



Tree Enemies

Objective

Students will:

- identify some of the causes of damage to trees and what they can do to help prevent harm to trees.

Background Information

Our friends, the trees, have many enemies. Fire, wind, ice, lightning, pollution, disease, insects, machines and vehicles, animals, and abuse from people all hurt trees. Some of these, such as weather damage, we can't always prevent. Others we can do much about. With good care and management, trees can continue to be **renewable resources**.

Trees give us many things. This includes fuel for fires and heating, lumber, wood pulp for paper making, and food for humans and animals in the form of fruits, nuts, bark, and leaves. Trees are an important part of the earth's environment because they absorb **carbon dioxide**, give off **oxygen**, hold water and soil in place, and return nutrients to the soil.

Forests can be resilient, but if they are continually or drastically disturbed, they can be destroyed. It is our job to protect, **conserve**, and manage the forests of the world rather than simply cut them for our uses today. Good management of a forest includes planting, growing, protecting, and reproducing trees in places where we cut them for lumber, fuel, or paper. At the same time, forest managers must control **soil erosion**, guard **watersheds**, protect animals, allow for agriculture, and provide for recreation. Each of us has a responsibility to do what we can to save and protect trees, too.

In these lessons, we will learn about some of the

Vocabulary Words

renewable resources	elm bark beetles
carbon dioxide	oak wilt disease
oxygen	chemicals
conserve	environment
soil erosion	urban
watersheds	girdling
fungus	humus
Dutch elm disease	kindling

natural causes of damage to trees, as well as damage caused by people and machines.

Natural Causes of Damage

Did you know that trees, just like people and animals, can get diseases? They can ... and it can be serious.

A **fungus** is an organism that may be deadly to certain trees. Two diseases caused by fungus that have had huge effects on the trees in Minnesota are **Dutch elm disease** and oak wilt.

Dutch Elm Disease

Dutch elm disease was first described in the Netherlands in 1919. It spread quickly in Europe and by 1934 was found in most European countries and the British Isles.

European **elm bark beetles**, which carry the disease, were reported in the United States, in Massachusetts, as early as 1909. The fungus that causes the disease came into this country in logs shipped from Europe. The logs contained both the fungus and the European elm bark beetles. The logs were shipped to factories in New York, Ohio, and



Indiana. The bark beetles escaped from the logs as they traveled and carried the fungus to at least seven states.

Once in this country, Dutch elm disease spread rapidly. It is now in more than 40 states and is the most destructive shade tree disease in North America.

Minnesota's first case of Dutch elm disease was found in St. Paul in 1961. Now the disease is in nearly every one of Minnesota's counties. It has infected large portions of the elm population in many areas.

To learn more about Dutch elm disease, see Resources, page 120.

Oak Wilt Disease

Oak wilt disease has probably been in the North Central states for many years. As early as 1912, records describe oak tree deaths in Minnesota and Wisconsin that were more than likely caused by oak wilt. Oak wilt had not been identified at this time, however, so other causes, such as drought, were blamed for the oak death. It was not until 1940 that a fungus was found to cause wilting and eventually death of oak trees.

Oak wilt is a concern in all of Minnesota. It is a serious problem in east-central and southeastern Minnesota. To learn more about oak wilt, turn to Resources, page 121.

Insects

Insects can be good or bad for trees. Some are truly plant enemies. They are hungry little creatures that chew away day and night. If they eat all the buds or young leaves on a tree, or the water-conducting tissue under the bark, the tree can die.

It is difficult to know how to control insects. Some people use **chemicals** that kill the bugs, but these chemicals can also cause other damage to the **environment**. Other folks try to combat some bugs with other bugs that like to eat them. This is more difficult, but better for the environment if we are sure the bug-eating bugs don't cause other problems. Getting rid of harmful insect enemies is important, but it has to be done with care. The best protection for trees is to keep them healthy in the first place.

Fire

Fire is another great enemy to trees. When a forest is very dry, thousands of acres can burn in a short time. Raging forest fires destroy valuable timber and threaten lives and property. They can also harm the soil and destroy the forest as a home for wildlife. Once they start, forest fires are hard to fight. Firefighters battle large fires with water dropped from planes or helicopters. They might also chop down trees and dig up the ground to form firebreaks, which keep the fire from spreading. Some fires are caused by lightning, but most are caused by careless people.

