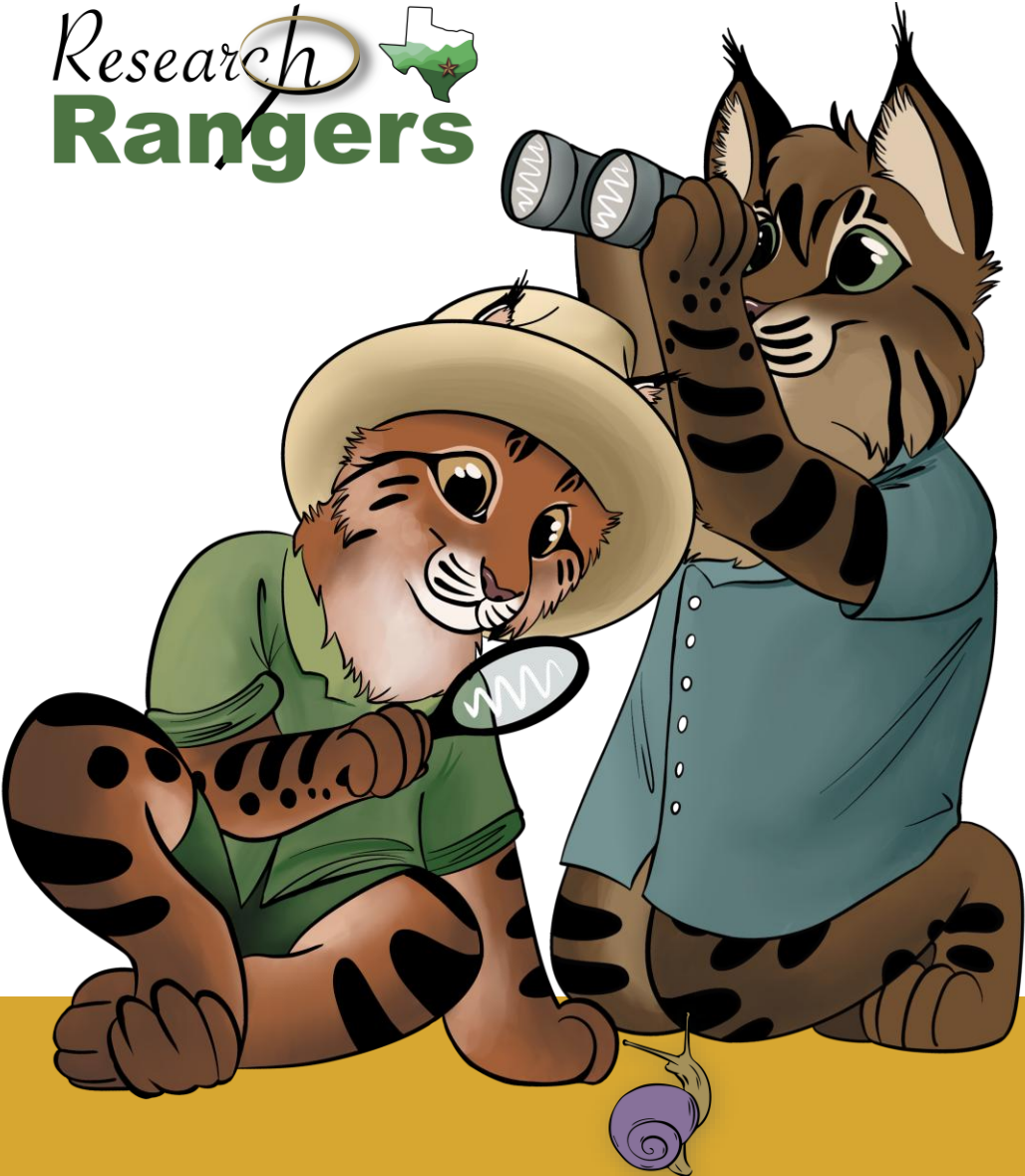


Tree Walk



Research
Rangers



Go outside and explore nature with Scout and Binx!

Research Rangers



What is Research Rangers?

Research Rangers is about inspiring people to spend more time exploring the natural world around them. We want to encourage and support people of all ages, abilities, and backgrounds to enjoy and study wildlife in their local area, and to observe and record information about the local environment.

Find out more at: researchrangers.wp.txstate.edu

What You Get to Do!

