National 4-H Curriculum
BU-08039

FORESTS of FUN

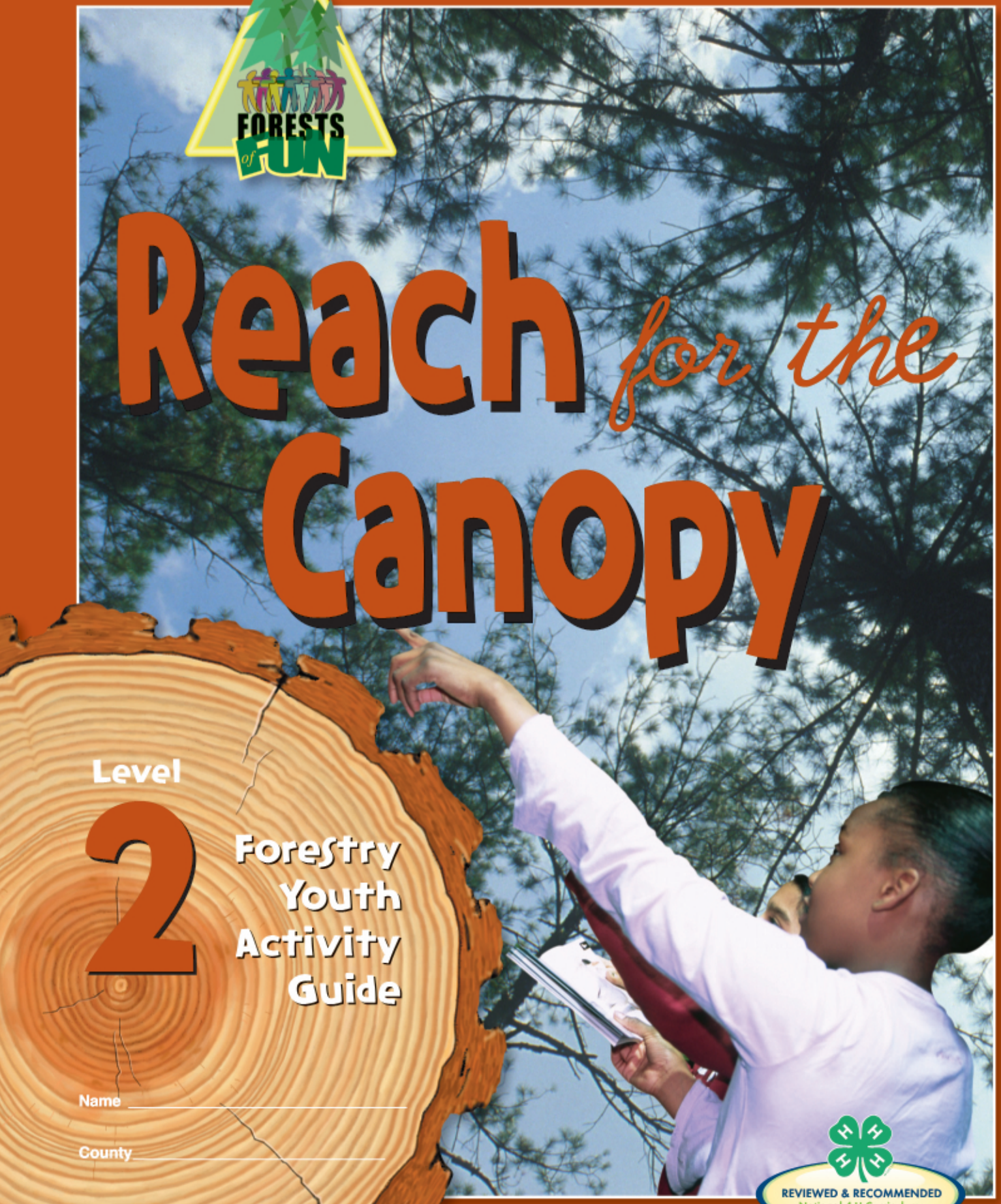
Reach for the Canopy

Level 2

Forestry Youth Activity Guide

Name _____

County _____



REVIEWED & RECOMMENDED
National 4-H Curriculum

Note *to the* Forestry Project Helper

Thank you for volunteering your time and talents to assist one or more young people in this project. This activity guide will introduce them to the exciting world of Forestry. Your involvement will make a real difference in the quality of their experiences. You will play a valuable role in helping them learn the subject matter and practice the important life skills along the way. Your interest, enthusiasm and, most importantly, your time will be key ingredients to positive and successful experiences. With your guidance and support, youth will set goals and challenge themselves to work through the activities in this guide. It will be a journey into the world of Forestry that everyone will enjoy.

