards* to a different student on the council (six total). Tell the rest of the class they have all been elected to the Sun Ridge Town Board. Seat the Wildland Fire Council members at the front of the room facing the town board members.

Tell the class that each of the students with a wildland fire council card has a specific role to play. Their role is explained on their card. Together, they will be explaining local wildland fire issues to the town board. The president of the Wildland Fire Council will present legislation for the town board to vote on.

The students who make up the town board will vote on each bill (i.e., each piece of legislation). If a majority of board members vote “yes,” the bill will become law.

- Ask each member of the Wildland Fire Council to read the card they were given to themselves. Explain to the town board that each member will need to keep a record of their vote on each issue. Hand a copy of Student Page  2, *Personal Meeting Record* to each town board member. Each student should record the cost of the bill, their vote, an explanation of their vote, and a record of the class vote. Answer any questions students have about the worksheet.
- Once the students understand their roles, hand each student a copy of Student Page  3, *Wildland Fire Council Agenda*. Have the Wildland Fire Council members use the agenda to plan their presentations. Help them work together to plan the meeting.

While the wildland fire council coordinates the meeting, have the town board members read over the proposed legislation listed on the agenda. They should know about each bill (and its cost) before they vote on it.

Be sure they understand that the town has a limited budget, and it may be that not all of the bills can be funded.

- Have the chair of the Wildland Fire Council lead the meeting according to the agenda. The council members should introduce themselves. They should present their issues. The council chair should then describe the legislation and lead a vote on each of the four bills.

NOTE: If the vote results in a tie, the chair of the Wildland Fire Council has the deciding vote.

- Keep a record of the class vote and cost of the approved legislation on the board.

ACTIVITY 4 – SYSTEM DIAGRAMS

- Once the voting is finished and you have recorded the votes on the board, have the wildland fire council take their seats with the rest of the class. Ask the class if they think the legislation they passed is going to solve the problems. Have a variety of students provide opinions.
- Tell the class that all problems can be seen as part of a system. Systems are a collection of related factors. Changes in any part of a system affect other parts of the system. Solving a problem requires that the changes produce the results for which you are hoping.

Ask the students to think of an oak forest ecosystem as an example. Place Teacher Page  5, *Wildland Fire Issue – Prescribed Fire* back on the overhead projector. Ask the students to describe the difference between the two forests at the top of the page. (*The forest on the right has many more small trees – it is more dense. The understory is made up of shrubs and herbaceous plants. The forest on the left is much more open – the trees are widely spaced. The understory is sunny and is mostly made up of grasses and other prairie plants.*)

Tell the students the forest on the right is an oak forest and the forest on the left is an oak savanna. The oak savanna on the left is managed with fire. Land managers start fires in the understory to burn the grasses and kill small trees and shrubs. The large trees are protected by their thick bark and do not die in the fire. The grasses grow back from their roots quickly after fire.

Ask the class what would happen to the oak savanna if the fires were stopped. (*Tree seedlings would grow in between the widely spaced oak trees. The grasses would be shaded out. More plants and shrubs would grow. Soon, the forest would look much like the oak forest on the right.*)

3. Tell the class that to better visualize the relationship, they can use a system diagram. Draw two circles above one another in middle of the board. Label the top circle "oak savanna" and the bottom circle "oak forest." Draw an arrow on the right-hand side from the top circle to the bottom circle, and on the left hand side from the bottom circle to the top circle. The drawing should be similar to the following:



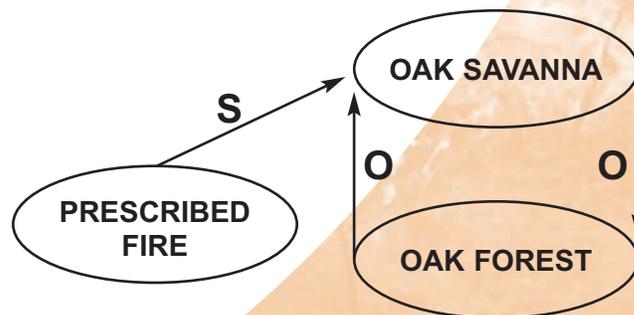
Tell the class the arrows represent the relationship between the two forests. Ask the class what happens to oak forests if oak savannas increase in size? (*Oak forests decrease in size.*) What happens to oak savannas if oak forests increase in size? (*Oak savannas decrease in size.*)

Tell the class the relationships are opposite. That means when one increases, the other decreases. Write the letter "O" next to each of the lines to represent opposite.



4. Tell students they have just created a simple system diagram that represents the relationship between oak forests and oak savannas over time. Tell the students all systems have factors that influence them. Ask the class if they can remember what factor causes oak forests to change into oak savannas. (*Fire.*)

Add a circle with "prescribed fire" to the left of the diagram. Ask the students to define the relationship between fire and oak savannas. (*An increase in fire causes an increase in oak savannas.*) This means the factors have the same relationship. Draw an arrow with an "S" from prescribed fire to oak savanna to represent the same.



5. Tell the class by creating a system diagram, they can better develop solutions to problems and predict how the solutions will affect the system. For example, in the system diagram you just created, prescribed fire can be used as a solution to increase the extent of oak savannas. But, what happens to oak forests? (*They decrease.*)

Emphasize to students that changes in one part of the system causes changes to other parts. System diagrams help us describe what changes will occur. Tell students they will use system diagrams to predict the consequences of the bills that were passed by the Sun Ridge Town Board.

6. Ask students to discuss how they voted on Bill #2 – Oak Savannas. Have them describe what they thought of the bill and the impacts it would have. Hand each student a copy of Student Page  4, *Creating a System Diagram* and tell the students the diagram describes the problem and solution proposed in Bill #2.

7. Place an overhead transparency of Student Page  4, *Creating a System Diagram* on the overhead projector. Review the steps as follows. Use Bill #2 as an example in each step.

- Describe the problem
- Diagram the problem
- Describe the outcome you are trying to produce
- Describe and diagram a solution

Answer any questions the class has. Tell the class they will now make system diagrams of the other bills they voted on.

8. Have students get into the same groups they formed to work on the wildfire dilemma cards at the beginning of the lesson. Tell the groups they should pick one bill that was voted on by the Sun Ridge Town Board.

They are going to create a system diagram that describes the issue and how the bill affects it.

Have the groups use their copy of Student Page  3, *Wildland Fire Council Agenda* to choose a bill to diagram. Walk around the room and help the groups choose a bill and begin their diagram. Use Teacher Pages  7A-C, *System Diagram Answer Key* to help groups with their diagrams

NOTE: System diagrams can take a variety of forms and still correctly describe the factors and relationships. If groups are using the correct methodology, allow them to be creative.

CONCLUSION – PREDICTING BEHAVIOR OVER TIME

1. Once the groups have finished the diagram of their legislation, have them discuss what they think the consequences of the bill will be. Allow a variety of groups to give predictions.
2. Tell students they can use their diagram to create a graph that describes what may happen over time. Place Teacher Page  8, *Behavior Over Time Graphs* on the overhead projector. Cover the balancing loop diagram and graph, as well as the reinforcing loop graph with a piece of paper. Expose only the first diagram with the title “Reinforcing Loop Diagram.”

Ask students if they recognize the system diagram. (*It is the same diagram that was on Student Page  4, Creating a System Diagram.*) Have the students explain the diagram. (*An increase in the use of prescribed fire increases the opportunities for education programs, which increases public support for prescribed fire, which increases the use of prescribed fire.*)

Tell the students all the factors have an “S” relationship – they reinforce each other. This is called a reinforcing loop.