Unusual as it may seem, fires are sometimes helpful to the forest. They can release nutrients trapped in the soil. These nutrients enrich the environment for new plants to start growing. Fires remove leaf litter to expose bare soil for new and dormant seeds to grow. They make growing conditions better for trees such as the jack pine that need fire to help open their cones, and for others that are not able to grow in the shade of a tall, dense forest. Frequent small fires can prevent a buildup of brush that can lead to a disastrous large fire.

Pollution

Imagine a world that is plain, even ugly—a world without beauty. Imagine a world in which most of the trees are dead. It wouldn't be a very pleasant place to live. But many scientists fear that's what our world will be like if we don't do something about pollution. Both air and water pollution are tough on trees. Pollution can poison a tree's system, slow its growth, and even kill it. Pollution happens when human-made and natural wastes dirty the air or water. Human-made wastes are the main sources of pollution. The greatest air pollution comes from the burning of fuel to run motor vehicles, heat or cool buildings, and run industry. Water pollution is caused by wastes from industry, farmlands, and homes. In the Mississippi River and parts of the Minnesota River, **urban** runoff from yard waste and lawn chemicals (fertilizers and pesticides) is a major pollutant.



Other Human Actions

People can be a tree's best friend; they often are its worst enemy, too. Plants and trees need land to grow on. But people need roads, houses, factories, mines, fields, shopping centers, and parking lots. So trees are chopped down, and land is cleared and paved. Little by little, the world's forests are disappearing.

Left alone, nature often renews itself. If we change too much land without renewing what we're taking away from it, we can upset or change the environment. Then all plant, animal, and even human life is affected.

Sometimes we might think people who are cutting down forests and clearing land are the only problem. Not true. People are wounding trees every day right in our own neighborhoods!

Trees can be wounded through damage to roots, to bark, and to the tree itself (limbs, trunk, leaves). Serious damage to any of these parts of the tree can threaten its health or even kill it.

Tree roots are injured when they're cut into or cut off, poisoned, or blocked from needed moisture, air, or nutrients. Lawn mowers, digging or grading equipment, and even shovels can cause serious root-cutting problems. Packing the soil above the roots or adding a layer of new soil limits air and moisture flow and can damage delicate roots. Dumping chemicals and other strong substances near the root system of a tree can cause poisons to enter the conducting vessels of the tree, damaging and killing tissue. Since the root of the tree is the first step in its food system, damage to roots can close down the tree's ability to get water and nutrients. Without water and nutrients, the tree will die.

Damage to bark happens through cutting or carving, ramming, fire, animal activity, people chaining or attaching things to the tree. Lawn mowers and weed eaters do their share, too. Bark has an outer dead layer and an inner living layer. The outer layer is the "skin" of the tree, protecting the soft inner parts of the tree from damage. The inner layer of bark carries food made by the leaves to other parts of the tree. Bark damage makes the tree more open to disease, rot, animal and insect inva-

sion. It also destroys some of the food- and water-conducting tissues.

Bark damage that goes most of the way or all around the tree is called **girdling**. Girdling usually kills the tree. Tree guards or mesh shields can help protect young saplings against girdling damage from animals and careless humans.

Damage to the structure of the tree comes through cutting, carving, breaking off, improper pruning, climbing, etc. This type of damage ruins the beauty of the tree. If there are bark injuries or open cuts, the tree faces the same health threats it did in the "Damage to bark" section.

What can we do to help protect trees? A lot! Here are just a few suggestions:

- Replace the grass around the base of a tree with mulch made from wood chips or composted leaves. As the tree gets bigger, the mulch bed should get larger. This will improve growing conditions for tree roots and protect the trunk from lawn mowers.
- If you have a lawn, help your family rake the leaves that fall on it in autumn. Don't burn them—that pollutes the air (in fact, leaf and debris burning is prohibited in most cities unless they choose to issue permits specifically regulating leaf and debris burning). Instead, rake them into an out-of-the-way pile. Flatten the top of the pile and leave it where rain can soak into the pile. (See "Compost Anyone?," Resources, page 101.) The leaves will rot and turn into dark, muddy-looking **humus** (soil). Spread the humus on your lawn and it will make the soil richer for the grass and other plants. In some communities, you can also take leaves and lawn clippings to a compost site.
- Don't carve on trees or peel the bark. The outside bark protects a tree from insects and fungi. The inner bark moves food from the leaves to the roots. Peeling off a tree's bark is like taking off its skin. It may cause the tree to die.



