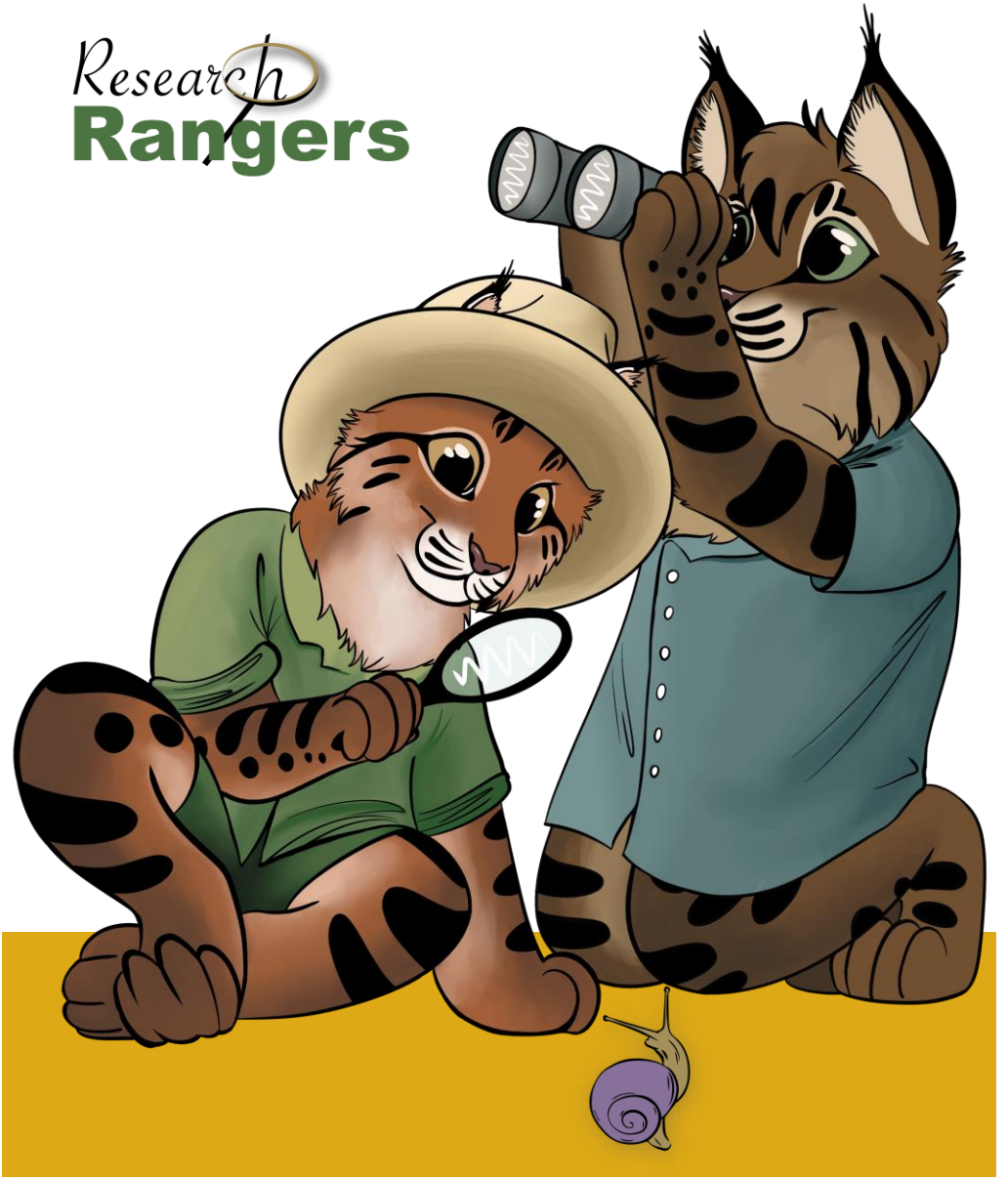
Good Gall-y!

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 become a community scientist! You will conduct a survey of plant galls in your area and contribute to local science.

This activity takes 30 minutes to an hour to complete. Get outside and explore!

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Supported by

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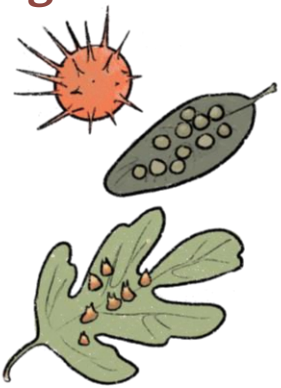
Build Your Knowledge

Galls are unusual growths on plants that are found on leaves, stems, flowers, and roots. They are formed using **plant tissues** stimulated by an insect, mite, worm, fungus, bacteria, or virus.

Galls can be found in a wide variety of shapes; some have spines, some look like cones or spheres, some are fuzzy, and some are smooth.

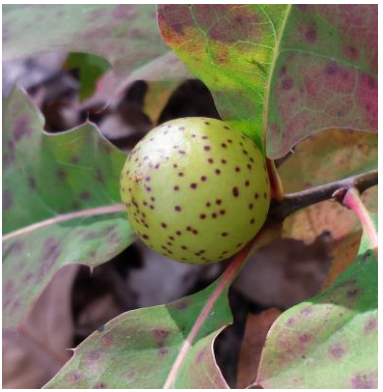


Example drawings of galls

Larva in a Goldenrod Gall

The galls we see most often are insect galls, where the insect deposits eggs into a plant, causing the plant's growing tissue cells to form a gall around the larva. This provides the developing gall insect with a source of food and shelter made up of the plant's matter. These galls do not hurt the plant, but the insect benefits! This is called a **commensalism** symbiotic relationship.