Expose the reinforcing loop graph. Tell students the graph represents the use of prescribed fire over time. Ask students to interpret the graph. (*The use of prescribed fire increases faster and faster as time passes. It never decreases.*)

NOTE: A graph could also be drawn in which use of prescribed fire decreases through time (for example, education programs are decreased, which decreases public support, which decreases the use of prescribed fire). System diagrams do not indicate an initial direction of change, only the relationship between system components. Therefore, in a reinforcing loop like this one, all components change in the same direction – they all increase or decrease depending on which direction one component is changed.

- Expose the balancing loop diagram. Ask the class to identify the difference between the first and second diagram. (*The second diagram has a new factor entitled “City Budget.” The use of prescribed fire decreases the city budget.*)

Ask the class to describe how the budget factor might affect what happens over time. Have a volunteer come to the board and graph what they think will happen. Expose the balancing loop graph and ask the class to describe it. After the initial increased use of prescribed fire, the use levels off.

Tell the class that when one of the factors in a loop is “O” for opposite, the loop is called a balancing loop. It is called a balancing loop because the behavior will level out over time. In this case, the use of prescribed fire stopped increasing.

- Have students get back into their groups and create a behavior over time graph for their system diagram. The “y” axis on their graph should be the main reason for which the legislation was created (i.e., house survival, number of new buildings, knowledge, dangerous wildfires).

Have each group create a poster with the title of their legislation, the system diagram, and the behavior over time graph.

NOTE: You may wish to hand each group a copy of Teacher Page  8, *Behavior Over Time Graphs* for reference.

- Once the posters are complete, have each group present their system diagram and behavior over time graph to the class. As each group presents, ask them if they think that their legislation will be effective or not. Ask them if they can think of anything that would improve the legislation.

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

Have students write a wildland fire council report that suggests improvements to one of the bills that the Sun Ridge Town Board passed. They could also write a report explaining why the town board should pass a bill that it didn't. Have them present a diagram of the bill as it is written with a behavior over time graph. They should then present a new, more effective solution, with a new system diagram and behavior over time graph.

REFERENCES

MindTools. Systems Diagrams: Understanding How Factors Affect One-Another. World Wide Web: www.mindtools.com/pages/article/newTMC_04.htm.

SILVIS Lab. The Wildland-Urban Interface. World wide web: http://silvis.forest.wisc.edu/projects/WUI_Main.asp.

Systems theory. Wikipedia. World Wide Web: http://en.wikipedia.org/wiki/Systems_theory.

Wisconsin Department of Natural Resources. (2005). Fire Prevention and Safety. World Wide Web: <http://dnr.wi.gov/org/land/forestry/fire/fire-ps.htm>.

Wisconsin Department of Natural Resources. (2005). Spreading like Wildfire: Planning fire prevention as communities grow into woodlands. Wisconsin Natural Resources Magazine. PUB-FR-309-2005.

RECOMMENDED RESOURCES

WEBSITES

Fire Dependent Ecosystems of the United States

www.nifc.gov/preved/comm_guide/wildfire/fire_6.html

A technical description of fire dependent ecosystems in the United States.

Firewise Communities

www.firewise.org

Learn about the Firewise program and find educator resources including videos on a variety of topics such as Firewise building practices and the dynamics of wildfire.

Glossary of Wildland Fire Terms

www.nifc.gov/fireinfo/glossary.html

A comprehensive glossary of wildland fire terms.

MindTools

www.mindtools.com/pages/article/newTMC_04.htm

A brief overview of system diagramming with examples and additional tools.

SILVIS LAB – The Wildland/Urban Interface

http://silvis.forest.wisc.edu/projects/WUI_Main.asp

A great resource for information and maps describing the wildland/urban interface in Wisconsin and the upper Midwest.

Wisconsin Department of Natural Resources – Forest Fire Program

<http://dnr.wi.gov/org/land/forestry/Fire/>
Information related to wildland fire in Wisconsin from the Wisconsin DNR. Includes Firewise information, regulations and permits, prevention information, an overview and photos of suppression equipment, weather indices, and the current fire danger around the state.

FIRE ISSUES OVERVIEW

FIRE PREVENTION

In Wisconsin, the danger of wildland fire increases and decreases throughout the year. The most dangerous part of the year, the fire season, occurs in spring during the months of March, April, May, and June. Eighty percent of accidental wildfires start during spring. (*Show graph at top of Teacher Page* 🍏2.)

The weather and fuel conditions in the spring make wildfires very dangerous. After the snow melts and the ground warms, the dead leaves, sticks, and grasses begin to dry. Strong winds are also very common. Many deciduous trees are still dormant (their new leaves have not begun to grow). Some coniferous trees are highly flammable, and can start on fire easily. The dry fuels and dry weather create conditions that lead to dangerous wildfires.

Roughly 1,500 accidental fires start every year in Wisconsin (in 2005, 1,517 accidental fires started). All these fires are caused by human activity. Debris burning is the biggest cause of wildfires. (*Show graph at bottom of Teacher Page* 🍏2.) The DNR controls outside burning by issuing burning permits. Burning permits limit the times of year and times of day that people can burn outside. Generally it is safer to burn after 6:00 p.m. because (usually) the humidity is higher, there is less wind, and the temperature is lower.

DILEMMA RECOMMENDATION

Wait until the time specified on the burning permit. If you start a fire that does not comply with your burning permit, you will be responsible for any damages that occur. If the fire were to get away and destroy forests and homes, you could be charged for the damage. That could cost your family thousands, or even millions, of dollars!

WILDLAND/URBAN INTERFACE

The wildland/urban interface is an area where human structures exist next to wildland fuels. Wildland fuels are usually grasslands and forests that have the potential to start on fire. When homes are built in these areas, the possibility of accidental wildfire increases – remember, human activities are responsible for most wildfires. Also, there is a much higher chance that human lives or property will be put in danger.

The wildland/urban interface in Wisconsin is growing as people build houses in rural areas. When entire neighborhoods expand into wildland areas, it is called an “interface.” When individual houses are built within wildland areas, it is called an “intermix.” Both of these situations increase the danger of wildfire. (*Show Teacher Page* 🍏3.)

DILEMMA RECOMMENDATION

Try to build the house you want and still use firewise practices that protect you and your home. Think about the consequences. Would you want your house to burn?

FIRE ISSUES OVERVIEW

FUEL BUILDUP

For more than 50 years, federal, state, and local governments in the United States have had a policy to put out all natural and accidental wildfires. Fire has been removed from grasslands and forests. Throughout history, fire had occurred periodically in many areas. Fires killed the smaller trees and shrubs in many forests, “thinning” the understory.

Because fires no longer occur, forests can grow very thick with shrubs and small trees. (Compare two drawings at top of Teacher Page 🍏4.) Firefighters call these trees “ladder fuels” because they give wildfire a path to climb into the crowns of the trees. Once a fire enters the tree crowns, it becomes very dangerous. Firefighters cannot control crown fires. Surface fires are easier to control. (Show bottom of Teacher Page 🍏4.) For this reason, fire agencies often recommend that forests be “thinned” by harvesting the smaller trees that can serve as ladder fuels.

DILEMMA RECOMMENDATION

Contact the manager of the park and bike trail. Public parks are usually managed by the city, county, or state government. Ask them the questions about the thinning that concern you and share the answers with your parents and friends.