Your Role

- Become familiar with the material in this activity guide and the *Forestry Project Helper's Guide*.
- Support youth in their efforts to set goals and complete the activities.
- Date and initial the activities on the Achievement Program as the youth complete them.
- Help the youth know themselves, including their strengths and weaknesses.
- Incorporate the use of the experiential learning cycle in all learning experiences.

Youth Outcomes

1. Practicing the life skills of decision making, problem solving, communicating with others, interpreting information, teaching others
2. Recognizing the importance of forests
3. Identifying different types of forests, trees and forest products
4. Developing skills necessary to keep forests healthy

The Forests of Fun Forestry Series

Follow the Path	4-H BU-08038
Reach the Canopy	4-H BU-08039
Explore the Deep Woods	4-H BU-08040
Forestry Group Activity Guide	4-H BU-08041

The three youth guides have been designed for grades 3–5, 6–8 and 9–12, respectively, but may be used by youth in any grade based on their forestry project skills, experience and interest.

Forestry Helper's Guide

The *Forestry Helper's Guide*, provides additional learn-by-doing activities that can be adapted to 4-H forestry project groups, clubs or other groups. You'll also find helpful hints about characteristics of youth, life skill development, teaching experientially, project meeting ideas and resources for organizing a community Forestry program.

Activity Elements

Each activity is designed so the young person has an opportunity to learn by doing before being told or shown how. Your role as Helper is to "take a back seat" while the youth explores the activities and learns from the experiences, even when something doesn't work the first time the way you might think it should. You can help with the learning most effectively by listening as the young person considers the questions and draws conclusions. At times the activity may call for you to be a resource person for content or other ideas.

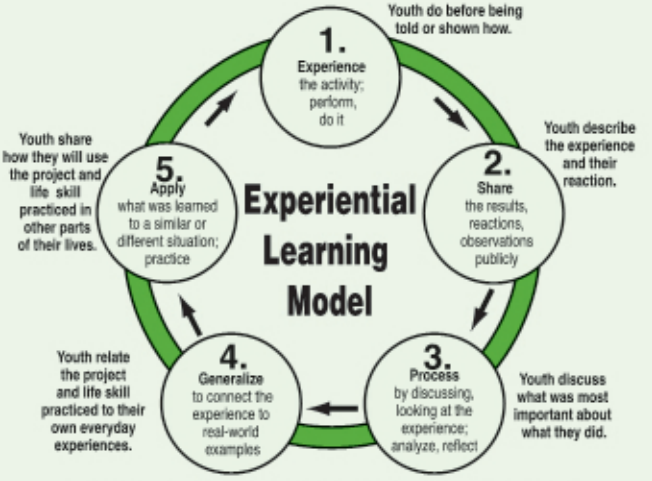
All activities support the experiential learning model endorsed by the 4-H Program. Each activity lists the project skill, the life skill to be practiced, educational standard and a success indicator. The success indicator indicates what the youth will do to successfully complete the activity. In addition, in the *Helper's Guide* you will find an evaluation piece to use to determine what the youth have learned from each activity.

Take a Hike! gives the youth direction for completing the activity.

Tall (Tree) Tales asks youth to share their experience by recording brief answers to questions and sharing these with the Project Helper. The questions help youth process the experience through the five important steps of the experiential learning cycle shown on this page and more fully outlined in the *Helper's Guide* — Share, Process, Generalize and Apply.

Branching Out includes additional activities the youth may choose to do to expand the experience. These activities may be used to complete the Achievement Program for this level. Also included in most activities are additional resources such as **Budding Knowledge** and **Forest Factoids** that support the subject matter of the activity. Internet and additional information and activities are included in the **Forestry Project Online** website.

Good luck in your role as Project Helper.



Pfeiffer, J.W., & Jones, J.E., "Reference Guide to Handbooks and Annuals"
© 1983 John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.

