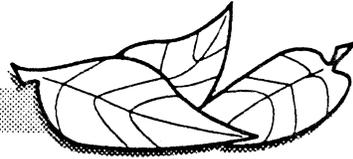


Grade 2



Tree Life



Objectives

- Students will gain a basic knowledge of a tree's life cycle.
- Students will develop appreciation for trees and be motivated to plant them.

Background Information

Utah, like many parts of the world, has very cold winters. During this time the ground is hard and seems lifeless under layers of snow and frost. But under all this cold lie the **seeds, roots, and stems** that will be next summer's plants. Each seed holds a tiny plant and some food that will feed the new plant. Roots and stems have tiny **buds** that will begin to grow when the weather warms. The cold earth is far from lifeless. Winter is simply a time of rest.

As spring arrives, the rays of the sun begin to warm the earth. Snow and frost melt. The moisture soaks the seeds and makes them swell. The tiny plants begin to grow. Buds and roots also begin to grow and soon we see new plant life.

Through the hot summer months, plants grow strong and sturdy. But at the end of the season, a plant's work is usually done. For some plants, it's the end of their lives. For others, it means going into a long rest as the autumn ground freezes and there is no more water. They will "sleep" (lie **dormant**) again until spring, when the **life cycle** will start all over again.

It Starts With Seeds

They can be as large as a coconut or as small as the head of a pin. Some are flat, some are round; others are long and thin. Most

travel...some by air, some by water, some by quietly

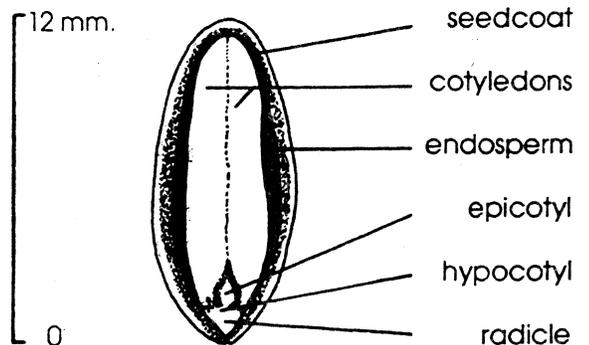


Vocabulary Words

seeds	sapling	sapwood
roots	root tips	heartwood
stems	cambium	chloroplasts
buds	fibers	carbon dioxide
dormant	sap	photosynthesis
life cycle	cells	evergreen
oxygen	cellulose	broadleaf
chlorophyll	annual rings	deciduous
pollen	outer bark	ecology
seedling	inner bark	germinate

hitching a ride with a passing person or animal. Touch them with a bit of warmth and moisture, and the miracle of growth begins. What are they? Seeds, wonderful seeds!

Seeds look and feel very different from each other, but they're all alike in important ways. Each of them is a baby plant with its own food supply, all put together in one handy, self-sealing package. They all have the same needs for growth-moisture, warmth, sunlight, food, **oxygen**. And they all begin to grow in much the same way: Moisture soaks the outer shell of the seed until it becomes soft. The food inside expands as



Seed Cross Section

the water enters the seed. If warmth is also present, the shell breaks open and growth begins.

A seed contains everything that's needed to form a new plant. The cross-section on page 2-1 shows the parts of a Kentucky coffeetree seed.

As growth begins, a small root pushes out of the seed and down into the earth to search for water. A tiny stem pushes up through the soil reaching toward the sunlight.



As the plant grows underground, it uses the food stored in the seed. As soon as it pushes out of the ground into the sunlight, it begins to make its own food. Food is made by the leaves and the stem of the plant. A green material in the leaves' plant tissues -**chlorophyll**- acts together with water, air, and sunlight to make a kind of sugar that is food for the plant. The sugar flows from the chlorophyll throughout the plant so the whole tree is nourished.

Some tree species have unusual seed "containers." Think about coconuts, bananas, apples, pine cones. Pine cones vary, too. One kind is small and papery and full of tiny grains of **pollen** that look like yellow powder. The wind blows the pollen out of the cones. Another kind of cone is covered with wood scales that hold seeds. When a seed is ripe, the wind blows it off the scale. When it reaches the ground, the seed may take root and grow into a new pine tree.

The young tree that grows from a seed is called a **seedling**. After a tree reaches a height of six feet or more and its trunk is one to two inches thick, it is called a **sapling**. The tree grows taller and its trunk grows thicker every year. The tree continues to grow as long as it lives.