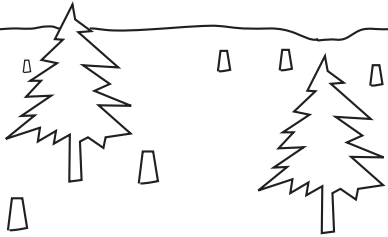

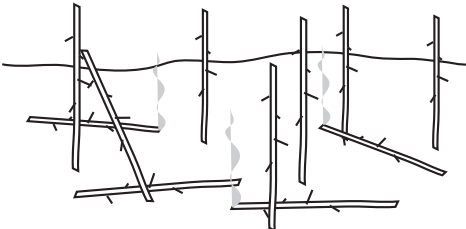


Bulletin Board Idea



Tree Enemies

Create a cause and effect chart that includes both natural and human hazards for trees. Students participate by finding or drawing pictures to match each category. If possible, students might also draw or find pictures that offer solutions to the problems.

Cause	Effect	Solution
Insects 		
Fungi		
Humans 		
Pollution		
Fire		



Language Arts

Literature and Folklore

Book Nook. See “Book Nook,” Resources, page 135, for tree-related books.

Trees. Read the familiar tree poem, “Trees,” by Joyce Kilmer. What does it mean to students? What other tree stories and poems do you know? Find some to share with the group. For some suggestions, see Resources, page 130.

How Do People Wound Trees?

You’ll need: “How Do People Wound Trees?” Activity Sheet, page 45.

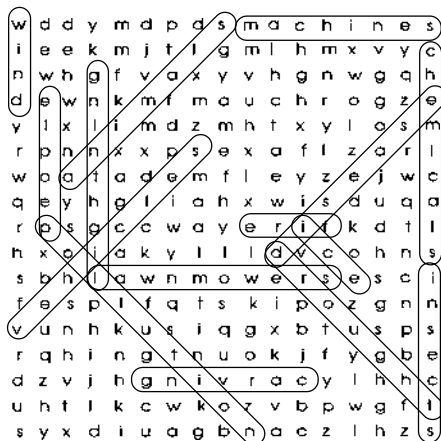
Do the activity sheet and learn more about how trees can be hurt.

Trees Have Many Enemies (Vocabulary)

You’ll need: “Trees Have Many Enemies” Activity Sheet, page 46.

Do the activity sheet and discover some enemies of trees.

Answers:



Write a Rap

You’ll need: Writing paper and pencils.

Write raps about saving, protecting, and respecting trees. Brainstorm words that might be used and list them on the white board.

My Side of the Story

Imagine city life from a tree’s point of view. As a group, brainstorm ideas about how a tree might act, or what it might say or feel when it is wounded or hurt in some way. What might it say when it is helped and thoughtfully cared for? Jot down your group’s ideas. These discussion-starters may help, too.

What would a tree say or do if:

- a 10-year-old locks his bicycle to it?
- a teenager carelessly rams into it with the lawn mower every week during the summer?
- a person from a lawn service sprays weed killer on the grass around it?
- a parks worker structurally prunes it and places mulch around it?
- cars slap against the branches hanging over the street?
- people having a garage sale nail their signs to it?
- someone gives it water on a hot, dry day?
- children playing in the schoolyard all use the same tree as “base,” and the many feet pack down the dirt around it?
- gophers dig tunnels in and around its roots?
- a new curb in the street causes the rain to collect around it in a pool of water?
- junior high kids think it’s cool to carve their initials on it?
- the children in the neighborhood climb it, going all the way to the small branches near the top?
- a teenager puts a fence around it when it is small so no rabbits can nibble on it?
- construction crews drive bulldozers and other heavy machines over its roots?
- city workers remove branches broken by strong winds?
- people volunteer to keep watch for insect and disease problems?