In this activity, you will:

- Learn about tree adaptations
- Observe and identify types of trees
- Explore the differences between deciduous and coniferous trees

This activity takes about 30-45 minutes to complete. Have Fun!



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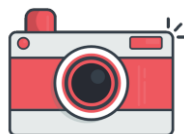


Template Designed by
Sandy Fleming [HCMN] & Kristy L. Daniel

Know Before You Go

Materials You Will Need:

- Your Research Rangers Activity Book
- Pencil or Pen
- Camera or Phone
- *Optional Items:* Clipboard, iNaturalist App



Location Suggestions:

- Local Park
- Nature or Hiking Trail
- Backyard
- Schoolyard
- Garden
- Anywhere in Nature!

Safe Science



Give animals **space**. Keep a safe distance from wildlife.



Stay **calm** and **quiet** around wildlife. Respect their habitat.



Do not touch wildlife or their habitats.



Do not eat anything that you find unless you are sure it is safe.

**Remember,
Safety First!**



Engage With Nature

Words to Know

Gymnosperm – a group of plants that produces cones

Angiosperm – a group of plants that produces flowers and fruits

Dichotomous Key – a scientific tool that uses a series of “yes or no” choices to help identify a specific plant or animal based on its features

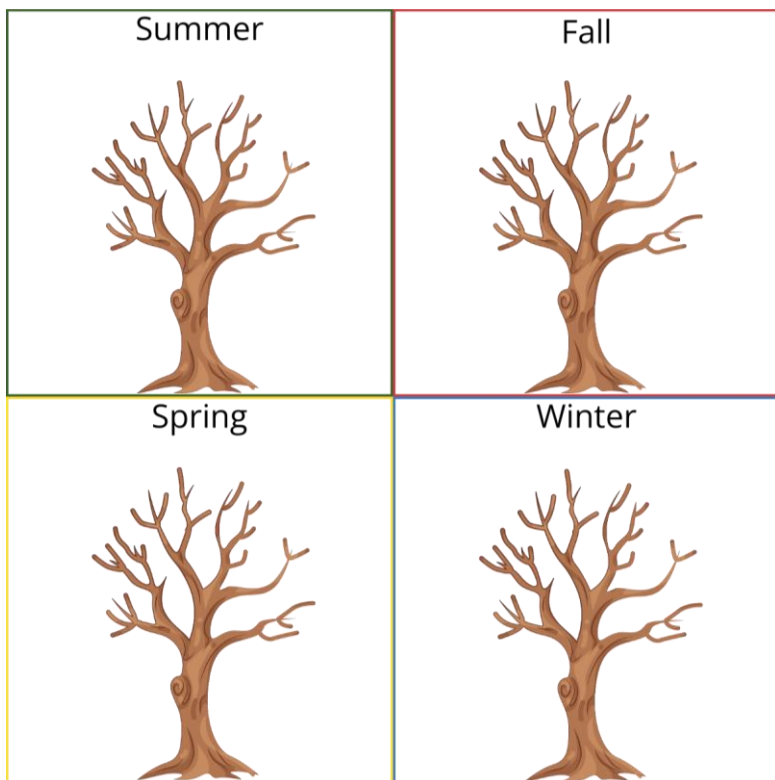
Evergreen – a tree that keeps its green leaves or needles throughout the entire year

Deciduous – a tree that loses all its leaves once a year to save energy during the winter

Adaptation – a special feature (structural) or action (behavioral) that helps a living thing grow and thrive in its specific environment

Complete the trees

Color what you think the tree would look like during each season of the year.



Engage With Nature

Trees are more than wood and leaves; they produce over a quarter of the air we breathe and provide homes and food for wildlife. Today, you are invited to take a closer look at trees.

Maybe you will observe different shapes and colors of leaves, flowers, or cones that you can record as you explore nature.



Trees help create habitat

Did You Know?



- One of the oldest and heaviest living organisms on earth is Pando, a massive clonal colony of quaking Aspen trees in Fishlake National Forest, Utah. It is about 80,000 years old and weighs millions of pounds!
- Trees use a hidden network of underground fungi (mushrooms) to share nutrients and communicate with each other about pests

Trees have structural and behavior adaptations allow them to thrive as the seasons change.

Write down a question about this idea that you might be able to answer after exploring nature.