This five-step model is used in each activity in this series. The youth first attempt the activity independently. After the youth do as much as they can and answer the questions, you discuss the questions with them. What did they do? What was important about what they did? How does their accomplishment relate to their lives? And finally, how might they use the life and project skills practiced in the future? The more you can ask additional thought-provoking questions and help them clarify and expand on their ideas, the richer the youths' educational experiences will be.

Revised 2008 — Copyright 2004 National 4-H Council. All rights reserved. Reproduction without permission of National 4-H Council is strictly prohibited.

For more on Forestry look for other guides in this series.

Level 1
BU-08038

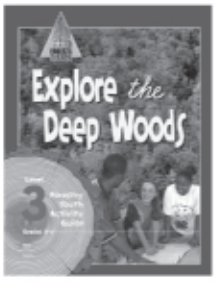
Follow *the* Path

Chapter 1: Know Your Trees
- Talking Trunks
- Leafing Out
- Meet "Your Highness"
- Hold On Tight!

Chapter 2: Know Your Forests
- Home, Tree, Home
- Bark Buddies
- Straight and Tall
- In the Tree's House

Chapter 3: Forests Have Needs
- Down in the Dirt
- Thirsty Trees
- Spotlight: Trees
- Makin' Maps

Chapter 4: People Need Forests
- Where's the Water?
- My Couch Is a Tree?
- Fun in the Forest
- Trees at Work



Level 3
BU-08040

Explore *the* Deep Woods

Chapter 1: Meet the Trees
- Key That Tree!
- Winter Trees
- Fruity Finds
- A Leafy Heritage

Chapter 2: Know Your Forests
- Turn Left at the Tree
- A World of Forests
- Foreign Forests

Chapter 3: Forests Have Needs
- City Trees
- It's a Bird, It's a Plane, It's Super-Tree!
- Recycle Me, Please
- Trim the Trees

Chapter 4: People Need Forests
- Wanted: Forest Owners
- Anyone Need a Tree?
- Houses & Chairs Are Harvested
- My Boss Is a Tree

BU-08041

Helper's Guide

Chapter 1: Planning for Success
- Steps to a Successful 4-H Forestry Program
- Evaluating Your 4-H Forestry Program
- Ages and Stages of Youth Development
- Teaching and Learning Experientially
- Developing Skills for a Lifetime
- Forestry Project Achievement Certificate

Chapter 2: Fun with Forestry
- Let's Make Plans
- Playing Birch Bingo
- Conducting a Forestry Quiz Bowl
- Forestry A to Z
- Conducting a Mini 4-H Forestry Invitational

Chapter 3: Budding Knowledge
- Fun with Forestry Pyramid
- Forestry Glossary Games
- Raising Christmas Trees

Chapter 4: Tall Tree Tales
- Finding Your Way
- A Crowded House
- Piney Woods Squares
- What Kind of Tree Is This?

Acknowledgments

2004 Forestry Design Team:
Bob Daniels, Coordinator; Robert Horton, Liaison; Keryn Page, Principal Writer; Rae (Dehlia) Wilkinson, Jim Freed, Sanford Smith, Natalie Carroll, Rita McKenzie, Jim Nichnadowicz, Peggy Preusch, Ralph Johnson, Gwenda Adkins, Marcella Szymanski, Martha Monroe, Kris Irwin, Julie Sexton, Carol Hanley, Ed Faurot, Writers; Natalie Carroll, Sanford Smith and Ralph Johnson, Photographs; Tom Zurcher, Editor; and Northern Design Group, Design and Production.

Supporters and Donors
U.S. Forest Service
Hardwood Forest Foundation
National 4-H Curriculum

Reach *for the* Canopy

CONTENTS

Note to the Project Helper ..... Inside Front Cover
Reach for the Canopy Contents 1
Let the Fun Begin 2
Planning Your Journey 3
Reach for the Canopy Achievement Program 4
Reach for the Canopy Completion Certificate 5

Chapter 1: Meet the Trees
- Water on the Move 6
- The Leaf Machine 8
- Tick, Tock, Tick, Tock 10
- Dead Ringer 12