Arbor Month Spelling

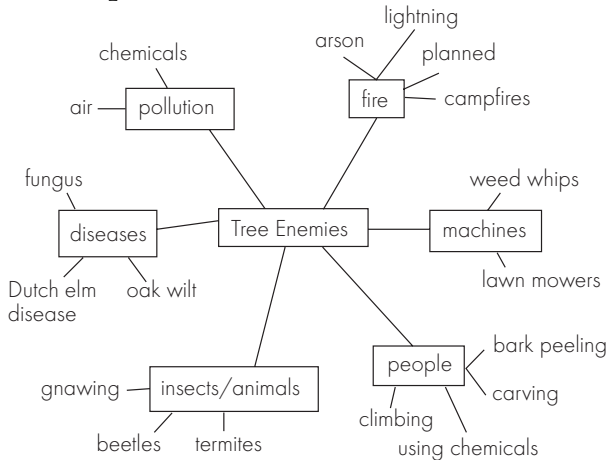
For Arbor Day (last Friday in April) or Arbor Month (May), choose tree- and forest-related words in spelling.



Word Webs

Write the word “tree enemies” on the white board. Brainstorm together and write in random spaces all the words you can think of that could represent damage to trees. Draw lines to join things that go together. Circle all the words on your word web that people can help prevent.

Example:



People and Cultures

Visit City Hall

Arrange to have your class visit your community’s local government offices (city hall, county courthouse) to ask their own questions and to learn answers to these questions:

1. What department is in charge of the trees in the community?
2. How much money does this department spend each year on tree care? What are the main expenses?
3. Has the community planted any trees? How many? Where? Where did they get their planting stock (trees)? What species of trees were planted? Why were these species selected? Have the plantings been successful? Who cares for the trees? Did the trees survive?
4. What kinds of “tree enemies” do the trees in our community have?
5. What can people do to help our trees stay healthy?
6. Where can citizens get help and advice about their own trees?

7. Where can citizens get seedlings to plant new trees?
8. Does the city/county have any laws that protect trees?

Conservation Connections

Get to know conservation groups! What are some organizations that work for conservation and protecting the environment? (American Forests, Izaak Walton League, National Arbor Day Foundation, National Wildlife Federation, Sierra Club, Society of American Foresters, the Wilderness Society, nature conservatories, and state conservation agencies are some.) Contact one of the organizations in your community. Can someone come out to talk to the students about their work? Do they have brochures and educational materials for young people? Some organizations are already geared to youth—Boy and Girl Scouts, 4-H, FFA, Camp Fire, Incorporated, etc.

Necessary or Just Nice?

Brainstorm a list of forest products people use in these areas of home living:

1. Kitchen (cutting board, knife handles, cupboards, shelves, counters...)
2. Interior (furniture, walls, doors...)
3. Cleaning and repair (broom handle, vacuum cleaner bags...)
4. Food (vanilla, nuts, wild game...)
5. Exterior (fence post, picnic table, shutters...)

Divide the class into small groups. Students use the list for discussion to answer these questions:

1. Which of the items listed are necessary for human survival?
2. Which of the items are not necessary or maybe even wasteful of forest products? Why? Which of the unnecessary products are you willing to eliminate or find a substitute for? What would be the environmental effect if everyone avoided the unnecessary products?
3. Look at the items you decided were necessary. Are there materials available that could be substituted for the forest products used? Do you think the substitute material would serve as well as the forest product?



Check Out the Wraps

You'll need: Writing paper and pens or pencils.

One way humans damage forests is through too much cutting and not enough replanting. One way to try to influence food businesses to save trees is to check out containers.

Contact a local fast-food business and find out what their food trays and containers are made from. Are they recyclable? Write letters and perhaps draw pictures expressing your concern and encouraging them to help save our trees. If they aren't using recyclable containers, suggest that they do so!

Trees Get "Sick" Too!

Note: Can be integrated into "Visit City Hall," page 40. Discuss the "Dutch Elm Disease" and "Oak Wilt Disease" sections of this unit and in Resources, page 120. Then assign students to one or more of these activities.

