

the  
**GIVING  
GROVE**

## **CLASSROOM LEARNING ACTIVITIES FOR SECONDARY STUDENTS**

**N**UTRITION FROM TREES

**E**NVIRONMENTAL BENEFITS OF TREES

**S**OIL BIOLOGY FOR GROWING HEALTHY TREES

**T**REE BIOLOGY FOR MAINTAINING HEALTHY TREES

Curriculum provided by Kansas City Community Gardens  
and sponsored by EPA Region 7

**300 WEST 39TH STREET, KANSAS CITY, MISSOURI 64111**

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# TREES CONSERVE ENERGY

**Lesson Objective:** The Learner will identify ways that trees help to conserve energy.

**Key Questions:** Why is the temperature cooler in the shade vs. in the sun? How do trees help us to conserve energy?

## **Background Information:**

One-quarter of the forest canopy in the United States is found in urban counties. The trees planted within our communities are known as our “community forest” or “urban forest.” One of the more measurable benefits trees provide is energy conservation. On a community-wide scale, shade trees help reduce the “heat-island” effect caused in urban centers by buildings and pavement, which absorb light energy and reflect it as heat.

Trees conserve energy! Three trees placed strategically around a single-family home can cut summer air conditioning needs by up to 50 percent. By reducing the energy demand for cooling our houses, we reduce carbon dioxide and other pollution emissions from power plants.

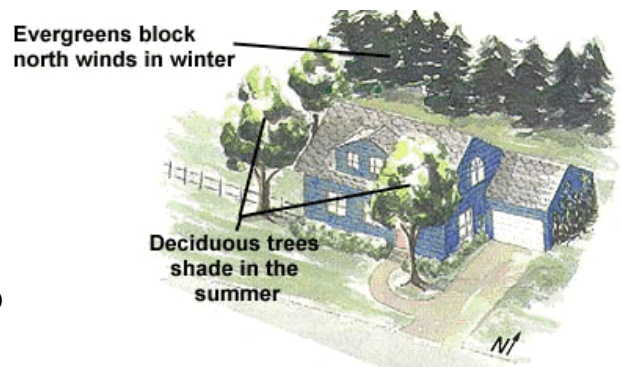
Trees save energy in several ways. Tree leaves absorb light energy, thereby reducing reflected heat. They also absorb water through their roots and release moisture through the leaf surfaces by a process called evapotranspiration, which cools the air in much the same way our skin cools us through the process of sweating. Trees can reduce the surrounding air temperature by 9 degrees F and the temperature directly under the tree as much as 25 degrees F. It only takes a hot summer day to send us looking for the shade of a tree and its cooling benefits!

Trees can be strategically planted to take advantage of their energy-saving benefits. Properly placed trees can effectively reduce the solar heat absorbed by buildings and reduce cooling costs by 30 percent. Large-growing deciduous trees are the best choice for shading and cooling. During summer, their leaves block the sun and provide shade, yet during winter months the sun passes through the leafless canopy. Placing trees on the south and west sides of your house can take advantage of the shade they provide, especially if they are planted to shade the building during the hottest part of the day or early evening. Trees with a broad canopy will provide the greatest shading benefits. A combination of large and smaller trees can be used on the west side of a building to reduce the late afternoon heat and glare when the sun is at a lower angle.

Shading other impervious surfaces such as driveways, sidewalks, streets and parking lots also can significantly improve the microclimate around your home by reducing glare and reflected heat. And if your air conditioner is not located in a shaded area, consider planting a small tree or large shrub nearby to shade the unit. Shading an air conditioning unit can increase its efficiency by 10 percent.

You can even plant shade trees for your sidewalk and driveway to keep sunlight off the hard paving and thereby lower local temperature without shading your house at all.

Trees also shield people from ultra-violet rays. Skin cancer is the most common form of cancer in the United States. Trees reduce UV-B exposure by about 50 percent, thus providing protection to children on school campuses and playgrounds - where children spend hours outdoors.



## **Materials:**

Outdoor area with shade trees

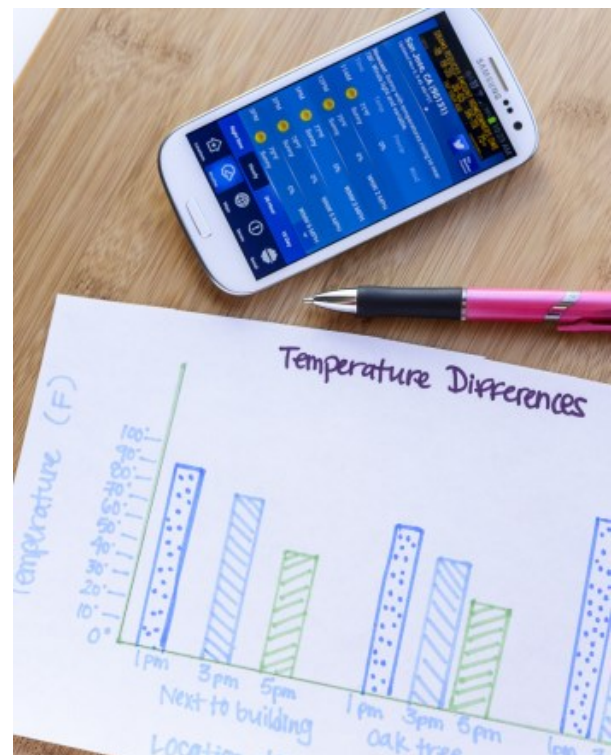
Outdoor thermometers

Science journal

Activity Page “Made in the Shade”