Chapter 2: Know Your Forests
- My State Forests 14
- Ch-ch-ch-changes 16
- A Home in the Trees 18
- Forest Invasion 20

Chapter 3: Forests Have Needs
- Someone Call a (Tree) Doctor! 22
- Stop Bugging Me! 24
- Fire in the Forest 26
- Move Over, Please! 28

Chapter 4: People Need Forests
- Growing Every Day 30
- Breathing Easier 32
- City Trees 34

Tree Talk Glossary 36

Let the Adventure Begin

Are you ready to continue the Forestry project? You've already begun to discover the many wonders of trees, forests, forest ecology and human reliance on forests. Now you will continue to learn about forest resources near your home and around the world. You'll also get to explore the relationship between trees, people and communities.

Through the activities in this guide, you will have many interesting and exciting challenges. You'll learn about different types of trees and tree parts, characteristics of different forests, what forests need to grow and thrive, and the many different products and benefits people get from trees and forests. You'll even learn about the many jobs you might want to do when you grow up!

Don't be afraid to jump right into an activity and give it a try. Don't give up if the activity doesn't work the first time. Learning takes place even when things don't turn out as planned. The most important thing is to try. Once you try, talk with your helper about what you did or tried to do.

You'll also be learning about yourself. In addition to what you learn in this project, many of the things you'll do are skills you'll use in other areas of your life, such as decision making, problem solving, communicating with others and more.

Reach *for the* Canopy

Guidelines

- Set your goals and record your Forestry project highlights.
- Complete "What do I know?" on page 3.
- Do a minimum of six activities in the *Reach for the Canopy* Achievement Program each year and complete the entire program within three years. This program will help you set goals, record your successes and be recognized for your good work.
- Practice and develop the life skills of relating to others, making decisions, learning to learn and communicating with others.
- Increase your Forestry knowledge and skills.

Your Project Helper

Your project helper will support you in this project and make learning more fun. This person may be a parent, project leader or adviser, a neighbor or an older friend who knows about forests and is willing to support you. The choice of a helper is yours.

As you do the activities, you'll discuss with your helper what you did and the questions in the **Tall Tree Tales** part of each activity. Sometimes your helper will work with you to identify resources, including people, Internet sites, organizations, events, magazines and books necessary to complete an activity.

Once you have successfully completed an activity, your helper will date and initial your achievement program record. Write the name, phone number and e-mail address of your project helper here.

My Project Helper _____

Phone number _____

E-mail address _____

Planning Your Journey

My Forestry Project Goals

Name _____

What I want to do and learn.

1. _____

_____

2. _____

_____

3. _____

_____

What Do I Know? - Before and After

Here is a great way to see if you learn something new and develop important skills in this project. Before you start doing the activities in this guide indicate what you know **BEFORE**. Then when you complete the *Reach for the Canopy* achievement program indicate what you know **AFTER**. You may be surprised what you learned. Share the results with your helper.

Begin each skill with the words

I know how to _____.

Then circle **1** (to a great extent)
2 (somewhat),
3 (not at all)

Reach for *the* Canopy	Before	After
Understand how trees move water from soil to canopy.	1 2 3	1 2 3
Identifying parts of a leaf.	1 2 3	1 2 3
Describe a tree's life.	1 2 3	1 2 3
Decode a tree's rings.	1 2 3	1 2 3
Locate the nearest public state forest.	1 2 3	1 2 3
Describe a major forest change.	1 2 3	1 2 3
Describe types of organism habitats.	1 2 3	1 2 3
Describe impact of invasive species on forests.	1 2 3	1 2 3
Identify infectious and noninfectious tree diseases.	1 2 3	1 2 3
Identify and record insect damage to trees.	1 2 3	1 2 3
Analyze forest fire risk.	1 2 3	1 2 3
Describe indicators of forest densities.	1 2 3	1 2 3
Estimate the volume of a standing tree.	1 2 3	1 2 3
Describe why trees are necessary for human life.	1 2 3	1 2 3
Select urban tree planting sites.	1 2 3	1 2 3

Forestry Project Highlights

Date and list the most fun and interesting things you do in this project.