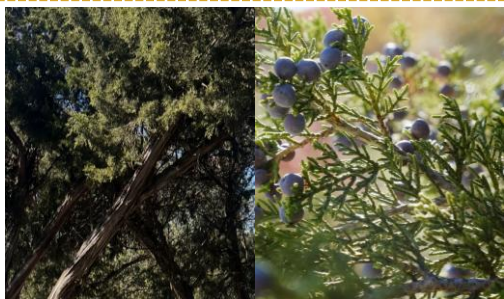


Field Guide

What Tree Do I See?

Use this simplified **dichotomous key** to identify the tree you see. This tool can help you use leaf features, such as shape and texture, to determine which tree from the Field Guide you are looking at. Start at #1 and select the best option from the two statements given, and follow the guide until you reach an answer.

- #1. A. The tree leaf is needle-likeGo to #2
B. The tree leaf is broad or flatGo to #3
- #2. A. The leaf is feathery and softBald Cypress
B. The leaf is scaly and pricklyAshe Juniper
- #3. A. The leaf looks a lot like this: Texas Red Oak
B. The leaf does not look like this:Go to #4
- #4. A. The leaf feels rough, like sandpaperGo to #5
B. The leaf does not feel roughGo to #6
- #5. A. The leaf is more pointed Hackberry
B. The leaf is more oval Cedar Elm
- #6. A. The leaf feels fuzzy and softTexas Persimmon
B. The leaf does not have fuzzGo to #7
- #7. A. The leaf is small, oval, and smoothTexas Live Oak
B. The leaf is long, pointed, and toothed.....Pecan



Ashe Juniper (*Juniperus ashei*):

This **gymnosperm** is a drought-tolerant **evergreen** tree with needle-like leaves. These trees have a crisp, woody, and dry smell. It produces distinct blueish purple cones (that look a lot like berries) that provide food for mammals and birds.



Bald Cypress (*Taxodium distichum*):

This **gymnosperm** tree grows best near water. It produces cones and needle-like leaves in the spring. This **deciduous** tree has leaves that turn yellow or red and drop in the fall.

Field Guide



Live Oak (*Quercus fusiformis*):

This **angiosperm** tree is commonly found in Texas and grows small flowers that turn into acorns. It is considered semi-**evergreen** because it does not shed its dark green leaves seasonally.



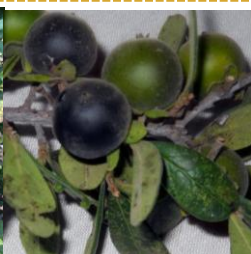
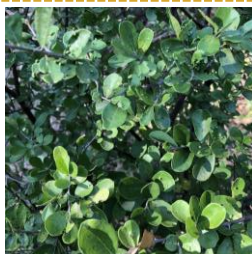
Texas Red Oak (*Quercus buckleyi*):

This **angiosperm** tree makes medium-sized acorns. It is classified as **deciduous** because it has leaves that turn bright red and the fall off the branches in the winter.



Pecan (*Carya illinoensis*):

This common **deciduous, angiosperm** tree that produces pecan nuts (these are the fruits) that are used as food for a variety of wildlife and people.



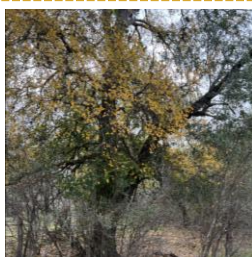
Texas Persimmon (*Diospyros texana*):

This **angiosperm** tree is a shrubby **deciduous** species with small leaves. It produces sweet, black fruits that are edible when ripe.



Hackberry (*Celtis occidentalis*):

This **angiosperm** is a medium sized tree with greenish flowers that develop into purple berries in the spring. It is **deciduous** with leaves that feel rough like sandpaper.



Cedar Elm (*Ulmis crassifolia*):

This tree is an **angiosperm** and is native to Southern and Eastern Texas. It is **deciduous** and has bright green leaves that turn yellow in the fall.