## **Learning Activity:**

- A great activity to educate your students about the cooling effect of shade is to measure the temperature difference between shaded and non-shaded areas. The general goal of this activity is to put thermometers in areas of direct sunlight and in the shade of trees and measure the temperatures in both locations.
- Select 3 or 4 locations, close to each other: one area shaded by a man-made structure, one area shaded by a tree (or 2 areas, each shaded by a different type of tree), and one area in direct sunlight.
- Place a thermometer in each location (thermometers should be of the same kind).
- Check temperatures at regular intervals. Be sure shady places stay shady during temperature measurements.
- Carefully record all observations and measurements.
- Repeat the above process on another day, under the same conditions and in the same locations, but switch the thermometers around.
- Have blindfolded volunteers spend one minute in each shady area, with at least one minute of exposure to direct sunlight in between.
- Ask students which (if any) type shade they preferred.
- Analyze the data. Interpret your findings.
- Show results visually using charts and graphs. For younger students, use the Activity Page “Made in the Shade”.
- Display any interesting photos taken throughout the course of the experiment.
- You can increase this activity’s degree of difficulty by incorporating graphing exercises. If your science department has some light sensing and data logging equipment, this could be used to compare light levels and temperature, and the relationship between these variables.



## **Additional Resources:**

Lesson adapted from <https://www.education.com/science-fair/article/made-in-the-shade/>

<https://www.thefencepost.com/news/trees-help-consume-energy-in-several-ways/>

<https://www.plt.org/educator-tips/activities-explore-uses-trees/>

# MADE IN THE SHADE

Use an outdoor thermometer to gather outdoor temperature data in various locations at different times of the day. Choose a location next to a building, under a shade tree, and in direct sunlight. Graph your findings.

TEMPERATURE DIFFERENCES

TEMPERATURE (F)	100°											
	90°											
	80°											
	70°											
	60°											
	50°											
	40°											
	30°											
	20°											
	10°											
0°												
		Time:	Time:	Time:		Time:	Time:	Time:		Time:	Time:	Time:
		LOCATION ONE:				LOCATION TWO:				LOCATION THREE:		

LOCATION OF THERMOMETER

Why is there a temperature difference between areas in the shade vs. the direct sunlight?

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What are some conclusions that you can make from the data you collected?

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# ENVIRONMENTAL BENEFITS OF TREES

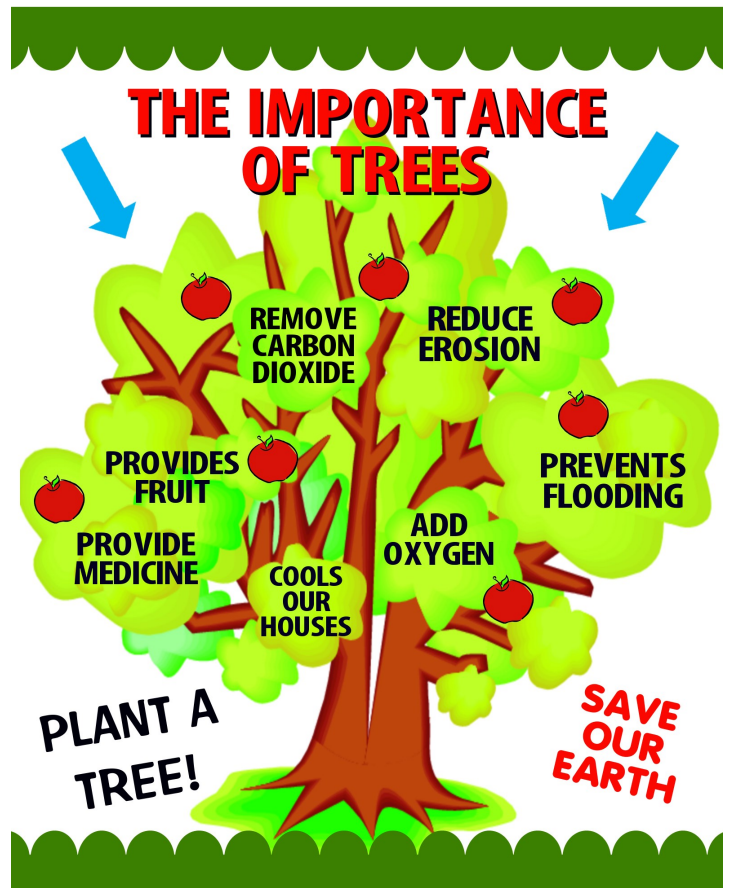
**Lesson Objective:** The Learner will identify the various environmental benefits of trees and complete a research project on one of the benefits.