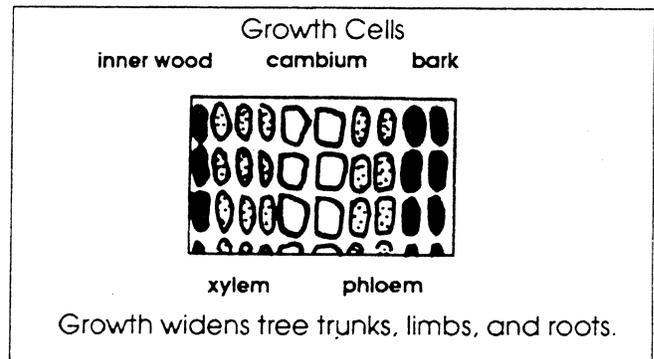
Where Growth Takes Place

Trees have three different growing parts: the **root tips**, the **cambium** layer, and the buds. The root tips cause the roots to grow longer and spread out in search of more water and minerals. The cambium layer is a thin layer of cells between the bark and the inner wood. You'll find

cambium in the trunk, limbs, and roots. The buds on the limbs grow and get longer, making the tree taller and wider. This also makes it possible for the limbs to spread out to receive more sunlight.

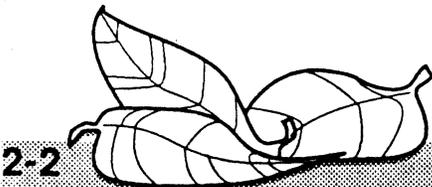
Wood is not solid material. It is made up of a lot of little **fibers** woven together that can be seen only under a microscope or very strong magnifying glass. Fibers vary from short to long.

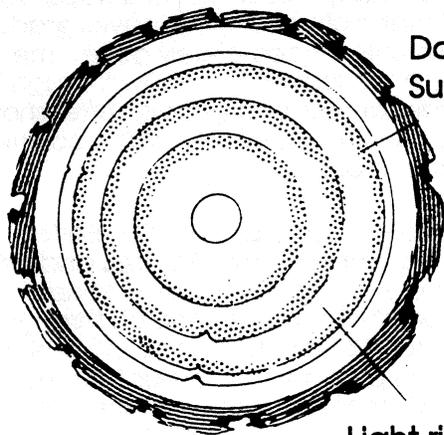
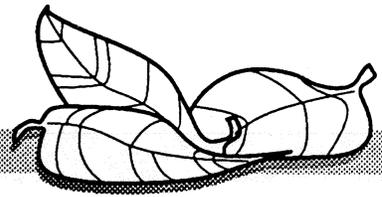
Little tubes carry plant foods up and down the trunk of the tree and through the branches as liquid called **sap**. These tubes, or pipelines, are made up of many small sections called **cells**. The cells are so small they can only be seen through a magnifying glass.



The ends of the cells are open, like a soda straw. A row of material called **cellulose** forms around the outside to strengthen the tube. A piece of wood, even as small as a pencil, contains millions of these cells.

By looking at the cross section of a tree trunk, you can see tree growth from the center towards the outside. Look closely at the top of a stump or the end of a log, and you can see rings in the wood. These rings are made by growing layers of wood; a new layer is added each year. Each layer is made up of a band of lighter colored wood called spring wood and a band of darker wood called summer wood. The spring wood band is usually wider than the summer wood band. These rings are called **annual rings**.





Dark rings are
Summer Wood

Light rings are
Spring Wood

Tree Cross Section

The tree's age can be figured out by counting the rings on a stump. Remember, one light ring and one dark ring together make one year. Start from the center and count out; count only the dark rings.

The covering on the outside of the stump or log is usually rough and does not look like the wood. This is called the **outer bark**. It is a layer of dead cells and is only a protective coat. Just inside the outer bark is a thinner, lighter colored layer called the **inner bark**.

The very thin layer of cells just inside the bark can't be seen by the naked eye. It is the **cambium** (discussed earlier).

Next is a wide band of lighter colored wood that is called **sapwood**. Notice the darker, dead, inactive wood in the center of a stump or log. It is called **heartwood** and it gives support and strength to the tree. For more information about annual rings, see Grade 6, pages 6-8 and 6-9.

The shape of a tree varies. Part of that is due to the kind of tree it is. Part is due to the tree's environment. When a tree stands in an open location, branches often grow low down on the trunk. They may spread out, almost sweeping the ground. When trees grow close together, like in a forest, the lower branches do not get enough light and soon die. The branches forming the crown at the top of the tree are sometimes the only ones that survive.

The Leaves' Job

Sunlight comes into a leaf through the leaf's skin, which is clear like glass. Beneath the skin are millions of tiny "bags"—again called cells. These cells are like little balloons filled with water and living jelly. Inside the cells are small green packages called **chloroplasts**. The chloroplasts are green because they are filled with green chlorophyll. The chlorophyll catches some of the sunlight that falls on a leaf.