Ranger Records

Explorer's Information

Name: _____

Today's Date: _____ Time: _____ AM/PM (Circle one)

Who are you doing this activity with today (Select all that apply)

☐ Myself ☐ Family ☐ Friends ☐ Classmates ☐ Ranger Guide

Where are you? (City, State) _____

What is the current temperature? _____ °F



Cold



Cool



Warm



Hot

What is the current weather like? (Circle all that apply)



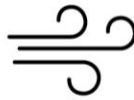
sunny



partly cloudy



cloudy



windy



rainy

Nature Observation Site Details

Describe the Type of Location: (Select all that apply)

☐ Local Park

☐ Schoolyard

☐ Nature or Hiking Trail

☐ Garden

☐ Backyard

☐ Other (Please describe)



Explore Nature

During your tree hike, try to identify what trees you see! Try to find and identify 3 different trees and record the names of trees you find using the Key and Field Guide on pages 6 and 7 to help you. If you need more help identifying your tree, you can use the free iNaturalist app (page 10). Draw each tree and a close-up of its leaves (along with a cone, flower, or fruit if found), then mark which type of tree you think each is.

Tree Name	Tree Drawing	Leaf Drawing	Type of Tree
Example <i>Live Oak</i>			☐ Gymnosperm ☒ Angiosperm ☒ Evergreen ☐ Deciduous
Tree #1			☐ Gymnosperm ☐ Angiosperm ☐ Evergreen ☐ Deciduous
Tree #2			☐ Gymnosperm ☐ Angiosperm ☐ Evergreen ☐ Deciduous
Tree #3			☐ Gymnosperm ☐ Angiosperm ☐ Evergreen ☐ Deciduous



Take photos of your
observations!



(Optional) iNaturalist Resource

Contribute to science by sharing your data with others!



The iNaturalist app is an optional resource that can help you identify plants, insects, and animals for your Research Rangers explorations. It is easy to use once you get it set up on your phone or other mobile device.

1. Download the iNaturalist app from the Google Play Store or Apple Store onto your mobile device.
2. Sign up for an account (with the help of an adult). Then, click on the **Projects** button at the bottom of the app, search for the Research Rangers Project, and join!

www.inaturalist.org/projects/research-rangers

3. Open iNaturalist and click “+Add Observations” or tap the camera icon labeled “Observe.” Take a photo or upload a picture of what you found.
4. Need help identifying what you found? Click “What did you see?” to view possible identification suggestions.
5. Add your observation to the Research Rangers project to get more information and help scientists collect data! This can be done by clicking *Projects* and selecting the Research Rangers project before clicking *Save* or *Submit*.



For more information and to download this free app, visit:
www.inaturalist.org/



Scientist Spotlight



Dr. John Sakulich, Associate Professor at Regis University

Dr. John Sakulich studies how trees record what happened in the past through **dendrochronology** (say: den-droh-kroh-NAH-luh-jee). He studies the trunks of an old species of trees found in Colorado called bristlecone pines. These trees can live for thousands of years! If you look at the trunk of a tree, you'll see circles called **tree rings**. One ring equals one year of the tree's life and growth. Wide, big rings mean the tree had a good year. It got lots of sunshine and water it needed to grow. Thin, small rings mean the tree had a hard year. Maybe there was a stressful event like a fire, drought, or a flood. By looking at the patterns of wide and thin rings, Dr. Sakulich learns about the history of our **climate** (patterns of temperatures and rainfall over 30 years or more). His research helps us understand how forests change over a time and how forests can recover after stressful events.

Dr. Sakulich's research shows us that trees are scientific tools. Because they hold so much history, it is important to protect trees from being cut down (logging) or harmed by pollution.

Build Your Knowledge

If you travel through Texas, you might notice there are different types of trees with unique characteristics. Some trees are tall with long trunks and wide leaves, while others are short with lots of tiny leaves, like shrubs. The unique characteristics are known as **adaptations**. Adaptations can be **structural** or **behavioral**.



This oak tree has a thick trunk



Thick, waxy leaves on a Texas Mountain Laurel reduce water loss

Structural adaptations are visible features on the tree that help it **thrive**, or grow well, in its special environment. For example, trees in the Texas Hill Country face tough conditions like hot, dry summers. Some trees that live there have fuzzy leaves to trap water, while other trees in that area have smooth, waxy leaves to protect them from the harsh sun.

Behavioral adaptations are actions that a tree does to help it thrive in its environment. These behaviors are a plant's response to changes in the environment around it. For example, some trees lose their leaves in the fall to save water and energy when the temperature gets colder and daylight hours get shorter.