Reach *for the* Canopy

Achievement Program

Guidelines

1. Complete at least six activities each year.
2. Complete at least 20 of the *Reach for the Canopy* and Branching Out activities within three years to complete this Achievement Program and receive a completion certificate signed by your project helper.
3. Ask your project helper to initial the activities as you complete them.
4. After you've finished the activities, ask your helper to complete the certificate for *Reach for the Canopy*.

Reach *for the* Canopy Activities	Date Completed	Helper's Initial
Chapter 1: Meet the Trees		
Water on the Move		
The Leaf Machine		
Tick, Tock, Tick, Tock		
Dead Ringer		
Chapter 2: Know Your Forests		
My State Forests		
Ch-ch-ch-changes		
A Home in the Trees		
Forest Invasion		
Chapter 3: Forests Have Needs		
Someone Call a (Tree) Doctor!		
Stop Bugging Me!		
Fire in the Forest		
Move Over, Please!		
Chapter 4: People Need Forests		
Growing Every Day		
Breathing Easier		
City Trees		

Branching Out

Select any of the Branching Out activities. Record the page number of each activity you complete and discuss with your helper.

Page #	Date Completed	Helper's Initials

Write your own activity.

Date_____ Helper's Initials_____

Write your own activity.

Date_____ Helper's Initials_____

Write your own activity.

Date_____ Helper's Initials_____

FORESTS of FUN

Reach *for the* Canopy

COMPLETION CERTIFICATE

I certify that

_____

has completed all requirements of the Reach *for the* Canopy Achievement Program in the Forests of Fun Series.

Helper's signature _____

Date _____

Water on the Move

Forestry Skill:
Learning how trees move water from the soil up to the canopy

Life Skill:
Observation

Success Indicator:
Experiments to determine how trees raise water against gravity.

Education Standard:
Structure and function of living systems

Do you like to watch the rain? Everyone knows that trees need water to grow. But did you ever think about how a tree can get water up to its canopy? A tree can't absorb water through its trunk or its leaves. In this activity, you'll use your observation skills to discover how trees accomplish this amazing task.

Take a Hike!

1 Make four, 12-inch-long tubes of different types of paper. Take a 12 x 8 inch piece of lined writing paper, paper towel, newspaper and cardboard, roll them into a tube (in the long direction) and use small pieces of tape to hold the tube together. Now you have four tubes of different kinds of paper. Take a bucket or large bowl and fill it two inches deep with water. You may want to add a little food coloring to the water to help you see the results of this experiment. Now take the four tubes and stand them on end in the bucket and let them stand for one hour. Observe during the hour as the water is transmitted from the end that is in the water up the tube. Record below how far water has traveled up each tube every 15 minutes during the hour.

Length Water Traveled (inches)				
Paper Type	15	30	45	1 Hour
Paper Towel				
Newspaper				
Cardboard				
Writing Paper				

Notice that the different papers transport water up them at different speeds. This is true because of the different types of paper and it is similar to different types of trees. Different tree species are more efficient at moving water than others, therefore some can survive in wet soils and others in dry soils.

Tree Talk

Cellulose
Evaporation
Sapwood
Xylem

Forest FACTOIDS

Most of the water on Earth gets run through a tree eventually. The water we use today has been on Earth for thousands and thousands of years.

Tall Tree Tales (Talk it over with your helper)

Share

What happened in your paper tube experiment?

Which type of tubes transported water up the tube best?

Process

Trees do not have muscles like you have. How do you think trees are able to raise water from below the ground to the tops of their crowns to supply water to every leaf? Some trees are hundreds of feet tall.

Generalize

Forests have been called "vertical water highways." What do think this means?

What gets carried by all the water moving through the trees?

Apply

How could you use this demonstration to teach others about water movement in trees?

Budding Knowledge

Water Movement in Trees

Water is essential for plant life, but how does a tree actually move the water to where it is needed in the tree? Water weighs about 8 pounds per gallon. Some parts of trees are hundreds of feet in the air! Douglas-fir trees can grow to be over 325 feet tall, Loblolly pines 110 feet and Northern Red Oaks up to 160 feet tall.

Trees move water through an elaborate system of "pipelines" that begins in the roots and ends at the leaves on every live branch—some of them hundreds of feet in the air. The pipelines consist of **xylem** in the **sapwood** of the tree. A tree uses 55 pounds of water to make 100 pounds of cellulose, which is the main part of wood, but it evaporates (transpires) more than 90,000 pounds of water in the process.