While the green packages are catching sunlight, other things are happening in the leaf. Air comes into the leaf through many tiny openings. Water, moving up from the roots far below, flows through the leaf. The air and water mix together and flow into the cells.

These cells are like little factories. Here, the green chlorophyll works away. Using sunlight as a source for energy, it changes water and a gas from the air (called **carbon dioxide**) into a form of sugar. This process is called **photosynthesis**. The sugar made by the leaves is food or energy for the growing parts of the tree and for storage. During photosynthesis, the leaves also produce oxygen, which is released into the atmosphere.

Some trees lose their leaves before winter; others do not. Why does this happen? Leaves make the food for the trees and they need water to do it. A tree gets water from the ground. The roots take it in, then the water travels up the trunk to the leaves. In late summer, a thin layer of cork grows over the leaf-twig connecting spot. Water can no longer pass into the leaf, so it dries up, dies, and falls off.

Another kind of tree, the **evergreen**, does things a bit differently. Its leaves are called needles and they fall off, but not all at once like the first trees (**broadleaf** or **deciduous**) we talked about. Evergreen needles are tough and don't freeze in winter, so they don't lose water as quickly as other kinds of leaves do. By holding onto the water that's in them, they stay alive and green even in winter.

Seasons Come, Seasons Go

Seasonal changes bring a lot of variety to a forest. During the spring of the year, forest life is renewed. The flowering plants, including many trees and shrubs, display their showy flowers. The broadleaved trees and shrubs begin to cover

themselves with new leaves, while the evergreens develop new shoots, known as candles, that later flare out into new stems and needles. The male pollen-bearing flowers of evergreens are also colorful with their different shades of yellow and purple. Have you ever tapped the end of a pine branch when the pollen was ripe? If not, try it sometime; you will see a dense cloud of yellow or purple pollen drift away with the wind. The wind will carry some of this pollen to female flowers of the same tree or to neighboring trees that are the same kind. These female flowers will then begin producing new pine cones.

While all the forest plants are springing to life, fur-bearing mammals are giving birth to their young. Songbirds, game birds, predatory birds (hawks and owls), and scavengers (vultures, gulls, crows) are hatching their offspring. Along nearby ponds and lakes, waterfowl hatch their young. All this new plant and animal life is a wonderful form of beauty for people to enjoy.

During late spring and summer, all the new life that began in the spring is "growing up." Many flowers turn into showy fruits; young birds grow feathers and begin flight training; ducklings start to swim; young fur-bearing animals romp around and learn the serious business of hunting for food and hiding from their predators. While all this activity is going on, the trees in the forest are adding a new layer of wood around their trunks and spreading their branches wider and higher.

In the fall, the forest changes into a new kind of beauty. The leaves of broadleaved trees, shrubs, and other plants change to brilliant colors of red, yellow, and orange. Do you know why the leaves of broadleaved plants change color? Many people think frost causes this change. Actually, frost can cut down the brightness of autumn colors. The green color in leaves comes from the green chlorophyll. When exposed to light, chlorophyll starts the process of photosynthesis.

Carbohydrates are made during photosynthesis. These carbohydrates collect in the leaves and make other colors. In the fall, when temperatures are too low but not yet freezing, the

production of the green chlorophyll stops. The chlorophyll that is already in the leaves gradually breaks down until it is completely gone. The other colors in the leaves then show through in various shades of reds and yellows. After showing their beauty for several weeks, the colorful leaves fall to the ground.

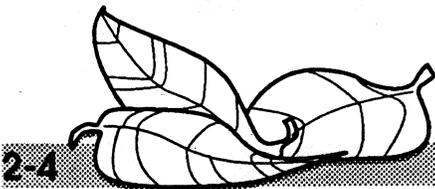
During the fall, some birds and waterfowl migrate to warmer climates. Squirrels and chipmunks are busy storing acorns, pine cones, and seeds of other plants to feed on through the long winter months. Bears and other hibernating animals prepare to "hole-up" for much of the winter. Most of the trees and other plant life shed their seeds before the snow flies so the seeds will be ready to sprout into new plants when the snow melts the next spring.

Death Of A Tree

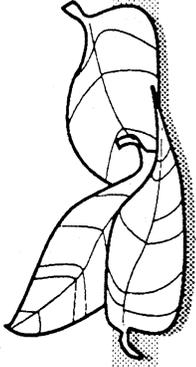
We are part of a living and dying world. Plants and animals are born, grow to maturity, age, and die. Their places, in turn, are taken by other plants and animals. As each living thing dies, decays, and returns to the soil, it affects the area around it and changes the environment. For example, one plant's death may make it possible for new plants to grow where they could not before. This is a part of the exciting process called **ecology**.