PRESCRIBED FIRE

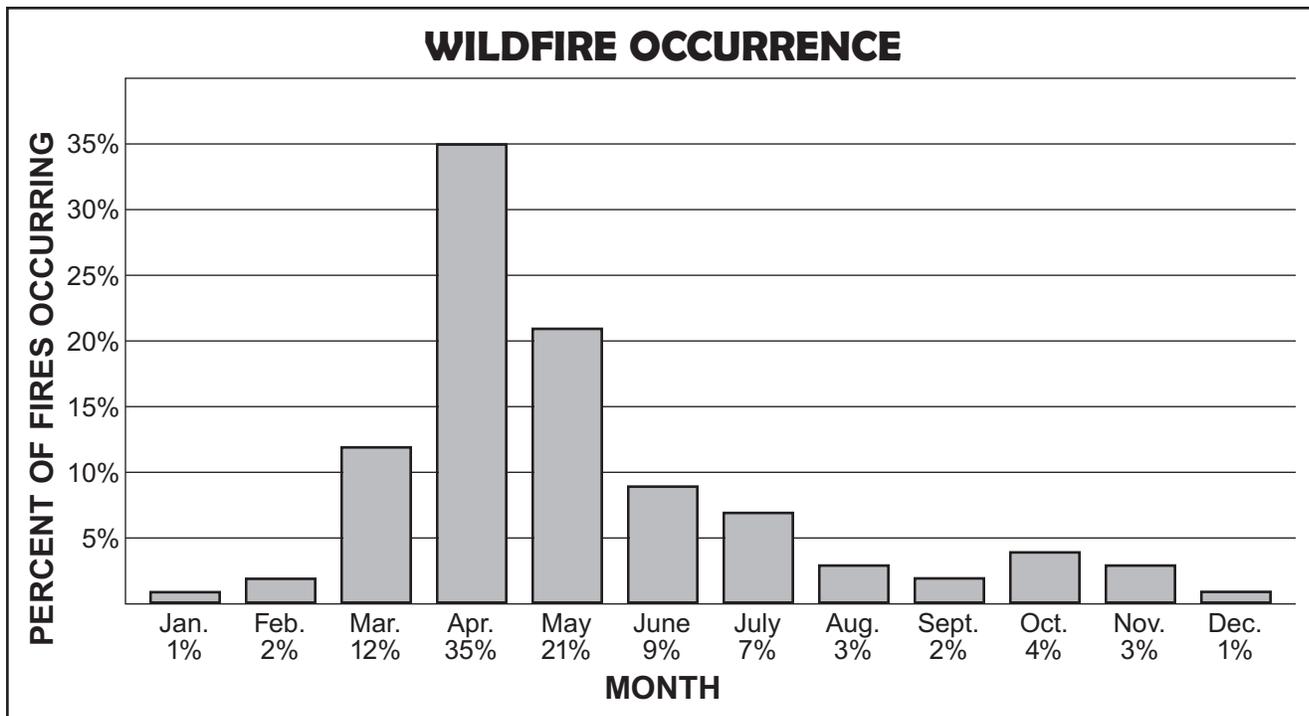
Prescribed fires are controlled by land managers and firefighters. They are intentionally started to meet desired management goals such as creating wildlife habitat and controlling diseases and pests. Prescribed fire is used to restore and maintain ecosystems that depend on fire.

Local, state, and federal governments take precautions to make sure that prescribed fires are safe. They use prescribed fires to reduce fuels to prevent dangerous fires in the future. Prescribed fire is a controlled way to return the natural process of fire to the landscape. (Show drawings on Teacher Page 🍏5.)

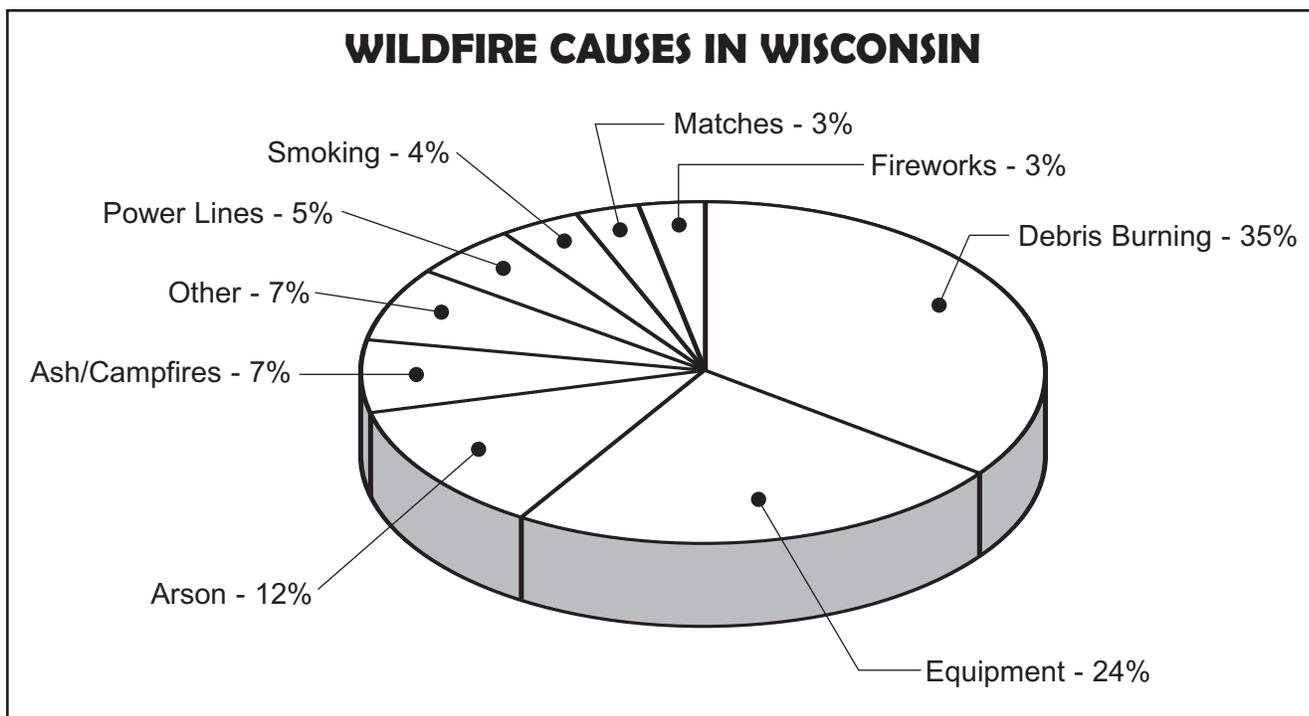
DILEMMA RECOMMENDATION

Learn about the two types of fire – prescribed fire and wildfire. Talk to your parents about the difference between them. Go on the Internet and search the terms. You are bound to find information on how fires are dangerous and should be prevented as well as information on the many uses of fire. You might be surprised at how many plants and animals benefit from prescribed fire!