A medium-sized tree (40–50 feet tall) will take 10,000 gallons (83,000 pounds) of water from the soil in a growing season. A tree in full leaf may lift a ton (2,000 pounds) of water a day from the soil and carry it to its leaves. In some species of trees, **evaporation** from the leaves creates such a "pull" that the water rises inside the tree at the speed of almost 150 feet per hour. Could you lift that much water as efficiently as a tree?

Branching Out

1. To experience how difficult a task trees have in moving water try this activity. Place two empty one-gallon milk containers near a chair in the center of a room. Pick up one milk container in each hand and hold them by your sides. Now, while keeping your arms straight, raise the milk jugs up so that your hands re even with your shoulders. Hold that position for as long as you can.
2. Now, fill each of your one-gallon milk containers half full of water and put the lids on tight. Pick up a milk container in each hand and hold them by your sides. While keeping your arms straight, raise the milk jugs up so that your hands are even with your shoulders. Hold that position for one minute if you can. If your arms become too tired, lower the milk jugs. Do this several times. Take a rest.

Acknowledgement: Activity written by Bob Daniels.

The Leaf Machine

When you picture a factory, you probably see large metal buildings with chimneys that have smoke billowing out the tops. But all green plants have factories of their own inside their leaves. In this activity, you'll discover the hidden machines inside leaves.

Forestry Skill:
Understanding photosynthesis

Life Skill:
Interpreting information

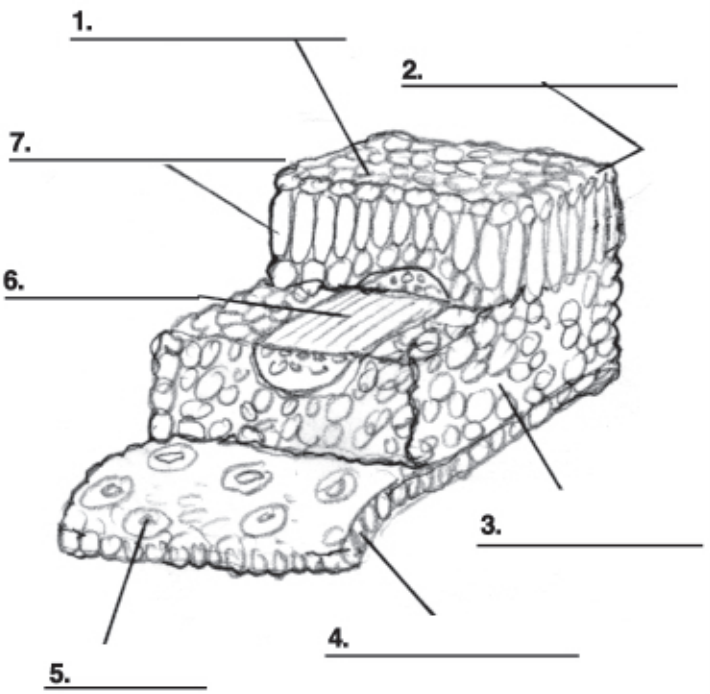
Success Indicator:
Labels leaf parts and writes photosynthesis equation.

Education Standard:
Structure and function in living systems

Take a Hike!

Examine the leaf diagram below. Label the parts of the leaf used in photosynthesis and then write the chemical equation. Below the chemical equation, use words to explain the equation. Check "Budding Knowledge" for additional information.

Leaf Parts Identification



Photosynthesis
Chemical equation

Explain in words

Cross section of a Leaf Word Bank

a. cuticle
b. upper epidermis
c. palisade layer
d. vein
e. spongy layer
f. lower epidermis
g. stomata

Tree Talk

Chlorophyll
Glucose
Photosynthesis
Pigment
Stomata
Veins

It's pretty important!!

Photosynthesis is the process that maintains life on Earth. All living things need it, either directly or indirectly, to survive.

Forest FACTOIDS

Did you know that some trees' leaves are orange and yellow even in the summer? It's just that the green pigment in chlorophyll is a much stronger pigment and makes the leaves look green. When the chlorophyll levels decrease in the fall, the tree's other colors shine through for a beautiful fall display!