**Key Questions:** How do trees benefit the environment? What would be the impact on your neighborhood/city if there were no trees?

## **Background Information:**

Identify the great value trees bring to people by having the students identify the benefits that trees provide. List these benefits on a board or chart. Examples can include:

- Trees release oxygen into the air.
- Trees absorb harmful carbon dioxide from the air. (An acre of trees absorbs the amount of carbon produced by driving a car for 26,000 miles.)
- Trees give us shade from the sun and a cool place when it's hot. ( Just three strategically placed trees can decrease utility bills by 50 percent.)
- Trees provide a home for wildlife and humans.
- Trees produce fruit and nuts for animals and humans to eat.
- Tree roots prevent soil runoff and reduce it from washing away.
- Trees provide hundreds of products, which we use everyday (paper, benches, baseball bats, etc.)
- Trees increase humidity in dry climates through evaporation of water from their leaves into the atmosphere.
- Trees give us beautiful areas for camping, hiking, and playing.
- Trees clean the air by taking in carbon dioxide and releasing oxygen.
- Dead leaves and branches decompose to create enriching mulch and soil.
- Trees break strong winds.
- Trees are used for medicinal purposes.
- Trees provide dyes and pigments.



WHAT ARE SOME OTHER BENEFITS OF TREES?



## **Materials:**

List of environmental benefits of trees                      Research materials (books, computers)

Materials for students to create presentations

## **Learning Activity:**

- Identify the great value trees bring to people by having the students identify the benefits that trees provide. List these benefits on a board or chart.
- Students can work individually or in groups to create a research project.
- Have students select one of the benefits of trees. Students will conduct more in-depth research on this particular benefit.

⇒ Example: Trees help clean our air.

- ◇ Global forests removed about one-third of fossil fuel emissions annually from 1990 to 2007.
- ◇ Trees remove pollution from the atmosphere, improving air quality and human health.
- ◇ In Los Angeles, trees remove nearly 2,000 tons of air pollution each year.
- ◇ In Chicago, trees remove more than 18,000 tons of air pollution each year.
- ◇ In Greater Kansas City, trees remove 26,000 tons of air pollution each year.
- ◇ Roadside trees reduce nearby indoor air pollution by more than 50%.

⇒ Example: Trees help clean our drinking water.

- ◇ Forested watersheds provide quality drinking water to more than 180 million Americans.
- ◇ In 1997, New York City spent \$1.5 billion to preserve the forested watershed that supplies New York City's drinking water by purchasing thousands of upstate acres of forested watershed.
- ◇ A filtration plant large enough to clean New York City's water supply would have cost more than \$6 billion dollars.
- ◇ Today, New Yorkers enjoy some of the cleanest drinking water in the world, and New York City has won regional water taste competitions.

- Have students create a presentation to share their research with classmates. Presentations can incorporate a variety of learning styles: Tri-fold board, PowerPoint, Slideshow, Skit, Commercial, Poster, Music/Song. Presentations are only limited by the student's imagination!



## **Additional Resources:**

<https://www.arboday.org/trees/treefacts/>

<https://californiareleaf.org/wp-content/uploads/2010/12/2011-Arbor-Week-Poster-Contest.pdf>

<https://www.neefusa.org/nature/land/many-benefits-trees>

# BENEFITS OF TREES



My presentation will focus on this benefit:

\_\_\_\_\_

My presentation type will be: \_\_\_\_\_

(i.e. tri-fold board, PowerPoint, skit, commercial, poster, etc.)

I used these sources to gain information for my research:

1.

2.

3.

My presentation will include the following factual information:

A.

B.

C.

The most surprising information I learned was...

\_\_\_\_\_  
\_\_\_\_\_

How would my neighborhood/city be affected if there were no trees?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# URBAN & COMMUNITY FORESTS

**Lesson Objective:** The Learner will describe the benefits of urban/community forests and explore various careers related to the study of trees.

**Key Questions:** What is an urban or community forest? Why are urban and community forests important? What are the career opportunities related to the study of trees?

## **Background Information:**

What is an urban or community forest? An urban or community forest is comprised of trees and other vegetation in and around our communities, including the trees in our yards and along residential streets, in parking lots and along commercial thoroughfares, on school grounds, and in parks and open spaces.

Why are urban and community forests important? Healthy urban and community forests are integral to the ecological, economic, and social well-being of our communities. From cleaning our air and water to saving energy through cooling shade, from raising property values to rekindling neighborhood pride, from providing places for children to play to providing homes and food for wildlife, our communities' trees have a lot to offer. When selected, planted, and cared for properly, trees can improve the quality of our lives for decades to come.



Unlike the wildland forest that stretches uninterrupted by human activity for miles on end, the urban forest thrives around crowded highways, business complexes and convenience stores from a single tree planted in the corner of a parking lot to the thick woods of a city park. The emerging trend toward the growth and care of urban forests is opening new doors of opportunity to fulfilling careers for city dwellers who love nature and want to play a role in preserving the delicate environment.