WILDLAND FIRE ISSUE – FIRE PREVENTION

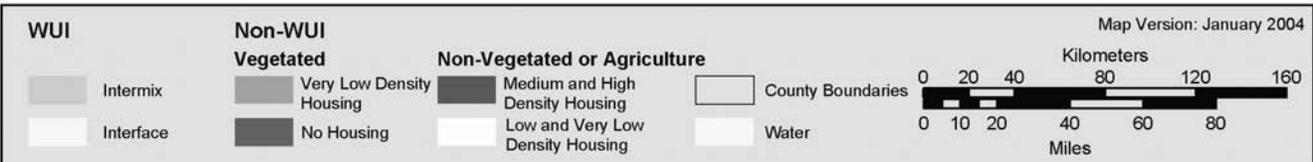
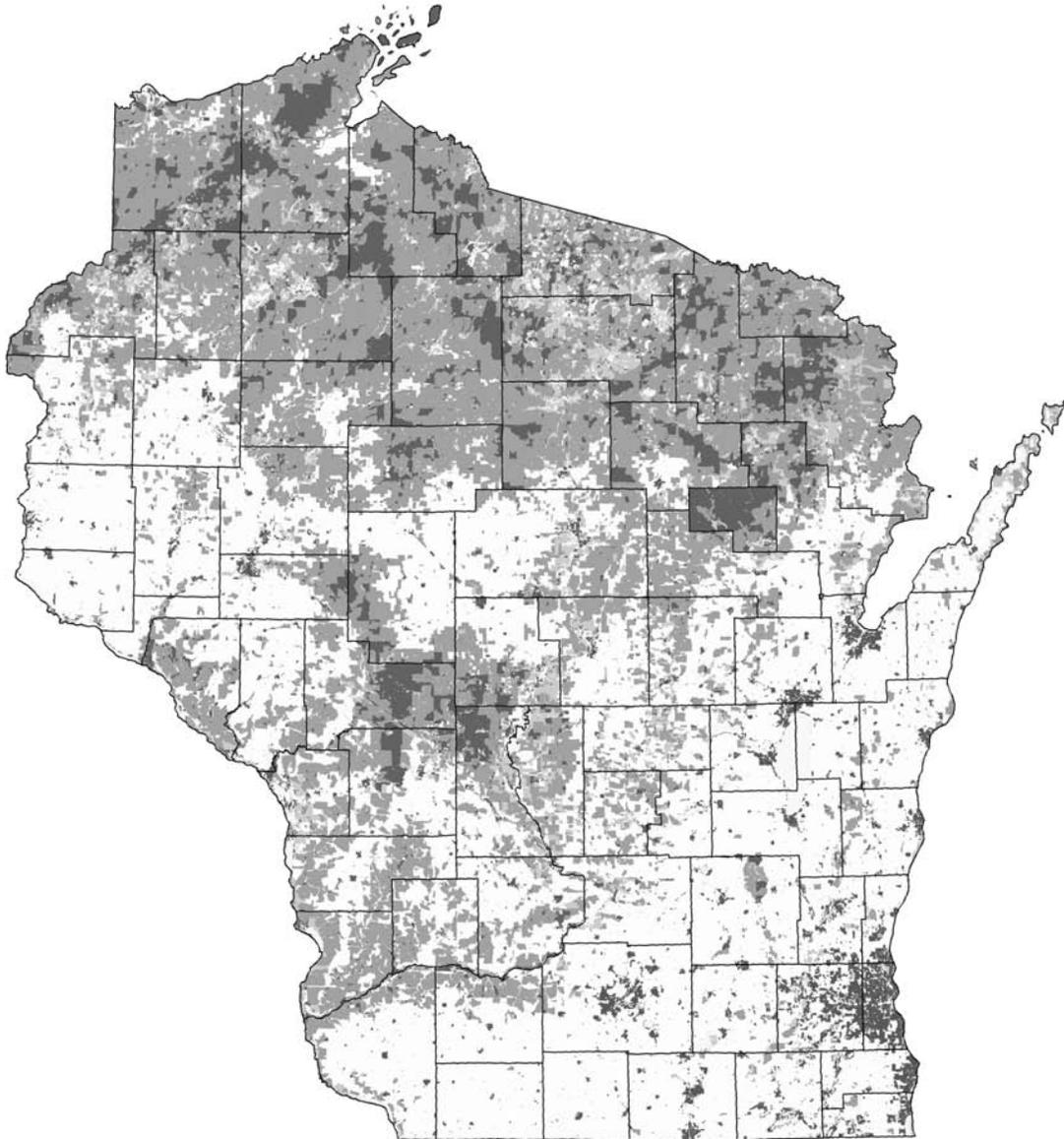


Both charts based on 2004 Wisconsin DNR data.