1. Contact your local tree inspector or city forestry department. How serious is Dutch elm or oak wilt disease in your community or neighborhood? How are they being managed? What is being done with trees that are cut down and removed?
2. Is there an area in the community where diseased trees are standing? Visit that area and look for symptoms of Dutch elm disease or oak wilt disease on the trees. If trees have been recently removed from the area, inspect the stumps. What disease symptoms do you see? (Other than a staining under the bark of a recently removed elm, there won't be visible signs.)
3. Find out from your community forester or extension office ways in which your community tries to prevent a problem like Dutch elm disease or oak wilt disease in the future. (For example, a variety of trees could be planted so a disease affecting one particular species would not spread so quickly.) Are any new tree diseases or problems being discovered? If so, how is your community guarding against them?

Wood Around the World

What are some main ways people around the world use wood? How can you find out? (Your librarian or media specialist can help you find resources.)

Why are there so many differences in how people use wood? What things are being done in different countries to protect trees and use wood wisely? (Some examples: Timber volume in the temperate climates is increasing rapidly, including in the former Soviet Union and Canada. This is happening through lots of planting and better forest management. In the United States, more timber is grown each year than is cut.)

Science and the Environment

Damage Detective Tour

Take a walk around the neighborhood and look for different forms of damage to trees. Scars, broken branches, misshapen trees are clues. Discuss:

- a. What caused the damage?
- b. Is this an old injury? A new one? How can you tell the differences between old and new injuries?
- c. What causes tree "bleeding" (sap running out of the tree)? Is it harmful to the tree? (Probably not.)
- d. Why are trees pruned and trimmed? How can pruning help a tree? Hurt a tree? (Pruning helps trees when it's done by people who know how to do it correctly. Pruning is done to cut off damaged, weak, or poorly attached tree parts. This leaves the rest of the tree strong and ready to face storms, diseases, and other threats. Pruning is also done to improve the appearance of a tree. Cutting large parts off a tree may create an opening for wood decay.)



Fire: Friend and Foe

Think and discuss: Is there such a thing as a good forest fire? Intense fire is usually an enemy to a forest, but sometimes fire can be helpful. For example, there was a great fire in Yellowstone National Park in the summer of 1988. At this time, there were great amounts of dry wood lying around like piles of **kindling**. Why would a fire have an easy time taking off during a dry summer? How might this fire have been helpful? (The fire cleaned out old forest and opened space for new growth and meadows. It encouraged growth of different types of vegetation. This in turn brings in animal life.) Once in a while, Minnesota forest managers decide it would be best to start a small, controlled fire to burn dry wood and underbrush that could start a big, out of control fire. What do foresters have to do to make sure their fires are safe and the right thing to do? (Safety plans must be made and in place before the fire is set. Houses and other property must be protected. Firefighting people and equipment must be available and ready for any emergencies. The weather must be right—no strong winds or dry conditions in the forest. Areas to be burned are usually done in small patches so wildlife can escape.)

What's Inside?

You'll need: A stethoscope (the school nurse may be able to provide one).

Borrow a stethoscope and have students listen to a tree in spring. Choose a healthy, medium or large broadleaf tree. What do they hear? (You should hear water—sap—moving from the roots to the leaves. Try a few different spots on the tree to find the best listening.) What do they think they would hear if the tree were diseased so its waterways were clogged?

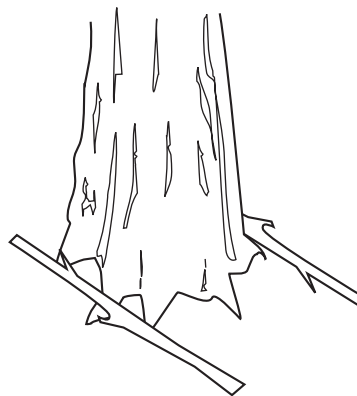
Enhancements

Math

Guess What?

You'll need: A tape measure and two sticks.

Have students estimate the diameter of a tree trunk. How can they check the estimates to see how close they might be? (Lay sticks that extend beyond the tree on opposite sides of the trunk. Measure the distance between them.)



Let's Measure That Tree!

You'll need: Rulers.