As more and more people are drawn into the urban environment, the need to reconnect with nature is becoming more acute and activities surrounding the urban forest are likely to expand. Positions within urban forestry encompass a broad spectrum offering opportunities for people of all interests, backgrounds, education and experience levels.

No matter if trees exist in the wildland forest or in urban and community forests, TREES PROVIDE JOBS! Some of the careers related to the study of trees include:

- ⇒ Arborist- Provides tree services to homeowners, commercial property owners, and cities and towns.
- ⇒ Forester- Cares for the land and sustains the long-term health of forests.
- ⇒ Park Planner- Plans all aspects of public park use.
- ⇒ Nursery Manager- Propagates, purchases, cares for, and sells potted trees, either wholesale or retail.
- ⇒ Tree Grower- Raises high-quality trees for wholesale and retail.
- ⇒ Urban & Community Forester- Cares for urban and community forest ecosystems within metropolitan and surrounding areas for the benefit of the residents.
- ⇒ Tree Trimmer- Provides tree care services to homes and businesses that promote optimal growth and correct problems with minimal damage.
- ⇒ Urban Planner- Coordinates and balances the complex relationships of a city. He/She understands the needs of a community and advises on the best way to pursue common goals.
- ⇒ Lumber Harvester- Turns logs into lumber.
- ⇒ GIS Technician- Uses Geographic Information Systems (GIS) to manage resources and plan land-use.
- ⇒ Research Scientist- Expert in research related to trees. Seeks ways to optimize the performance of trees by studying the effects of variable conditions on trees.
- ⇒ Community Project Manager- Works with communities to implement urban and community forestry grant programs.
- ⇒ Landscape Architect- Plans and designs private, public, and commercial green spaces.
- ⇒ Utility Arborist- Manages trees near utility lines.
- ⇒ Wildland Fire Manager- Prevents, suppresses, contains, and controls damage and injuries from fires.



WHAT OTHER CAREERS RELATED TO TREES CAN YOU THINK OF?

## **Materials:**

Activity Page “Communities Need Trees” and “Trees Provide Jobs”

## **Learning Activity:**

- Have students think about all the trees they see on an every day basis. Thinking back on how they use trees, have the students try to imagine their world without trees.
- Discuss the differences between wildland forests and urban/community forests. How do trees grow differently in populated vs. nonpopulated areas? Why is it important to have trees in urban areas? Can you think of place in your urban community/city where there are forest areas or green spaces?
- Each student will have the opportunity to act as a urban and community forester. He/she will be given eight trees to plant in a community where no trees exist. Using the Activity Page “Communities Need Trees”, students will plant (draw) their eight trees where they feel the trees would be most beneficial.
- Have the students number their trees as they draw them and then describe their rationale below the map.
- Whether trees exist in the wildland areas, or in the urban areas, there are many career opportunities related to trees. What jobs/careers can you think of that involve trees? Brainstorm a list together.
- Have students complete the Activity Page “Trees Provide Jobs”. For a more interactive approach, cut apart the boxes with the name of the job and the job description. Pass out a card to each student and have them find their “match”.
- Students can complete a more in-depth research project by choosing a career field related to trees and interviewing someone who holds that job.
- Ask students, “If you were to choose a job working with trees, which one would you pick? Why? What are things about your personality that would fit well with that job? What do you think would be the challenges of this job?”