This tree dropped all its leaves to save energy in the winter

Build Your Knowledge

Trees can be classified as either **gymnosperms** (grow cones) or **angiosperms** (grow flowers) and **evergreen** (keep leaves all year) or **deciduous** (drop leaves in the winter) depending on the adaptations each possess to help them thrive in their own specific environments.



Different types of trees growing in nature



A general drawing that models how common gymnosperm trees grow

Trees classified as **gymnosperms** grow **cones** that hold their seeds and help them reproduce without flowers.

These trees typically grow in dry areas with harsh weather. They often have waxy needle-like leaves to help prevent water loss. Many of these trees are **evergreen** and have leaves that stay green all year long to absorb sunlight and make food.

Trees classified as **angiosperms** grow flowers and fruits that hold their seeds and help them reproduce.

These trees typically grow in wet areas with moderate weather. They often have broad, flat leaves. Many of these trees are **deciduous** and drop their leaves when the weather gets colder and there is less light available in the winter to save energy and water.



A general drawing that models how common angiosperm trees grow

Cultural Connections



The current Treaty Oak in Austin, TX compared to what it used to look like before it was poisoned in 1989



The **Treaty Oak** is a 600-year-old historical landmark tree located in Austin, TX. It is known as the last of the Council Oaks. The Council Oaks are a series of mature live oak trees that are famous because of historic tribal meetings that happened there and for the legends retold by people over the years.

The Treaty Oak is a symbol of strength and resilience related to plant protections. In 1989, someone tried to kill this protected tree by poisoning its **habitat**. Through group efforts from the Texas State Government and local community the poisoned soil was removed, and many limbs had to be cut off. Over two-thirds of the tree died. But, the remaining tree recovered and started to regrow!

Today, the **offspring** of the Treaty Oak have been protected by Texas environmentalists who want to preserve the culture, history, and nature of this area for generations of future Texans.

Listen to the full story of Austin's Treaty Oak



Above and Beyond

Create a Leaf Rubbing!

It is important to practice **Leave No Trace**. That means leaving nature, including plants, rocks, soil, wildlife, etc. the way you found it, and refraining from littering. Instead, to bring a memory home with you, you can create a **leaf rubbing**! Leaf rubbings copy the shapes and patterns of a leaf without harming the trees you are observing. Follow the steps below to take home something memorable while also doing your part to protect the environment.

Step 1:

Grab a piece of paper, something to trace with (i.e., crayon or color pencil), and a flat hard surface (i.e., a hard book or a clipboard).

Now, you can do your own leaf rubbing in the space below:

Step 2:

Search for a fallen leaf on the ground. Refrain from plucking it from a tree.

Step 3:

Place your leaf on top of the hard surface and then put the paper on top. Make the rubbing by shading with the crayon or pencil gently across the area of paper the leaf is under. The ridges and lines of the leaf structure will appear on the paper, creating your own replica of the leaf!

Step 4:

When you finish, return the leaf to the ground where you found it to leave no trace.

Learn the 7 Principles of
Leave No Trace
nt.org/why/7-principles/



Extra Activities & Information



Find more Research Rangers activity topics and upcoming events!



BINX + SCOUT

researchrangers.wp.txstate.edu/



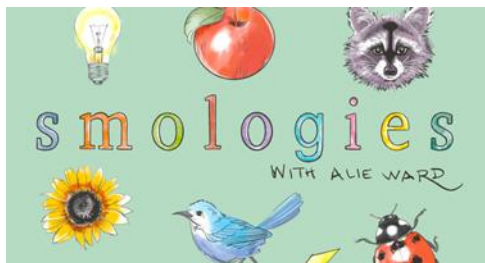
Learn more about trees in the National Geographic Kids: Field Guide to Trees



kids.nationalgeographic.com/books/article/field-guide-trees



Watch a video about tree anatomy and communication



youtube.com/watch?v=2nHKaPLEsbM



Watch Bill Nye the Science Guy talk about forests



youtu.be/aJ_XbNdKHVQ?si=twfximWReMhtV98A



Become a Nature Superstar by completing activities in Hays County Green Spaces!



beautifulhayscounty.org/coloring-book



The Daniel Biology Education Research Group at Texas State University teaches people how to become Ranger Guides!



TEXAS STATE UNIVERSITY
Department of Biology

txsciencepeers.wp.txstate.edu/



Ranger Reflections to assess learning can be found on our website!