Discuss the ways in which people in early times used their bodies (hand spans, step “paces,” for instance) to measure. Measure various things in the classroom using different parts of bodies: foot, hand span, arm span, length of a finger, paces. Estimate the measurements in inches or feet. Then remeasure the same items using a ruler.

How accurate is each type of measurement? Why do different people get different measurements when they measure by body forms?

How Tall?

You'll need: A tape measure or yardstick.

How can we measure a tree's height? Try this:

On a sunny day, measure the height of a small tree, preferably one short enough so students can reach its top. Record the time of day when the length of the tree's shadow is the same as its height. Then at that same time the next day, look at a tall tree. By measuring the tall tree's shadow when the sun is in the same position as when the small tree's height and shadow matched, how can you figure out



the height of your tall tree? (Shadow and height will match.) What are some other ways you might be able to measure the height of the tall tree? How would a forester do it?

Students may wish to estimate how many “student lengths” the tree will be before beginning the measuring exercise. Was their estimate less than or greater than the tree’s actual height?

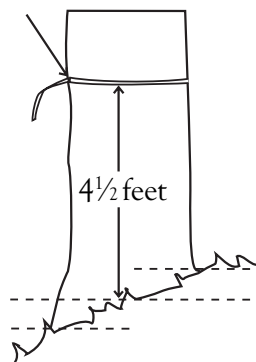
How Big Around?

You’ll need: A tape measure.

Measure the circumference of a tree by joining arms around a large tree or using hand spans on a small one. Estimate the circumference in inches or centimeters. Then use the tape measure to measure the distance around the trunk at a point 4½ feet above the ground to get an exact measurement.



If the tree is on a slope, measure from the ground at the mid-point of the slope and the tree base.



How close was your estimate?

The Arts

Another Point of View

You’ll need: Drawing paper and crayons or markers.

After discussion, based on additional research if necessary, ask students to think about how each of these individuals might view a healthy and a decaying tree. Ask the students to choose one of the individuals listed, then draw pictures of healthy and decaying trees as they think this individual might see it—or might use it.

an artist	a homeowner	a tree inspector
a forester	a gypsy moth	an ecologist
a logger	a tree farmer	a bird that lives in the trees
	a rabbit	

Create a gallery of these drawings. Have students serve as guides for each other, pointing out the differences in the way the various people and animals might view healthy and decaying trees.

Boot It Up!

You’ll need: Computer access and graphics software.

Use computer graphics to create tree art.

Bumper Notes

You’ll need: Drawing paper, markers, clear adhesive contact paper, and scissors.

Design bumper stickers that encourage people to plant trees and to practice fire safety in the forest. If you are going to actually apply them to bumpers, cut adhesive paper larger than the bumper sticker; mount the sticker face down on the sticky side to seal the drawing. Clean the bumper; apply by pressing the adhesive paper in place.

Bookmarks

You’ll need: Tagboard, clear adhesive contact paper, and small pressed leaves or evergreen needles.

Cut a strip 2 to 3 inches wide and 6 inches long from the tagboard. Cut a piece of contact paper large enough to cover both sides of the strip. Place leaves or evergreen needles on the strip to decorate it, then cover with contact paper. Press the contact paper and strip firmly together. Trim off any extra contact paper.



Games and Physical Activities

Jump Rope Jingles

You'll need: Jump ropes.

Make up your own jump rope jingles and raps about trees of the forest. Some idea starters:

Ma-ple, ma-ple,
Grows so tall
Leaves are bright red
In the fall

or

How many apples on my ap-ple tree?
Count with me and we will see!
1-2-3-4-5-

(Count until the jumper misses; a new jumper hops in and the chant begins again.)

Performance Assessment

Task Statement

Using the “How Do People Wound Trees?” Activity Sheet on page 45, students analyze what damage is happening and what they can do to prevent it.

Grade 3 Standard

Analyze damage to trees and how the damage can be prevented.