## **Additional Resources:**

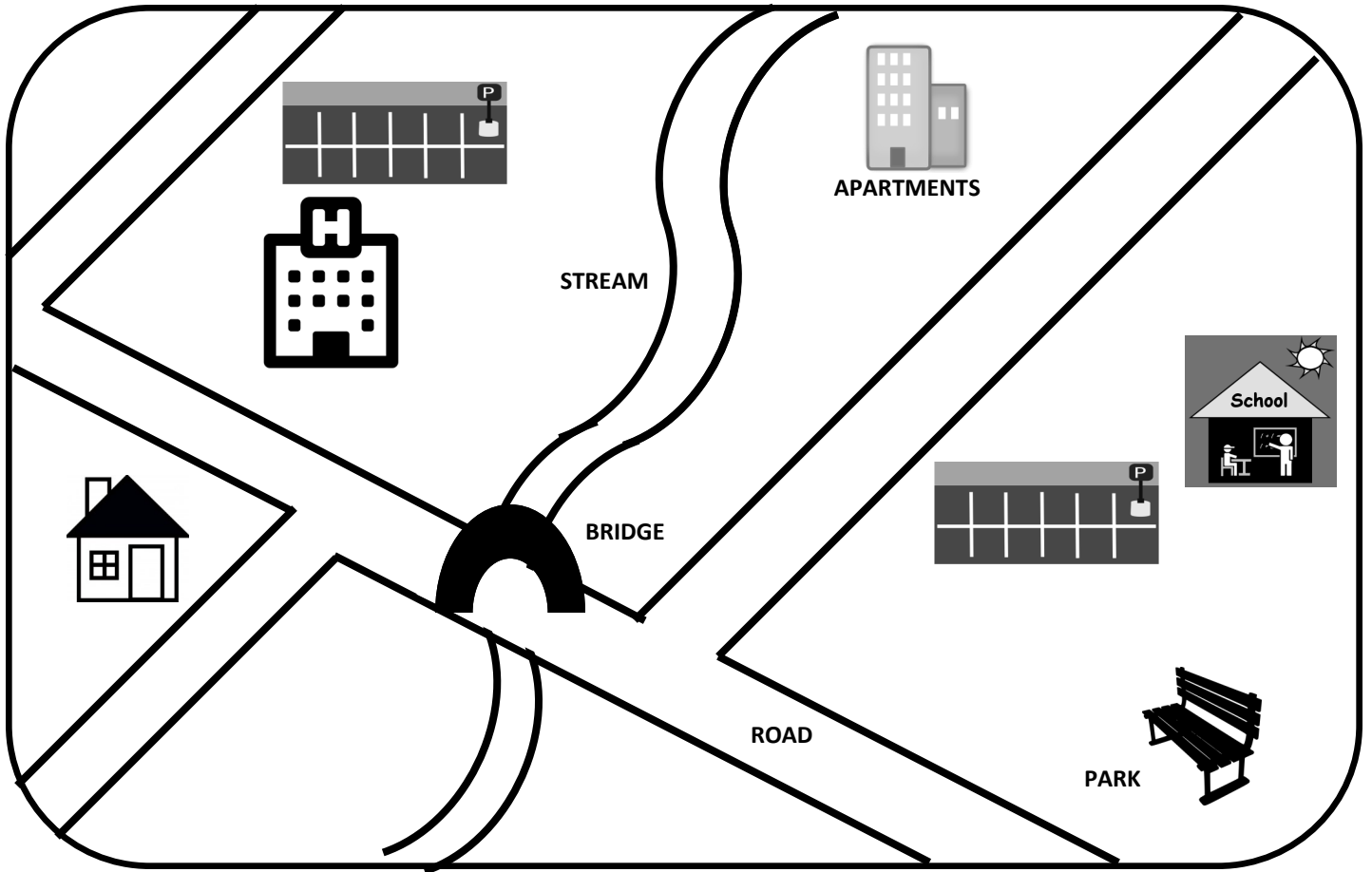
<https://californiareleaf.org/wp-content/uploads/2010/12/2011-Arbor-Week-Poster-Contest.pdf>

<http://www.urbanforest.org/index.cfm/fuseaction/Pages.Page/id/430>

<https://friendsoftrees.org/blog/the-value-of-city-trees-to-wildlife-and-people/>

<https://mdc.mo.gov/trees-plants/missouri-state-champion-trees/missouris-current-champion-trees>

# COMMUNITIES NEED TREES



Your job as an urban and community forester is to plant (draw) 8 trees in this urban community. Think about where the best location may be for each tree.

Number the trees you place on the community map and describe why you planted the tree in that particular location.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

## TREES PROVIDE JOBS

Can you match the job title to the job description? Which tree career would you choose?

**ARBORIST**

**FORESTER**

**WILDLAND FIRE  
MANAGER**

**TREE GROWER**

**TREE TRIMMER**

**URBAN PLANNER**

**LUMBER HARVESTER**

**RESEARCH  
SCIENTIST**

**COMMUNITY PROJECT  
MANAGER**

**URBAN & COMMUNITY  
FORESTER**

**LANDSCAPE  
ARCHITECT**

Raises high-quality trees for wholesale and retail.

Plans and designs private, public, and commercial green spaces.

Cares for urban and community forest ecosystems within metropolitan and surrounding areas for the benefit of the residents.

Provides tree services to homeowners, commercial property owners, and cities and towns.

Works with communities to implement urban and community forestry grant programs.

Turns logs into lumber.

Provides tree care services to homes and businesses that promote optimal growth and correct problems with minimal damage.

Cares for the land and sustains the long-term health of forests.

Prevents, suppresses, contains, and controls damage and injuries from fires.

Expert in research related to trees. Seeks ways to optimize the performance of trees by studying the effects of variable conditions on trees.

Coordinates and balances the complex relationships of a city. He/She understands the needs of a community and advises on the best way to pursue common goals.