The Norway (red) pine shows the death/new life connection. Norway pine tree seeds need mineral soil to **germinate** and grow. When a Norway pine tree is growing, it covers the forest floor with litter, making it impossible for other pine seeds to reach mineral soil. This means Norway pine seeds cannot reproduce themselves in the dense forest. When the Norway pine dies and the litter is disturbed, though, other Norway pine seeds may fall on the mineral soil and start to grow.

Plants that like shade, like the sugar maple, can sprout and grow on rotten logs. Plants growing on rotten logs help the log decay back into the soil. Small animals find homes in the logs; these animals become food for other animals. And so, death brings new life to a forest.



Grade 2



See activity details on pages 2-7 through 2-11.

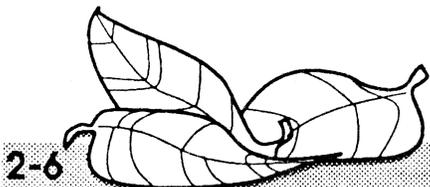
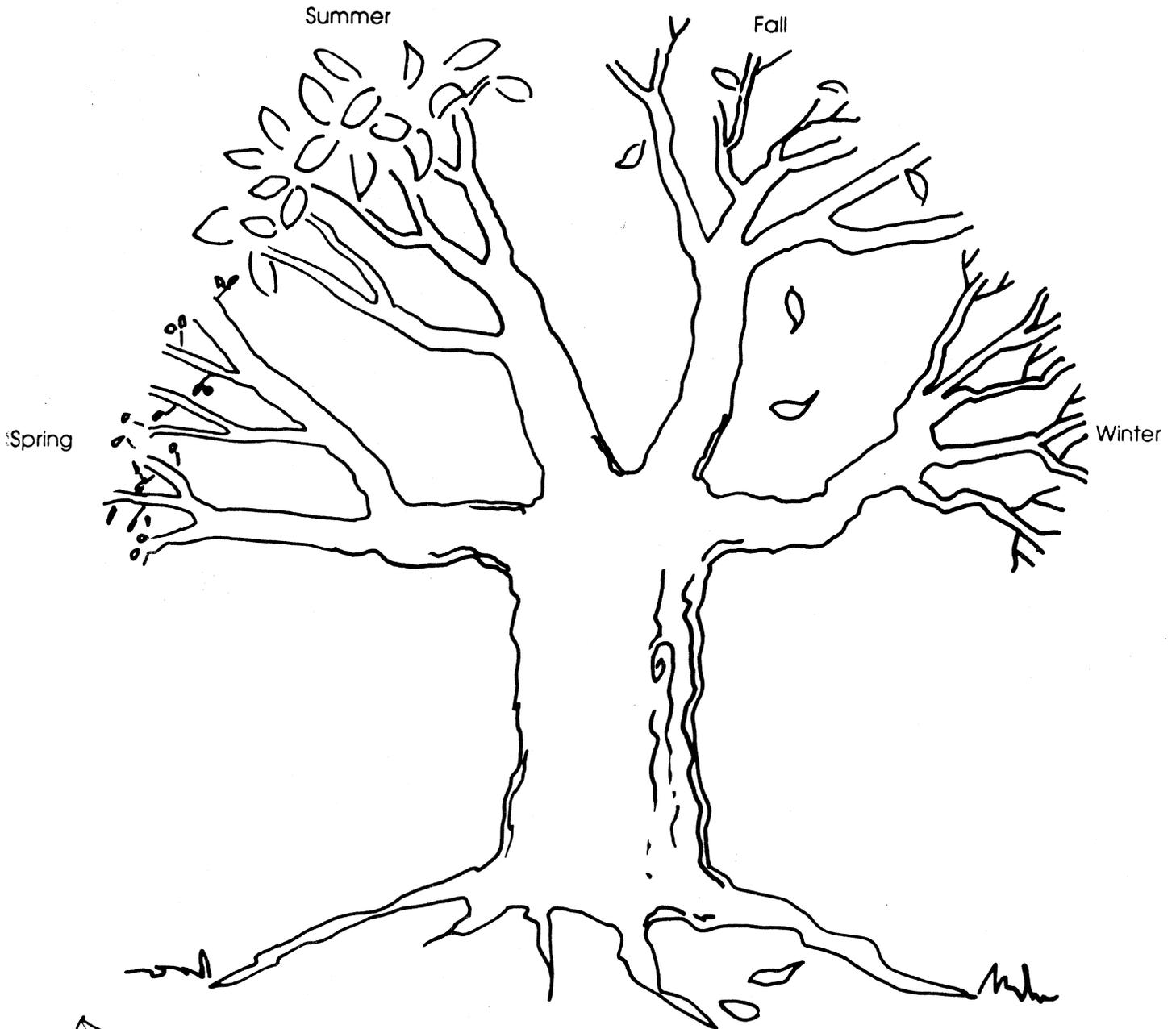
Calendar