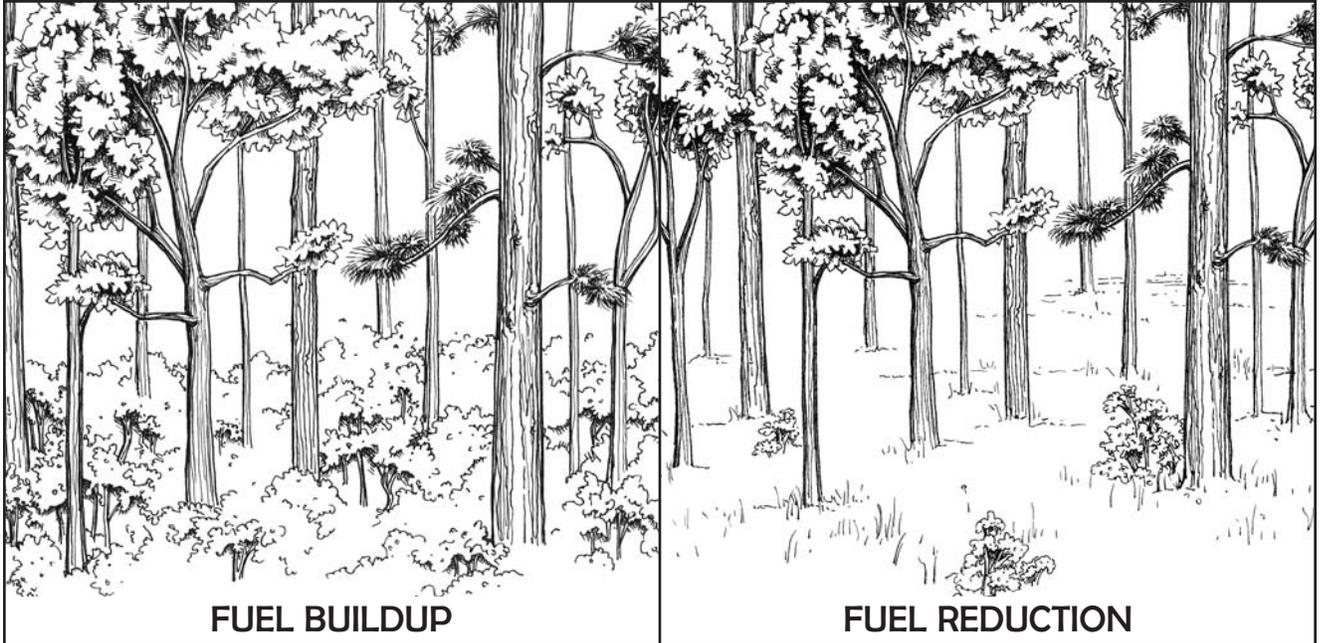


WILDLAND FIRE ISSUE – WILDLAND/URBAN INTERFACE

Wisconsin Wildland/Urban Interface 2000

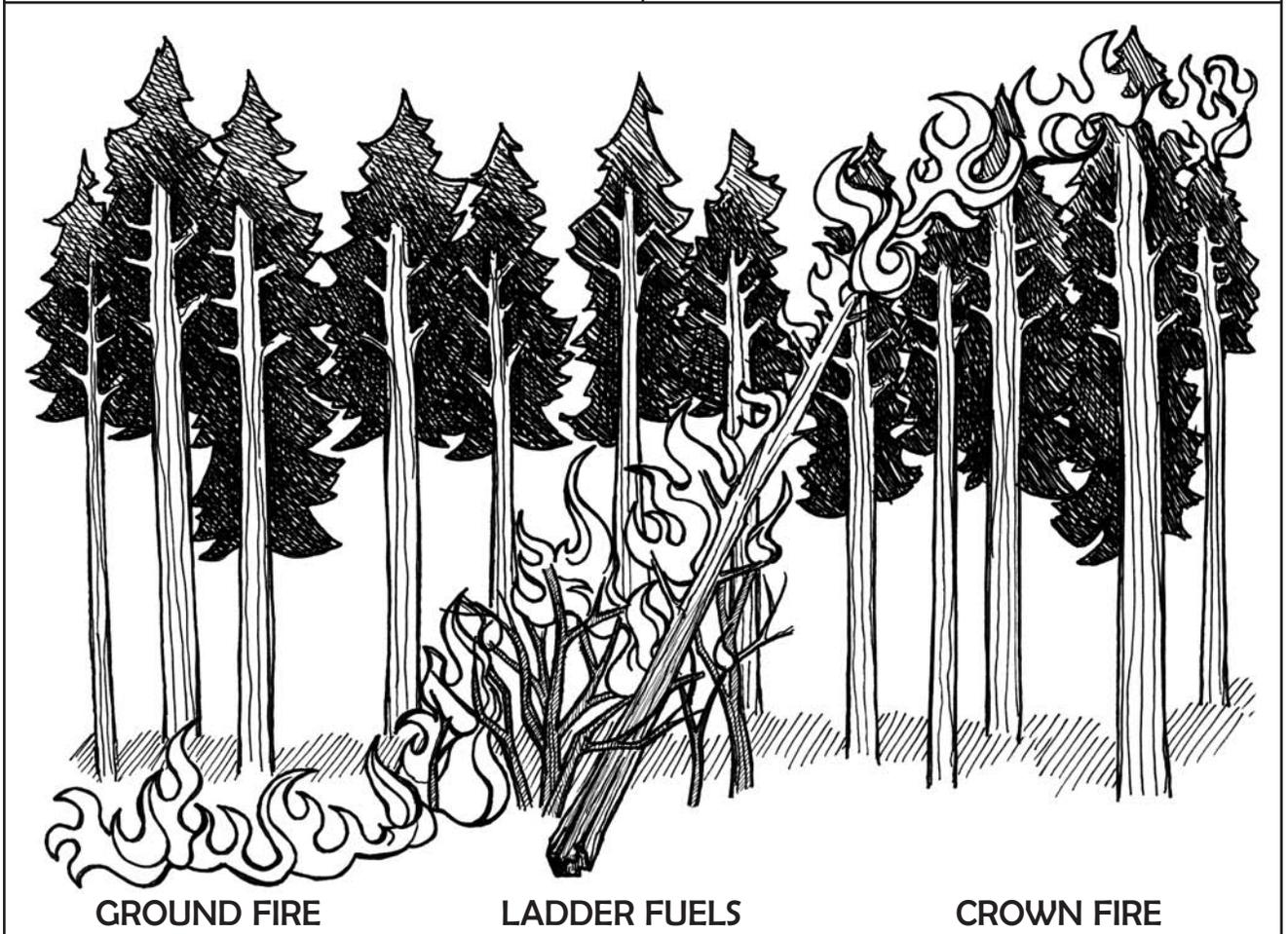


WILDLAND FIRE ISSUE – FUEL BUILDUP



FUEL BUILDUP

FUEL REDUCTION



GROUND FIRE

LADDER FUELS

CROWN FIRE

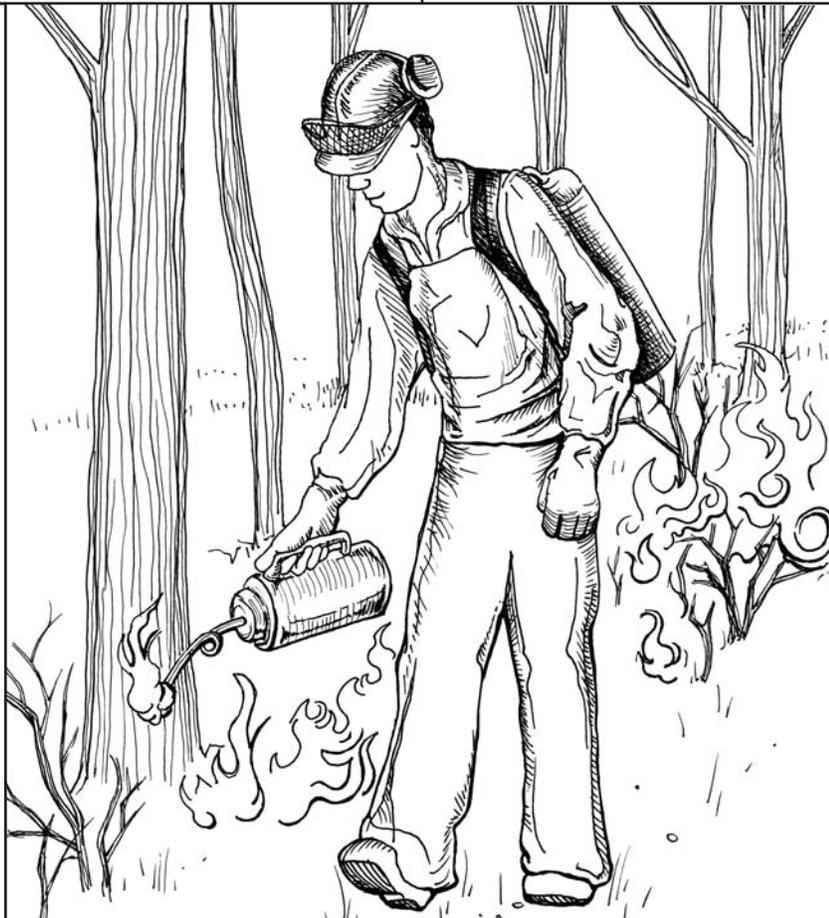
WILDLAND FIRE ISSUE – PRESCRIBED FIRE



PRESCRIBED FIRE USED



PRESCRIBED FIRE NOT USED



CONDUCTING A PRESCRIBED BURN

WILDLAND FIRE COUNCIL ROLE-PLAYING CARDS

COUNCIL PRESIDENT

Your primary role is to direct the wildland fire council meeting. Use the agenda to keep members on track.

You will also present all the legislation on the agenda. Present each bill and have the town board vote by raising their hands if they are in favor of the bill. Record the number in favor. Then have the board raise their hands if they are opposed. Record the number opposed. If the number in favor is larger than the number opposed, the bill becomes law.

If the vote is a tie, you have the deciding vote.

INSURANCE INDUSTRY

You helped write Bill #1 and are trying to convince the town board to pass it. Give a speech to the town board similar to the following:

“Every house that is destroyed in a wildfire costs you money because you end up paying more for your insurance. It doesn’t matter where you live, your insurance costs go up. That is why I am supporting Bill #1 that makes it a law that all houses built in wildfire prone areas must follow building and landscaping rules that reduce their risk of being destroyed. You should support it too, because when a building survives, your insurance costs do not increase.”

CONSERVATION GROUP

You helped write Bill #2 and are trying to convince the town board to pass it. Give a speech to the town board similar to the following:

“Oak savannas are the most endangered forest ecosystem in the world and they are right in our backyards. Ninety-nine percent of our oak savannas have disappeared over the last 200 years. Oak savannas provide habitat to threatened and endangered animals and plants like the greater prairie chicken and the Karner blue butterfly. To maintain and increase oak savanna ecosystems, we need to use prescribed fire in oak forests. We also need to educate the public about the safety and uses of prescribed fire. That is why I support Bill #2. If you don’t want to lose this endangered forest, you should too.”

SUSTAINABLE DEVELOPMENT GROUP

You helped write Bill #3 and are trying to convince the town board to pass it. Give a speech to the town board similar to the following:

“Each year more buildings are built in the forests, fields, and grasslands that surround our town. As people enter the areas, they increase the risk of starting wildfires and losing their lives and property. At this point, the community does not have a say in where or how the buildings should be built. We believe it should. The buildings affect both the environment and our pocketbooks. We propose that the city elect a Smart Growth Council that will work together to decide where new houses and businesses are built. We support Bill #3, and if you want a voice in the future of your community, so should you.”