Tall Tree Tales (Talk it over with your helper)

Share
How does a leaf produce oxygen?

Process
How do trees and people benefit from the process of photosynthesis?

Generalize
What do you think happens to the extra food our bodies cannot immediately use?

Apply
What other living things have "factories" inside of them?

Budding Knowledge

Photosynthesis

Leaves are small factories that produce food for the plant. The **veins** in leaves are tiny tubes that support the leaf and distribute food. On the underside of the leaf are microscopic openings called **stomata** that serve as the lungs of the leaf and allow the exchange of gases. Leaves are green because they contain small bodies in their cells called **chloroplasts**. These **chloroplasts** are in the cells of the palisade and spongy layers and contain a green **pigment** called **chlorophyll** that makes the leaf appear green.

With the help of **chlorophyll** and sunlight, a leaf can make food. This process is called **photosynthesis**. Plants need water gathered from the roots (H_2O) and carbon dioxide gathered through the leaf's stomata to make food through **photosynthesis**.

The leaf uses the **chlorophyll** and sunlight to change the water and carbon dioxide into oxygen and a sugar known as **glucose**. The plant uses the glucose as food and stores the extra glucose in its roots, stem and leaves. You can detect the sweetness of glucose when you eat a carrot. The oxygen is released into the air through the stomata. Humans use the oxygen from the process to breathe. We both benefit!

The chemical equation for **photosynthesis** is usually read as "Carbon Dioxide plus Water in the presence of Light and Chlorophyll produces Oxygen and Sugar (Glucose)."

$6CO_2 + 12H_20 + \text{sunlight} \longrightarrow 6O_2 + C_6H_{12}O_6 + 6H_20$ or carbon dioxide + water + sunlight – oxygen + carbohydrate + water

Branching Out

1. Research to discuss what happens to the photosynthesis process during the winter. Share what you find with your helper.
2. Search the Internet to find out if certain plants and trees make and store more unused glucose than others.

Acknowledgement: Activity written by Julie Sexton.

Tick, Tock, Tick, Tock

Forestry Skill:
Understanding the tree life cycle

Life Skill:
Organizing and communicating information

Success Indicator:
Describes a tree's life.

Education Standard:
Populations and ecosystems

Collage

Forest ecosystem

Tree life cycle

The clock is ticking away! Even though it may seem like the tree in your yard has always been the same size, it is actually growing every day. In this activity, you'll learn about the life cycle of a tree.

Take a Hike!

Look at the pictures in the collage below. Assign numbers in the order that the picture occurred in the life cycle of the tree. Next, write a short story about the life of a tree. Be as descriptive as you can about the tree's life — who planted it, what has happened in its life and where the tree is now in the **life cycle**. If the tree has died, describe what happened to it.

My Short Story Title _____

_____

_____

_____

_____

_____

_____

_____

_____

Talk about needing to check out the neighborhood before moving in… Depending on the size of its crown, a tree can control the size of its neighboring trees.

Tall Tree Tales (Talk it over with your helper)

Share
What part of the tree's **life cycle** is your favorite? Why?

Process
How are the words in your short story similar to words you would use to tell a story about a person?

Generalize
How is the tree **life cycle** similar to the human **life cycle**?

Apply
What stage of a tree's life is most useful to humans?

Budding Knowledge

Life Cycle of a Tree

All trees and forests are constantly changing. Trees are part of a larger **forest ecosystem** that extends from the very top of the trees to the very bottom layer of soil. Water, nutrients, soil, weather, degree of sunlight, competition and natural disasters all play a role in shaping the life of each tree. Even so, there are some natural stages that a tree goes through in its lifetime. Consider these similarities between the human **life cycle** and the tree **life cycle**.

- Each is "born" a very small replica of itself
- Each does most of its growing in its early years
- Reproduction is at its greatest during the middle years
- Each expands its "waistband" or circumference in its middle years
- Growth in height gradually ceases while growth in diameter likely continues
- Many lose their "covering" (bare branches/ hair) as they grow older

Branching Out

1. Identify where local trees are in the tree life cycle.
2. Begin a photo collection of a tree or forest near your home. Create a collage to show how the tree or forest changes over time. Look for old photos of the tree or forest in local history books.

Acknowledgement: Activity written by Julie Sexton.