<p>Do: Plant Kentucky coffeetree seeds!</p> <p>Science</p>	<p>Create: Pine cone critters.</p> <p>Art</p>	<p>Hike: Nature scavenger hunt.</p> <p>Science</p>	<p>Write: "Life of a Leaf" stories.</p> <p>Language Arts</p>	<p>Create: Tree monsters.</p> <p>Art</p>
<p>Create: Hear the forest!</p> <p>Language Arts</p>	<p>Discover: Treasures in rotting logs!</p> <p>Science/Social Studies</p>	<p>Do: Stump rubbings.</p> <p>Art/Science</p>	<p>Discover: Tree growth patterns.</p> <p>Science</p>	<p>Write: Be a poet. Tell about those marvelous trees!</p> <p>Language Arts</p>
<p>Do: Rodney the Root's Seed Search. (Activity Sheet)</p> <p>Language Arts</p>	<p>Listen: Woody literature and folklore.</p> <p>Language Arts</p>	<p>Look for: Tulips blooming, bees pollinating, robins nesting.</p> <p>Science</p>	<p>Discover: The number of pounds of paper your school uses!</p> <p>Math</p>	<p>Listen: Shel Silverstein's delightful book, "The Giving Tree."</p> <p>Language Arts</p>
<p>Research: What recycling has to do with saving trees.</p> <p>Science</p>	<p>Discover: Dead leaf skeletons.</p> <p>Science</p>	<p>Look for: Tree frogs. Discuss: If a tree falls in the forest and there's no one to hear it, does it make a sound?</p> <p>Science/Language Arts</p>	<p>Look for: Crab apple trees blooming. Fun Fact: Banyan trees make their homes inside other trees.</p> <p>Science</p>	<p>Discuss: How many species of trees can you name? How many grow in Utah?</p> <p>Science</p>

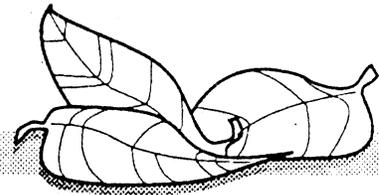
Bulletin Board Idea

A Tree For All Seasons

Make a basic tree trunk with branches.
Divide the crown according to the four seasons.
Students participate by adding appropriate parts
(buds, leaves, etc.) to each season's section.



Activities



Hands On - Minds On Activities

Follow these activities in order and you have one for each of the 20 days in Arbor Month (see calendar). Or, pick and choose any of the activities that best meet your class's needs.

To complete the calendar activities during the month, collect or ask youngsters to bring in the following: Kentucky coffeetree seeds and planting supplies (Activity 1); pine cones (Activity 2); "The Giving Tree" by Shel Silverstein (Activity 15).

Activity 1: Plant Kentucky coffeetree seeds!

You'll need: potting soil; sand paper; styro-foam or plastic cups (2 per student, 10 oz. - 12 oz. size or larger); seeds (order from: F.W. Shumacher, 36 Spring Hill Road, Sandwich, MA 02563).

What you do:

1. Scarify the seeds by rubbing gently on fine sandpaper until the seed coat is penetrated.
2. Fill each cup to within one inch of its top with potting soil.
3. Push seed about one inch into the soil. Cover the seed with soil and smooth the surface.
4. Water until soil is moderately moist.
5. Set cups on a window ledge or table in direct sunlight.
6. Check daily for moisture needs. If soil feels dry to the touch, add one or two table-spoons of water. Don't overwater. Your cup has no drainage system to get rid of extra water.
7. Watch for signs of germination (sprouting of the seed). Your sprout should appear in three to four weeks. Continue to water as needed. When the seedling has outgrown its container, transplant to a larger pot with good drainage. The seedling may be transplanted outdoors after one year.
8. To plant outdoors, see information in the Appendix, page 3. In addition to the Kentucky coffeetree seeds, try sprouting apple, peach, pear, avocado, orange, grapefruit, cherry trees. Or, try vegetable seeds. Beans are easy to grow and you'll see fast results; the bean sprouts appear in just a few days.

Activity 2: Pine cone critters.

Have students collect pine cones and bring them to class. Look for a variety of sizes...they're out there somewhere! Glue pine cones together to make animal critters. Use pipe cleaners, construction paper, etc. to add finishing touches.

Activity 3: Nature's scavenger hunt.