CONCERNED CITIZEN

You helped write Bill #4 and are trying to convince the town board to pass it. Give a speech to the town board similar to the following:

“Humans are the biggest cause of wildfires, and people in our town do not know much about them. Young people are often the cause of accidental fires. Our kids need to be taught about how fires start and the damage they can do. We need to make them aware of the consequences of their actions. That is why I support Bill #4. It will bring wildfire education to every fifth-grade student in our schools.”

FOREST PRODUCTS INDUSTRY

You helped write Bill #5 and are trying to convince the town board to pass it. Give a speech to the town board similar to the following:

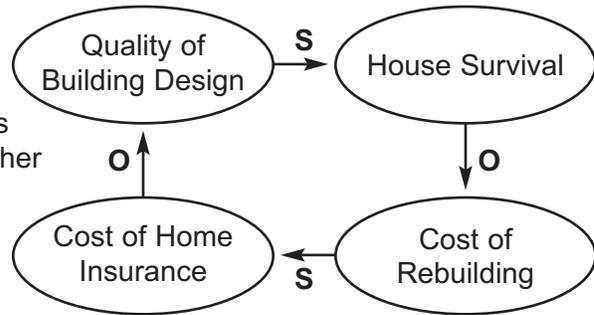
“Over the last 50 years we have stopped all fires in our forests. Though this has protected our property, it has changed our forests. The forests are much thicker with trees now than they would have been with fire. If a fire started in one of our forests now, it would be a catastrophe. It would burn too hot to control. That is why I support Bill #5. The bill would require that all forests that present a fire danger be thinned by harvesting some of the trees. If you want a safe and beautiful forest, you should support the bill too.”

SYSTEM DIAGRAM ANSWER KEY

BILL #1 – FIREWISE BUILDINGS

1. PROBLEM

Buildings are being destroyed in wildfires because they are not built and maintained to reduce the threat of fire. When a home is destroyed, insurance companies pay to rebuild. The cost of rebuilding is passed on to other people when the cost of home insurance increases.



2. PROBLEM DIAGRAM

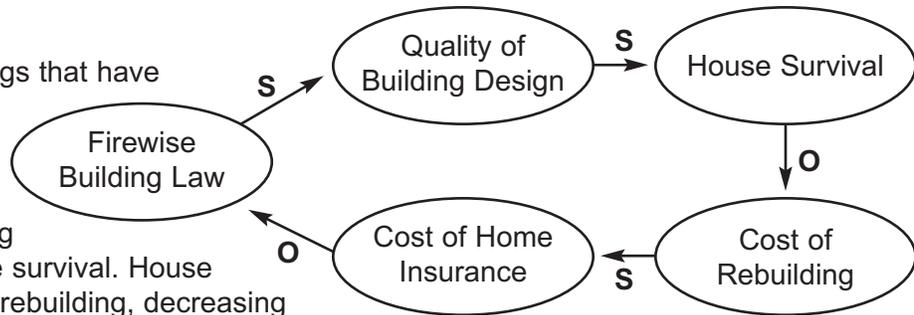
Decreases in the quality of building design decrease house survival. Decreases in house survival increase the cost of rebuilding. The higher the cost of rebuilding, the more homeowners will pay for insurance. The more it costs to insure a home, the less money people will have to pay for better building design. Therefore, the quality of homes being built will decrease.

3. ACTION

Increase the number of buildings that have good Firewise building design.

4. SOLUTION DIAGRAM

The firewise building law increases the quality of building design, which increases house survival. House survival decreases the cost of rebuilding, decreasing the cost of home insurance. Lower home insurance costs increase support for the Firewise building law.



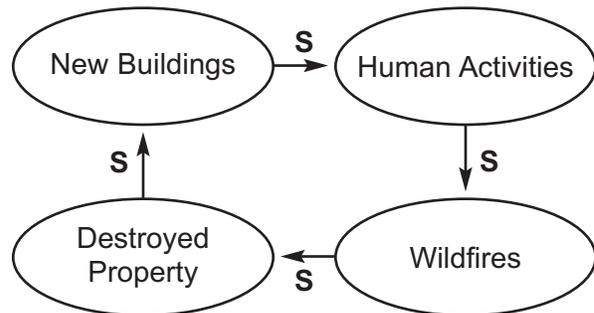
BILL #2 – OAK SAVANNAS

See Student Page 4, *Creating a System Diagram*.

BILL #3 – SMART GROWTH COUNCIL

1. PROBLEM

Many buildings are being built in dangerous wildfire areas. Humans are the biggest cause of wildfires. Their presence in the areas increases the possibility of wildfires. People in Sun Ridge have no control over where new buildings are constructed.



2. PROBLEM DIAGRAM

An increase in new buildings causes an increase in human activity. An increase in human activity causes more wildfires. More wildfires cause more property destruction. More buildings will need to be built after wildfires.

SYSTEM DIAGRAM ANSWER KEY

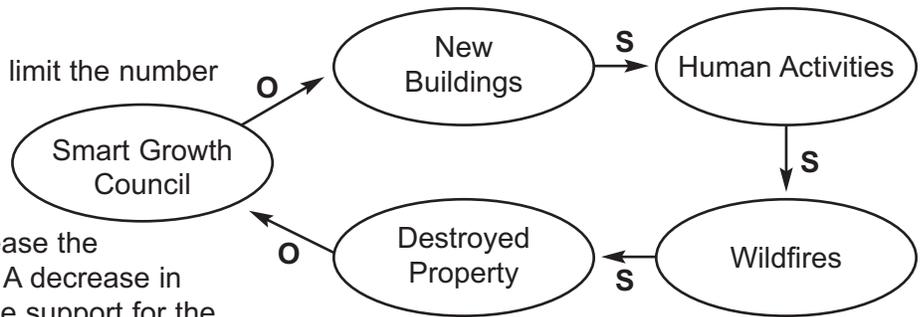
BILL #3 – SMART GROWTH COUNCIL (CONTINUED)

3. ACTION

Create a Smart Growth Council to reduce the number of new buildings in dangerous fire areas.

4. SOLUTION DIAGRAM

The Smart Growth Council will limit the number of new buildings in dangerous wildfire areas. This will decrease human activities and decrease wildfires. A decrease in wildfires will decrease the amount of property destroyed. A decrease in property destroyed will increase support for the Smart Growth Council.



BILL #4 – FIRE EDUCATION FOR CHILDREN

1. PROBLEM

Children do not understand wildfire and do not understand how to prevent it. Misunderstandings lead to the unsafe use of fire.

2. PROBLEM DIAGRAM

Lack of knowledge increases unsafe fire use. An increase in unsafe fire use increases the number of accidental wildfires.

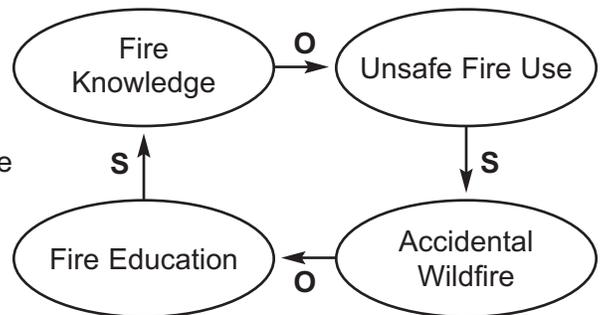


3. ACTION

Educate children about wildfire.

4. SOLUTION DIAGRAM

Fire education increases fire knowledge. An increase in fire knowledge decreases unsafe fire use. A decrease in unsafe fire use decreases accidental wildfires. A decrease in accidental wildfires increases support for fire education.