# THREATS TO HEALTHY TREES

**Lesson Objective:** The Learner will describe the various factors that affect the health of a tree.

**Key Questions:** What makes a tree sick? How can you tell if a tree is healthy or sick?

## **Background Information:**

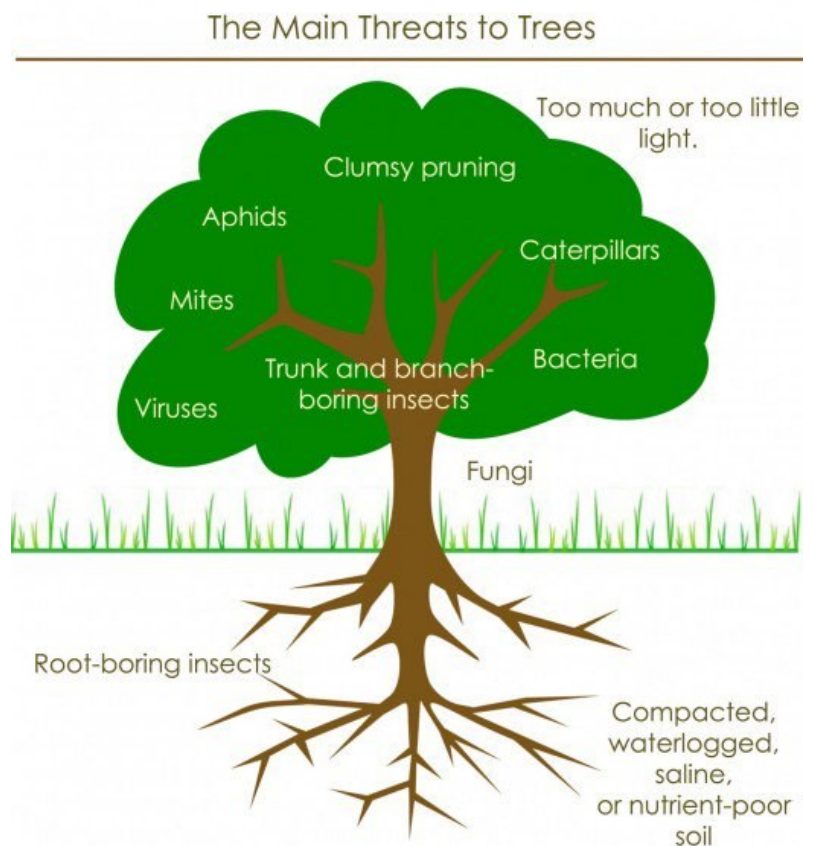
Trees can live for a very long time. A Great Basin bristlecone pine that recently died in California was 4,845 years old. Clearly, though, no tree is immortal, and some die a long time before they are fully grown.

If a tree that you care about is obviously struggling to survive, here is a little help in understanding the issues from a biological perspective. Good gardeners, and anyone interested in tree welfare, can benefit from a little science!

Did you know that most tree problems result from a combination of factors? Insects and diseases often get the blame for killing trees, but factors like drought or construction damage are most likely the primary cause of a tree's death. These primary factors weaken a tree's defenses, making it more susceptible to attack by secondary invaders like insect borers and wood-decaying fungi.

What are the main enemies of trees?

- environmental stress (water shortage, poor soil, excessive wind, too much or not enough light, for example)
- insect pests that eat or damage tissues
- mites, especially spider mites
- those fungi that can attack living trees
- bacteria
- viruses
- invasive species and exotic diseases
- some large mammals, like bears, deer, and rabbits
- human beings
- lightning





## **Soil Compaction Chokes Roots**

Highly compacted soil prevents both oxygen and water reaching the roots of trees. Without oxygen, the roots are far less efficient at moving water to the leaves.

Roots secrete exudates that include protective antibacterial and antifungal chemicals as well as chemicals that encourage beneficial microorganisms. Beneficial organisms are harmed by poor soil conditions, just as root function is.

How do You Recognize Soil Compaction?

- If water pools near a tree after rainfall it can be a bad sign. Healthy roots use water fast, and aerated soil drains quickly.
- Seedlings cannot take root, and the area is bare.
- You can use a simple rod to probe soil. Often compaction is local, caused by foot or vehicle traffic. Sometimes, you will find that the topsoil is fine, but the subsoil is almost impenetrable.

## **Waterlogged Soils**

Waterlogged soils are worse for roots than compacted soils. Oxygen is prevented from reaching roots, potentially dangerous fungi are encouraged and toxic chemicals can be produced by anaerobic bacteria.

If you dig holes for posts or planting, and they fill with water, this can be a sign your garden needs some drainage.

Alternatively, you can find trees that tolerate waterlogged soils. These include particular varieties of willow, ash, cedar, birch and maple, so there is plenty of choice.

## **Human Activity**

Sometimes, you are your tree's worst enemy. You can severely damage trees by hitting them with lawn mowers and weed whackers.

Pests and diseases find it hard to gain entry to the food-rich interiors of trees. If you prune branches, or remove roots, without due care, you will be opening a door to invaders.

Take care to consult proper pruning advice for each species, including the best time of year to do the work and how to minimize damage.

Clumsy pruning, root removal, soil compaction from cars and feet, can all threaten trees.

## **Animals**

Any animal that eats the leaves of trees can be a problem for saplings. Older trees are only seriously affected by animals that strip bark from trunks. Deer rub bark from trees when they condition their antlers.

- Black bears are notorious for stripping bark from trees.
- Beavers will fell trees with their sharp canine teeth in order to dam rivers and build homes for themselves and their young.