Give students bags and a list of things to find. Go outdoors to a safe and specific area in which to hunt. Set a time limit, and they're off! The list

of items to find might include pine cones, acorns, maple tree seeds, a dandelion, pussy willows, a feather, leaf buds, etc. You may want to do a "dry run" in the hunt area first to find things to add to the list.

Activity 4: Life of a leaf.

You are a leaf. What happens to you each season? When there is pollution in the air? When a hungry caterpillar decides you would make a tasty lunch? When you are chosen the most beautiful leaf in the school leaf collection? Write a story about yourself and your life as a leaf. Use plenty of details and describing words!

Activity 5: Create: Tree monsters.

Tree monsters are lurking in your classroom! Go outside and gather items from trees that you could make a monster from. Glue these pieces onto a piece of construction paper. Add crayon or paint features and details. What is the name of your monster?



Activity 6: Forest sounds.

Gather rhythm band and other instruments and create your own forest music. How does a forest sound? Which instrument(s) would you use to create the sounds of soft breezes through the leaves, strong wind through the needles or leaves, squirrels leaping from branch to branch, birds calling, a tree being chopped down or falling? How about feet shuffling through the fall leaves, a deer running through the bushes, a woodpecker pecking, a sleepy owl hooting? Would a forest sound different at night than during the day? Create your forest sounds with the instruments, tape recording your best efforts. Invite others to listen to your tape. Do others "hear" your forest the same way you do?

Activity 7: Rotting treasures.

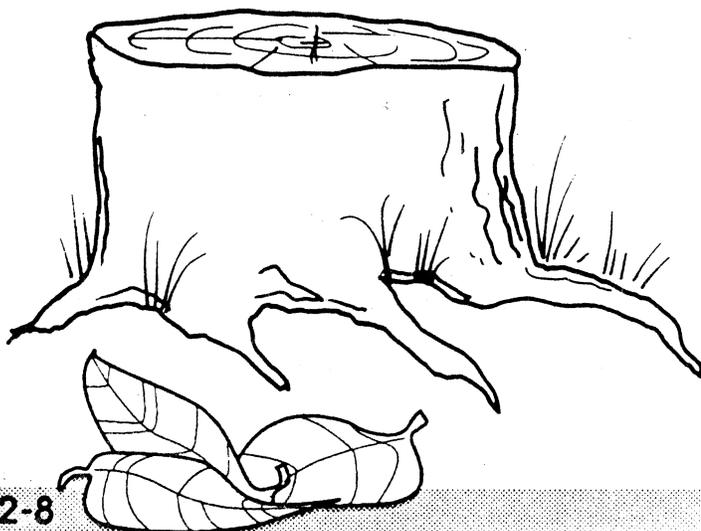
One of the best ways to learn about the ecology of an area is to study a rotten log or decaying stump. The competition and cooperation among plants, animals, and other factors of local environment (moisture, air temperature, light) can all be studied in this exercise. While all these things are happening in a very minor part of our environment, such as the log, the same things are at work in the larger environment, like the forest.

Study a rotten log or decaying stump and you see a community at work. Just as in your community, city, town, or village, the same birth, life, and death forces are at work. A good example of cooperation and competition exists in the log community, too. What comparisons can students make between the log community and their own?

Activity 8: Stump rubbings.

Find the stump of a large tree. (Dutch elm and oak wilt diseases have affected many trees. Diseased trees have been removed, and their stumps are a good learning source.) Do a stump rubbing, using a strip of paper and a soft lead pencil or dark crayon. Figure out when the tree was cut and find important dates in your community, state, or nation's history by counting toward the center. (See Grade 6, page 6-8 for more information about reading annual rings.)

It might be fun to see who in the class can find the oldest tree stump, and who can pick out the most important dates.



Activity 9: Tree stumpers.

On the same stump (or stumps) find the good and bad growth years. Compare with the weather history of an area to see if there is a relationship. Compare stump rubbings from several trees to see if growth patterns are similar. If not, research what may have caused the differences, i.e., insects, disease, competition from surrounding trees, a roadway, sidewalk, or building, etc.

Activity 10: Try being a poet!

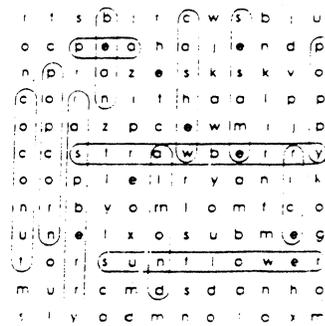
Write a poem about why trees are so special in our lives. As a group, brainstorm words that can be used. Then let the creative juices flow! Write about what trees and forests do for you... how they make you feel. Or imagine you are a tree. Talk about how things look from your point of view, or how you feel. What are some other ideas?