SYSTEM DIAGRAM ANSWER KEY

BILL #5 – FOREST THINNING

1. PROBLEM

Fire has been stopped in forests and grasslands for the past 50 years. The understory of some forests has grown very dense with young trees and shrubs. The small trees and shrubs act as ladder fuels that cause crown fires, which are very dangerous.

2. PROBLEM DIAGRAM

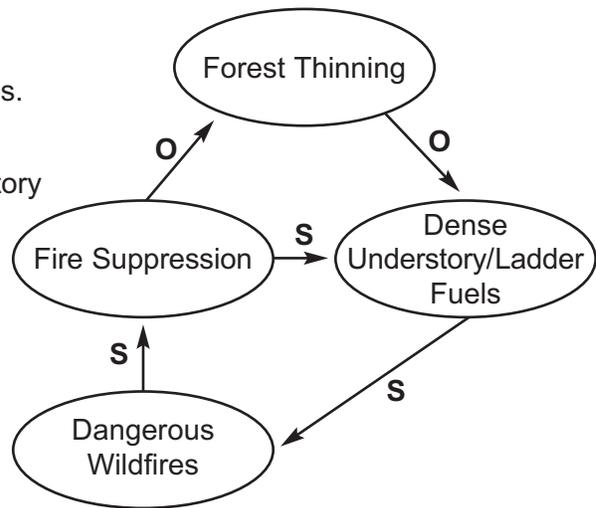
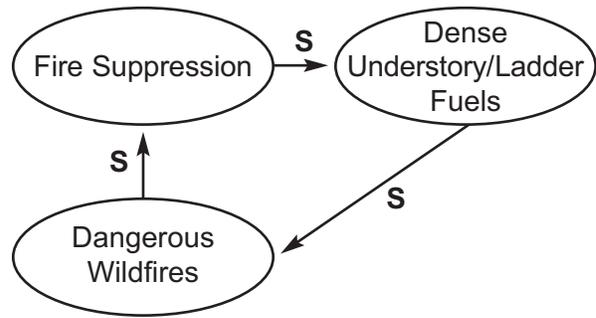
Increase in fire suppression increases the growth of trees and shrubs in the understory which act as ladder fuels. This increases the number of dangerous wildfires (crown fires). An increase in dangerous wildfires increases the suppression of all wildland fires.

3. ACTION

Decrease the amount of ladder fuels by harvesting trees.

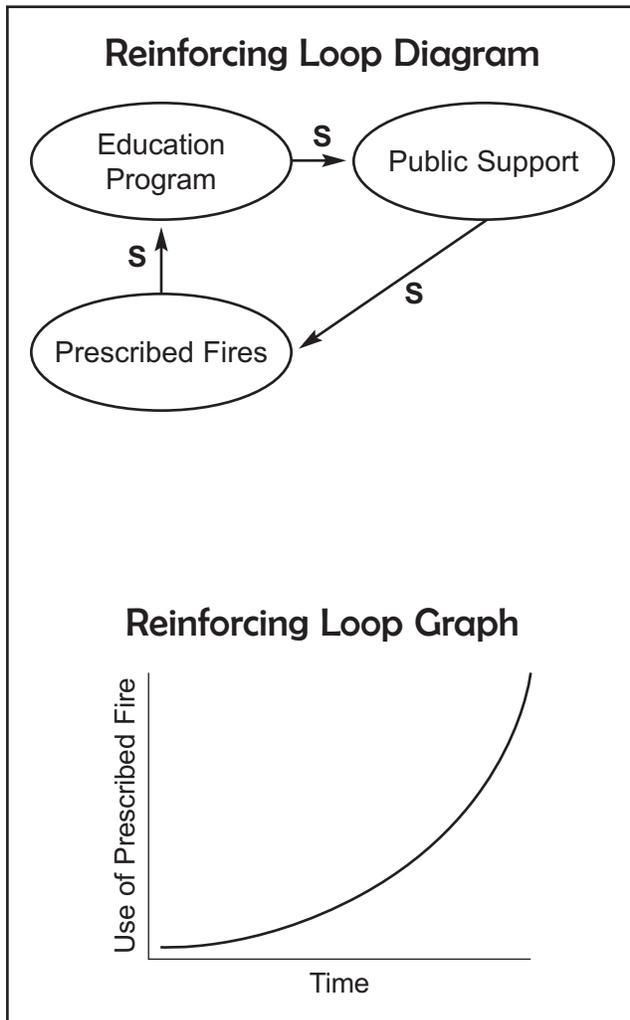
4. SOLUTION DIAGRAM

An increase in forest thinning decreases dense understory and ladder fuels. A decrease in ladder fuels decreases dangerous wildfires. A decrease in dangerous wildfires decreases the need for fire suppression and increases support for forest thinning.

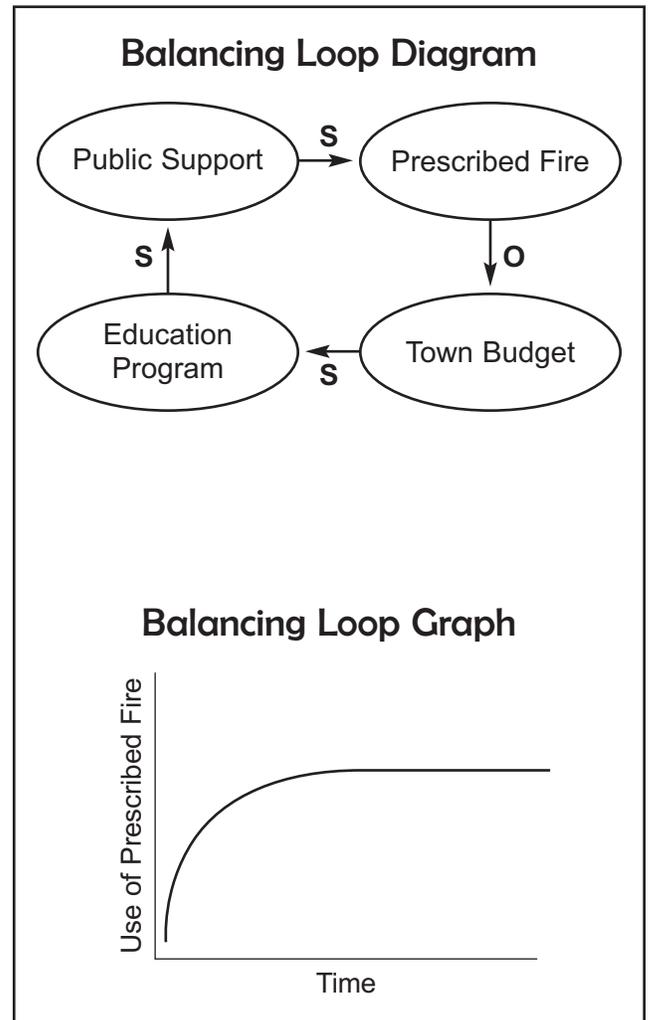


BEHAVIOR OVER TIME GRAPHS

REINFORCING LOOP



BALANCING LOOP



WILDLAND FIRE DILEMMAS

DILEMMA 1 – A BURNING PERMIT

It is early spring and the weather is warming up. You are traveling to a family cabin for the first time this year. You stop at the ranger station and get a burning permit so you can have a campfire and burn some brush to clean up a bit. You notice that the fire danger rating is high.

You get to the cabin in the early afternoon and the family wants to start cleaning up the leaves and branches around the house. The wind is blowing and it is hard to keep the leaves piled. The cabin has a deep fire pit dug into the ground with stone and gravel surrounding it.

The burning permit says you can only burn after 6:00 p.m. It is already 3:00 p.m. and it would be really convenient to start burning some of the brush and leaves right away. The family agrees it will be safe to start a little early. What do you do?