The mystery of trunk damage in, or near, wooded areas can often be solved by checking for animal tracks and droppings. Rabbits, voles, squirrels, porcupines—are some of the animals that can damage trees.

## **Nutrition Deficiencies**

Nutrient deficiency will slow the growth of trees. Trees need nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur as macronutrients. Other elements, like iron, are needed in smaller quantities but are very important. Sweetgum trees, for example, are prone to severe leaf chlorosis (yellowing) if starved of iron, which can lead to leaf loss. In our area, leaf chlorosis is much worse for pin oak trees.



Countless insects live on, in, and around trees - many are harmless, while others can cause fatal damage. Below is a general description of the three main types of insects that affect trees.

### **Chewing Insects**

Defoliating insects migrate to the foliage of a tree and feed on the leaves. Other chewing insects attack the fruit. Caterpillars and beetles make up the largest proportion of chewing insects.

Generally, trees can bounce back from an attack of these defoliators, though repeat infestation will weaken a tree and can eventually kill it by starving it of energy.

Examples include: Spring and Fall Cankerworm, Tent Caterpillar, Gypsy Moth, Leafminers, Bagworm, Japanese Beetle, Apple Maggot, Cherry Fruit Worm



Healthier trees are less likely to become infested, so maintaining the strength and vitality of your tree is an important prevention step. Once chewing insects are present, controlling movement up and down the stem with physical barriers can interrupt the lifecycles of many caterpillars.

### **Boring Insects**

Boring insects are often the most harmful to trees and if left untreated can cause death. Boring, or tunneling, insects cause damage by boring into the stem, roots, or twigs of a tree. Some lay eggs which then hatch and the larvae burrow more deeply into the wood blocking off the water-conducting tissues of the tree. Boring insects generally feed on the vascular tissues of the tree. If the infestation is serious, the upper leaves are starved of nutrients and moisture and the tree can die. Signs of borer infestation include entry/exit holes in the bark, small mounds of sawdust at the base, and sections of the crown wilting and dying. It is important to regularly monitor a tree's trunk for signs of boring insects to enable early identification and quick treatment.



Examples include: Asian Longhorned Beetle, Bronze Birch Borer, Dogwood Borer, Elm Bark Beetle, Emerald Ash Borer, Giant Palm Weevil, Greater Peach Tree Borer

The key is to prevent infestation by keeping the tree as healthy as possible. This includes proper pruning, watering, mulching and fertilization. Pruning should be done in late winter to avoid attracting insects to open wounds. Dead or fallen wood should be removed immediately. Once borers are present, control becomes extremely difficult, but steps should be taken to prevent further damage and to stop the spread to surrounding trees.

### **Sucking Insects**

These insects do their damage by sucking out the liquid from leaves and twigs. Many sucking insects (e.g. scale insects) are relatively immobile, living on the outside of a branch and forming a hard protective outer coating while they feed on the plant juices in the twig. Quite often they will excrete a sweet, sticky substance known as honeydew which contains unprocessed plant material. Honeydew can cause sooty mold to form on leaves and can become a nuisance for homeowners. Signs of infestation include scaly formations on branches, dieback of leaves, and honeydew production.

Examples include: Scale Insects, Aphids, Leafhoppers, Spider Mites, Thrips



As with other insect infestations, prevention is the best approach. This means maintaining a strong and healthy tree. Once they mature on the tree, sucking insects generally must be killed on contact to prevent reproduction and achieve effective control.

These are symptoms of common tree diseases in Missouri:

### **Leaf Spots**

- Spots appear on leaves on all parts of the tree
- More spots appear later on in the season
- Spots spread to other trees



Probably the most common disease found on trees in Missouri is leaf spots. This is a simple fungal infection that doesn't actually do much damage to your tree. This is because there is still plenty of leaf real estate for carrying out the basic functions of a tree, including photosynthesis.

The only time you really need to worry about leaf spots is when there is a severe defoliation. Leaf spots can return the next year on the same tree.

### **Root Rot**

- Deterioration of the roots seen outside of the soil
- Random parts of the tree starting to die
- Yellow, curling leaves or mushrooms appear toward the base



Root Rot is a tricky disease to catch because so much of it occurs under the ground. Many different fungal diseases cause root rot. By the time we see physical symptoms of the disease, it is often too late to save it. Even worse, the tree can die extremely quickly without enough time for you to find it. That is why it is so important to contact a tree care professional – the roots and stump will stay poisonous and infect other trees. The best way to prevent root rot is to keep your trees as healthy as possible. A healthy tree with enough nutrients and water getting to the tree will help to prevent root rot from taking over.

### **Fire Blight**

- Blossoms die extremely quickly
- Amber colored liquid appears on the bark
- Stems, bark, and leaves look like they are burnt.