Activity 11: Seed search.

You'll need: Rodney the Root's *Seed Search* Activity Sheet A. (Page 2-10.)

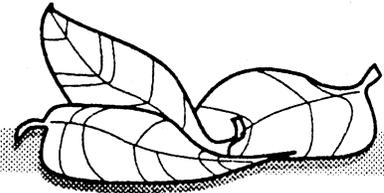
Discuss the activity sheet and do the word search.

Answers:



Activity 12: Literature and folklore.

Literature is packed with fascinating folklore and legends about plants and trees. Your librarian will be able to direct you to good sources. For example: It's said that Ojibway Indians seldom took down a living tree because they believed a tree could feel pain. Their medicine men told of trees wailing as they were being chopped down. Many other tribes around the world have also been especially respectful of trees. The primitive Basoga of central Africa



sacrificed animals to each tree they were about to cut down. Scandinavian elves and trolls are tree lovers, too.

Activity 13: Look for: Tulips blooming, bees pollinating, robins nesting.

Activity 14: Pounds and pounds of paper.

How much paper do youngsters use in your school? Here's a survey with surprising results:

1. Each student weighs all the paper in his or her desk (books, notebooks, etc.) on a postage scale. Add each student's total for a grand total.
2. Divide to find the average weight of paper per student.
3. Multiply the average weight by number of students in the school. What's the grand total for your school?
4. A 16-inch diameter tree used in paper production yields 700 pounds of paper. How many trees did your school consume?

Activity 15: "The Giving Tree."

Read and discuss Shel Silverstein's delightful book, "The Giving Tree." What things did people do that were damaging to this tree? How did the tree keep "loving back" in spite of what happened to it? Did the story change your feelings about trees? About how people treat trees?

Activity 16: Become recycling sleuths!

What are some of the many ways we can recycle to help save our trees? (Recycle paper products, save newspapers for recycling centers, etc.) Where is the nearest recycling center for you? What other things will it recycle? Find out what it does with the recycled products. What can you do to recycle products? (Cut out magazine pictures to make greeting cards; use discarded mail as scrap paper; cut corners from envelopes and slip over pages for neat bookmarks, etc.) What are some other things you can think of?

Activity 17: Dead leaf skeletons.

You can find leaves late in the winter or early in the spring that have not fully rotted into rich soil. Look under bushes, in tall grass, or all over the ground in the woods. Dig through the layers of rotting leaves. You might find a leaf "skeleton" with just the harder veins left. Dig down and look for leaves on the bottom that have almost turned

to soil and you may find insects hiding from the cold.

Activity 18: Look for: Tree frogs.

Debate the age-old question: If a tree falls in the forest and there's no one to hear it, does it make a sound?

Activity 19: Look for: Crab apple trees blooming.

Fun Fact: Most trees grow from the ground up, but not most banyan trees. The banyan usually sprouts above the ground and grows down. Banyans are planted when birds, bats, or squirrels drop seeds into cracks in the branches of other trees, called hosts. When a banyan sprouts, its roots grow down from the host branches and into the ground, forming trunks. The banyan kills the host tree by preventing its trunk from growing. After the host dies, the banyan continues to grow and eventually, one tree appears to be an entire forest.

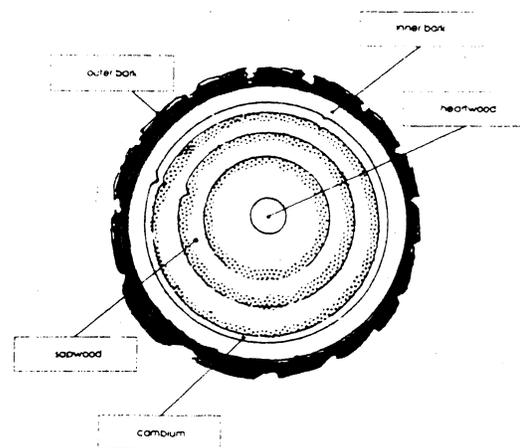
Activity 20: Brainstorm: All those trees!

How many different species of trees can you or your group list? Write the names on the chalkboard or on chart paper. Go through your list, circling those that grow in Utah drawing lines through those that don't. Research to find where the others grow.

More Activity Fun

Learn those layers! See Activity Sheet B, page 2-11.

Answers:



Activity Sheet A

Rodney the Root says...



help me in a seed search.

How many plants can you name whose seeds are often eaten by humans? Check out the puzzle below. Names are up and down and across. Did you find all 12?