DILEMMA 2 – LIVES AND PROPERTY

Your family has decided to build a vacation home in northwestern Wisconsin. Your family has been saving for many years to afford the house and is very excited about starting construction. The whole family has had input into what they want the house to look like and the architect has produced two drawings for you to look over.

The first drawing has everything your family wants and would be just under the family budget. It is a picture-perfect log home nestled in the woods. The second drawing is a house that costs the same price, but is a bit smaller. The trees and shrubs are cleared farther away from the house, and the exterior of the house has a lot less wood and a lot more stone.

The architect explains that the second house is designed with Firewise practices in mind. He explains that wildfires are common in the forest where the family has chosen to build. Firewise practices are building and landscaping techniques that would protect the home. He points out some of the stone building techniques, the cleared area around the house, and the fire resistant roofing.

Your family looks at both drawings and likes the first drawing better. What do you do?

DILEMMA 3 – TREE HARVEST

It's the weekend and you and a few friends are going for a bike ride. You decide to go to a forested mountain bike trail where you have been many times with your family. When you get to the parking lot, you notice that the trail is closed. You hear machinery and chain saws in the distance. The sign by the trail says trees are being harvested and the trail will be closed for the next few weeks. The sign explains the tree harvest will thin (i.e., take out some trees) from the forest and help prevent the spread of destructive wildfire.

Your friends are very upset because your plans for the day are ruined. They are also worried the bike trail and forest will be destroyed. Your friend's mom is very upset that they are cutting trees in a public park. You wonder if there is a good reason for the logging and if it will destroy the forest. What do you do?

DILEMMA 4 – FIRE IN THE DISTANCE

It is early morning and you see a large plume of smoke in the distance. You remember that a firefighter from the Wisconsin Department of Natural Resources told your parents they would be starting a fire in a local forest and grassland.

Your family doesn't seem to be concerned about the fire spreading, but you feel afraid. You don't understand why they would start a fire, or how they will stop it from spreading. What do you do?

PERSONAL MEETING RECORD

NAME: _____ DATE: _____

LEGISLATION	COST	MY VOTE	EXPLANATION OF VOTE	CLASS VOTE
<p>Bill #1 – Firewise Buildings Requires that buildings are constructed using techniques and materials that reduce the risk of burning from a wildfire.</p>				
<p>Bill #2 – Oak Savannas Creates an education program that allows the public to watch prescribed fires at nearby oak forests.</p>				
<p>Bill #3 – Smart Growth Council Creates a Smart Growth Council that would give local citizens the opportunity to plan how the town of Sun Ridge grows.</p>				
<p>Bill #4 – Fire Education Establishes “Fire Awareness Week” at local schools. Every fifth-grade student would learn about fire prevention and fire safety.</p>				
<p>Bill #5 – Forest Thinning Requires the city to remove small trees that are a wildfire threat from forests.</p>				

COMMENTS:

WILDLAND FIRE COUNCIL AGENDA

AGENDA

1. **Wildland Fire Council Introductions** •
Council President
2. **Council Member Presentations** • *Insurance Industry, Conservation Group, Sustainable Development Group, Concerned Citizen, Forest Products Industry*
3. **Budget Outlook**
4. **Presentation of Legislation** • *Council President*
5. **Vote on Legislation** • *Council President*
6. **Vote Summary** • *Council President*

BUDGET OUTLOOK

Sun Ridge has a yearly budget of one million dollars. The money pays for schools, roads, police, parks, and many other important services. The budget for wildland fire is \$50,000. If the total cost of legislation is more than \$50,000, money will need to be taken from the town budget.

LEGISLATION

BILL #1 – FIREWISE BUILDINGS

Bill #1 requires that in areas where wildfires are a threat, all new buildings be constructed using techniques and materials that reduce the risk of fire. Buildings would need to have a fire resistant roof, a large area around the building without trees or shrubs, and wide access roads and driveways. It will cost the city \$30,000 each year to educate people and monitor building activities. It is estimated that roughly two houses would be saved each year.

BILL #2 – OAK SAVANNAS

Bill #2 creates an education program that allows the public to watch prescribed fires in nearby oak forests. The events would educate the public about the safety and benefits of prescribed fire. The goal is to increase support for the use of prescribed fire. The bill would cost \$20,000 a year. It is estimated that five acres of oak savanna could be created each year, with a goal of having 40 acres (about the size of 40 football fields) of oak savanna that provide habitat for the endangered Karner blue butterfly.

BILL #3 – SMART GROWTH COUNCIL

Bill #3 would create a Smart Growth Council that would give local citizens the opportunity to plan how the town of Sun Ridge will grow. The council will decide on where new houses and businesses will be built. The goal of the council is to help the city grow without causing more destructive wildfires. The bill would cost \$20,000 a year to hire a person to organize and work with the council.

BILL #4 – FIRE EDUCATION

Bill #4 would establish “Fire Awareness Week” at local schools. Every fifth-grade student would learn about fire prevention and fire safety. The bill would cost \$10,000 for classroom materials. It is estimated that the bill would reduce human-caused fires by 10 percent each year.

BILL #5 – FOREST THINNING

Bill #5 would require the city to remove small trees from forests that are a wildfire threat. The goal of the bill is to protect forests and homes. Forests that are very thick with trees would be thinned so that fire could not move to the tree crowns and cause dangerous fires. The bill would cost \$20,000 a year. Ten acres of forest will be saved from wildfire each year.

CREATING A SYSTEM DIAGRAM

BILL #2 – OAK SAVANNA

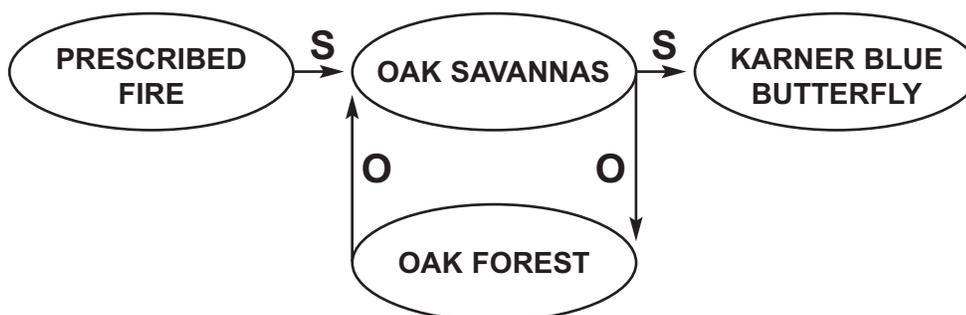
1. DESCRIBE THE PROBLEM

EXAMPLE

Oak savannas have been decreasing in size and distribution in Wisconsin. They are one of the most endangered forest ecosystems in the world. Oak savannas have been changing into oak forests because fire has not been allowed to burn in these ecosystems. Oak savannas are now maintained by prescribed fire. Prescribed fire is used to clear small trees and shrubs from the understory. The grasses and plants that grow after fire provide habitat for many animals and plants, including the endangered Karner blue butterfly.

2. DIAGRAM THE PROBLEM (Identify the factors and their relationships.)

EXAMPLE



3. DESCRIBE THE OUTCOME YOU ARE TRYING TO PRODUCE

EXAMPLE

Increase the number of oak savannas that provide habitat for the Karner blue butterfly.

4. DESCRIBE AND DIAGRAM A SOLUTION

EXAMPLE

Create an education program that allows the public to watch prescribed fires at nearby oak forests. Use the events to educate the public about the safety and benefits of prescribed fire. This will

increase the support for prescribed fire and the number of prescribed fires. The more prescribed fires we have, the more opportunity for public education and the better able we are to maintain oak savannas.