Fire Blight can be one of the grossest diseases your tree will get, if you don't catch it quickly enough. In the early spring months, Fire Blight will make your trees start to turn yellow and cause blooms to die after only a few days. After a few weeks, your branches and leaves will look like they've been burnt. Then the disgusting part happens. Your tree will start to ooze a liquid as it tries to repair itself. The liquid is actually bacteria that is somewhat sticky and resembles sap, but that isn't what it is. Once your tree starts to ooze that liquid, it is extremely contagious and can infect other trees in your neighborhood.

### **Apple Scab**

- Tree produces fewer fruit than in previous years
- Tree doesn't flower at all
- Apples have blemishes or don't grow very large



If you have apple trees in your yard, you are probably used to seeing "scabs" or blemishes on your apples. However, there comes a time when they start to become a hindrance rather than just something annoying. If your apples seem strange from what you are used to, either they have more blemishes than usual, they are too small, or you don't get as many flowers, you might have a severe case of Apple Scab.

## **Materials:**

Science journal

Activity Pages “Tree Detective”

Samples of “sick” trees/leaves

## **Learning Activity:**

- Become “tree-tectives” (tree detectives) by first examining neighborhood trees for signs of poor health and then investigating actions to help trees in trouble.
- Have students compare elements that keep humans healthy with those that keep trees healthy. For example, trees require some of the same things people need to grow and thrive. They need plenty of water, nutrients, room to grow, and a stress-free environment. When a tree is stressed, it exhibits symptoms that can help determine the problem.
- Plan a walk down a tree-lined city sidewalk, in a park, or in the woods, paying particular attention to trees and their symptoms along the way. They should take notes and make sketches of their findings to try and identify what caused the damage.
- Use the Activity Pages “Tree Detective” to guide students into solving the causes for these tree ailments. The students’ task is to use the ‘Evidence’ and the information in one or more ‘sources’ to identify each disease, the type of pathogen causing it, and the likely route by which the infection was spread, and how to stop it spreading to other plants.

Note:

Case 1 is leaf spots

Case 2 is root rot

Case 3 is fire blight

- Have students create an original “Case Study”. Instead of symptoms that point to a tree disease, focus on other factors that could be causing the tree to be unhealthy or dying. Have students trade their case study with each other and see if they can determine the reason why this tree is sick.
- Examine the trees in your Giving Grove Orchard. Do they exhibit any signs of poor health? Complete a monthly “health report” on the trees in your orchard.

## **Lesson Extension:**

- Investigate the similarities and differences between an unhealthy tree and healthy trees in the orchard
- Research one of the common tree diseases or tree insects in your area
- Adopt an unhealthy tree as a community project
- Revisit an unhealthy tree over time to document any change or decay

## **Additional Resources**

<http://www.saps.org.uk/secondary/teaching-resources/1391-plant-disease-teaching-resource-collection>

<https://www.plt.org/family-activity/trees-in-trouble/>

<https://owlcation.com/stem/Why-do-trees-die>

<https://www.treehelp.com/about-tree-insects/>

<https://www.gogreentree.com/5-common-tree-diseases-missouri/>

# TREE DETECTIVE

## CASE #1 NOTES

### EVIDENCE

Mr. Johnson has noticed that his cherry trees have brown or black spots on the foliage, sometimes with a yellow halo, usually uniform in size. The spots enlarge and will run together under wet conditions. Under dry conditions the spots have a speckled appearance. As the spots become more numerous, entire leaves are turning yellow, withering and dropping. The fruit appears spotted or has sunken brown areas.

### CONCLUSIONS

SUSPECTED DISEASE: \_\_\_\_\_

Circle what type of disease you suspect:

VIRUS / BACTERIUM / FUNGUS

HOW IT IS SPREAD: \_\_\_\_\_

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### RECOMMENDATIONS

ACTIONS THAT WILL HELP TO LIMIT THE SPREAD: \_\_\_\_\_

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# TREE DETECTIVE

## CASE #2 NOTES

### EVIDENCE

Mrs. Middleton has noticed that a few trees in the back of her yard seem to be declining. The leaves are small and pale, and even becoming wilted and brown. She has noticed that there are mushrooms growing around the bottom of the trees in sunken, dead areas. The ground always seems to be wet.

### CONCLUSIONS

SUSPECTED DISEASE: \_\_\_\_\_

Circle what type of disease you suspect:

VIRUS / BACTERIUM / FUNGUS

HOW IT IS SPREAD: \_\_\_\_\_

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### RECOMMENDATIONS

ACTIONS THAT WILL HELP TO LIMIT THE SPREAD: \_\_\_\_\_

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# TREE DETECTIVE

## CASE #3 NOTES

### EVIDENCE

Mr. Thompson is alarmed that his peach tree leaves are turning yellow or brown. They appear to be dying, but not dropping off. There is a sticky substance, like sap, oozing out of the tree bark.

### CONCLUSIONS

SUSPECTED DISEASE: \_\_\_\_\_

Circle what type of disease you suspect:

VIRUS / BACTERIUM / FUNGUS

HOW IT IS SPREAD: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### RECOMMENDATIONS

ACTIONS THAT WILL HELP TO LIMIT THE SPREAD: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_