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

Look for these seeds:

coconut
sesame

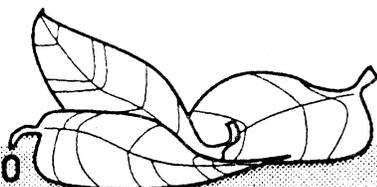
bean
almond

cashew
raspberry

sunflower
strawberry

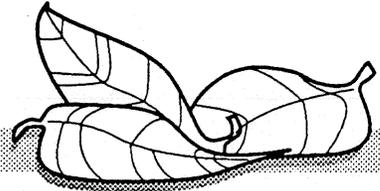
popcorn
poppy

pea
rice



Answers: See Activity 11, page 2-8.

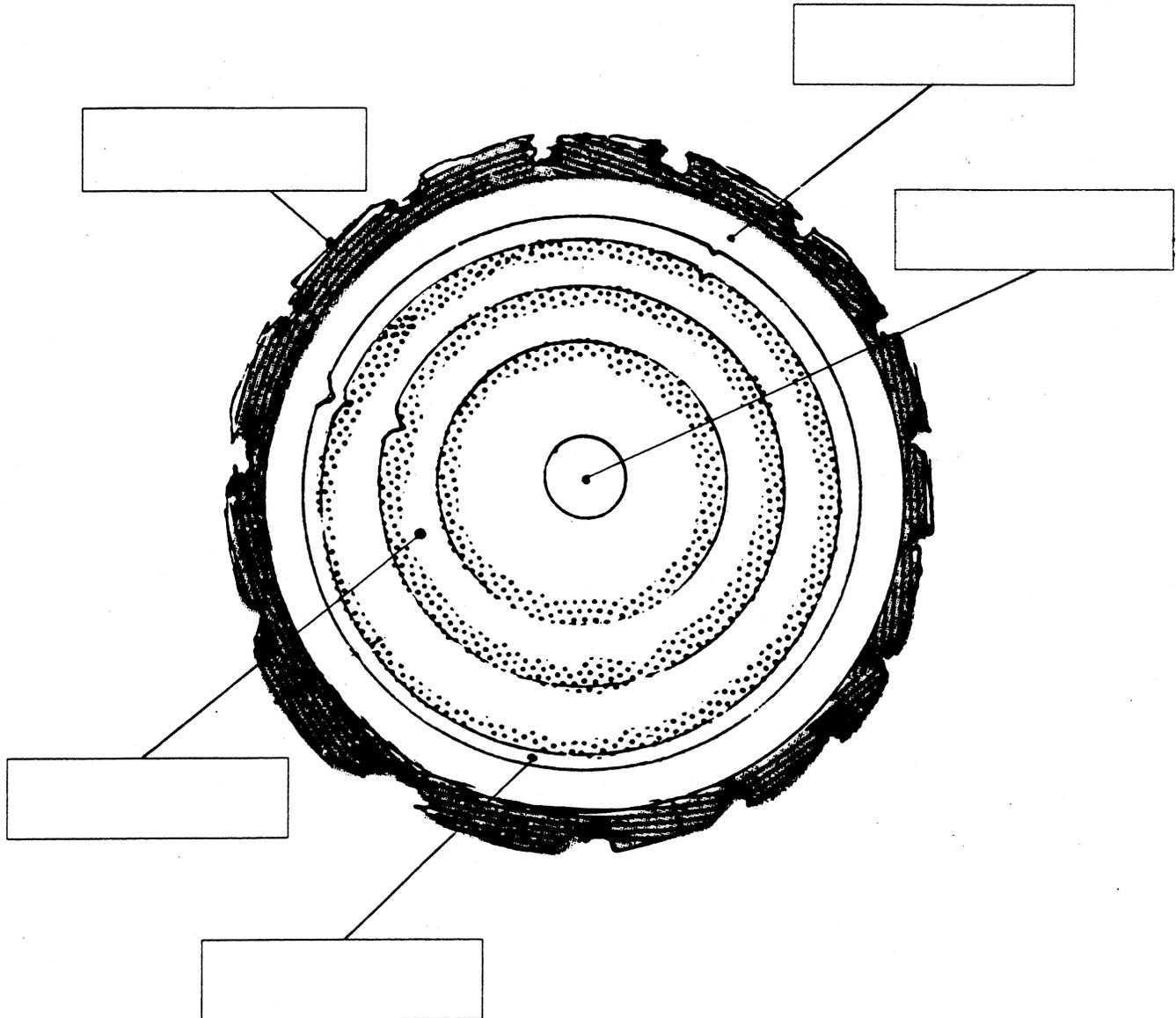
Activity Sheet B



Learn Those Layers

Can you label each layer? The layers you're looking for are:

outer bark heartwood inner bark cambium sapwood



Answers: See More Activity Fun, page 2-9.