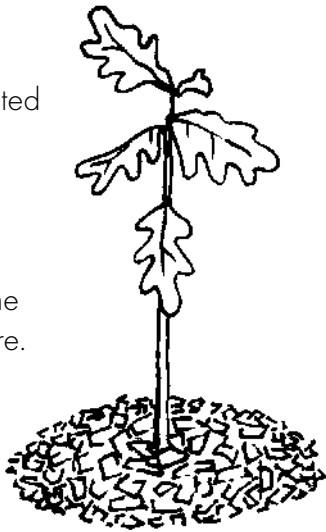
Rubric—Quality of Performance

- 4 Exceeds performance standard
- 3 Meets performance standard
- 2 Developing toward performance standard
- 1 Attempt made but many serious errors

FUN FACT

We're a Planting State!

More trees are planted in Minnesota than are harvested each year. Forest managers are making sure there are plenty of trees for all the generations of the future.



How Do People Wound Trees?



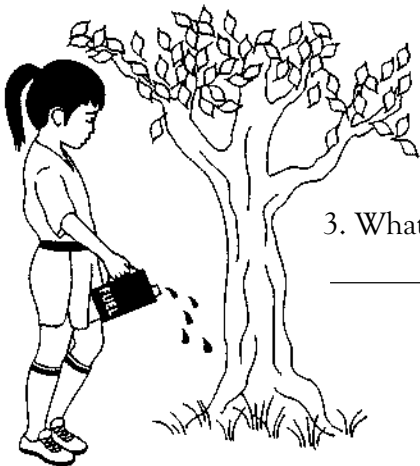
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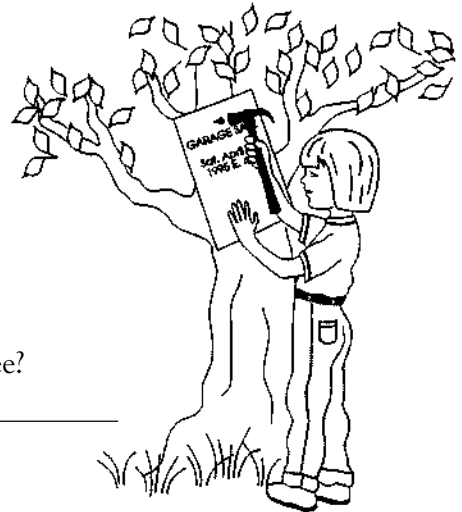
1. What happens to the tree?



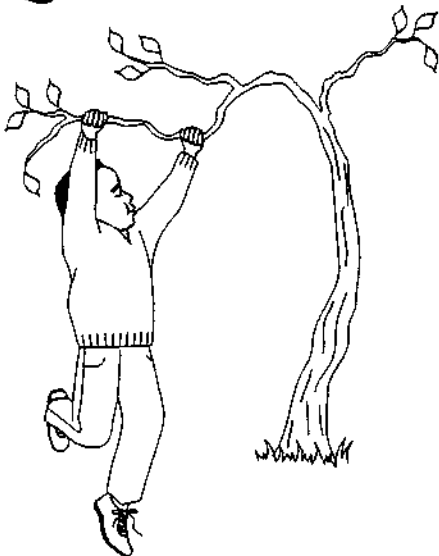
2. What happens to the tree?



3. What happens to the tree?



4. What happens to the tree?



5. What happens to the tree?



6. What happens to the tree?



Trees Have Many Enemies



NAME: _____

PROTECT



PROTECT

w d d y m d p d s m a c h i n e s
 i e e k m j t l g m l h m x v y c
 n w h g f v a x y v h g n w g q h
 d e w n k m f m a u c h r o g z e
 y l x i i m d z m h t x y l o s m
 r p n n x x p s e x a f l z a r i
 w o a t a d e m f l e y z e j w c
 q e y h g l i a h x w i s d u q a
 r p s g c c w a y e r i f k d t l
 h x o i a k y l l d v c o h n s
 s b h l a w n m o w e r s e s c i
 f e s p l f q t s k i p o z g n n
 v u n h k u s i q g x b t u s p s
 r q h i n g t n u o k j f y g b e
 d z v j h g n i v r a c y l h h c
 u h t l k c w k o z v b p w g f t
 s y x d i u a g b n a c z l h z s

Can you find these words? They go across, up, down, and diagonally. Sometimes they're even backward.

lawn mowers

machines

disease

chemicals

animals

people

pollution

carving

wind

lightning

drought

fire

vehicles

insects

ice



Answers on page 39.