The chosen part of the plant must be actively growing for a gall to develop, so the mother will inject her ovipositor (egg-laying organ) into a part of the plant that is in a growing stage, such as a flower or leaf bud during the spring or beginning of summer. The plant tissue grows into the gall and serves as a shelter for the insect.

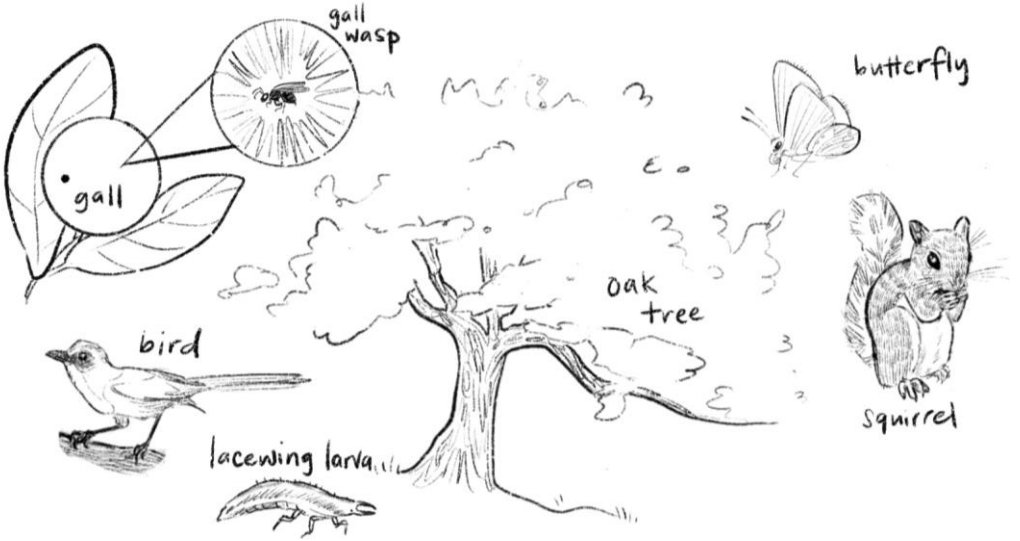


Oak Apple Gall on a Red Oak Tree

Build Your Knowledge

Plant galls and gall insects have their own place in the ecosystem. Galls can form of lots of different species of plants including oaks, goldenrods, pecans, hackberries, grapes, and persimmons. However, most gall insects can only use one plant species or family of plants to make galls. This relationship is called **host specificity**. All galls look unique, kind of like a fingerprint to help us identify what species created it.

Other insects also benefit from galls! Some parasitic wasps inject their eggs into galls made by other wasps, and their larvae also eat the plant tissue created by the original gall wasps.



After the adult insect emerges (or leaves), other organisms such as ants, small spiders, mites, and lacewing larvae can crawl in and use it as a home!

Some galls can secrete sugary substances called honeydew that feed honeybees, butterflies, flies, and other wasps.

Other animals also feed on the galls themselves, such as squirrels and birds.

Know Before You Go

Materials You Will Need:

- Your Research Rangers Activity Book
- Pencil/Pen
- Watch/Timer
- Optional: Camera/Phone, 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 any wildlife you see.

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.

Today, we will be looking at the Texas live oak (*Quercus fusiformis*) as our host plant. It is a large, evergreen tree that has acorns and has thick, oblong, dark green leaves.

Once you find a Texas live oak tree, look closely at the leaves, stems, and buds for galls! In this activity, we will describe and draw the galls we find. Finally, you will have the option to post your findings to iNaturalist.

Field Guide

Bubble gall

Belonocnema kinseyi

Mealy oak gall

Disholcaspis cisnerosa

Wool-bearing gall

Andricus lanigera

Oak rosette gall

Andricus quercusfoliatus

Gouty gall

Callirhytis quercussutoni
or C. quercuspunctata

NOT a gall:

This is the live oak kermes, a scale insect that expands and fills up with young. Unlike a gall, it is not made up of plant tissue, but is the insect itself.

What Do You Think?

1. Where do you think you should look for galls on a plant? *(use words or drawings to share your answer)*

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2. Using what you have read about galls, predict what you might find inside of a plant gall.

I predict that I will find _____ inside of a gall because _____.

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3. What type of relationship do gall insects have with plants?

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4. Explain how you think plant galls fit into the ecosystem near you? Think about what might eat the gall or the insect inside it and what might use the gall for shelter.

Ranger Records

Scientist's Information

Name _____

Date _____ Time _____ AM / PM *(Circle one)*

Who are you doing this activity with today? *(select all that apply)*

☐ Myself ☐ Family ☐ Friends ☐ Classmates

Where are you? *(city, state)* _____

Site Observations

What type of location are you in? *(select all that apply)*

☐ Local Park ☐ Schoolyard

☐ Nature or Hiking Trail ☐ Garden

☐ Backyard ☐ Other *(Please Describe)*_____

_____

What is the temperature? _____°F

What is the weather like? *(select all that apply)*

Capture Your Observations

For our gall hunt activity, you will be looking for galls on two Texas live oak trees! Once you find your trees, take 15 minutes to find and tally as many galls as you can find. **Keep one gall you find to use later.**

Galls	Example	Tree 1	Tree 2
 Bubble gall	IIII		
 Mealy oak gall	II		
 Wool-bearing gall			
 Oak rosette gall	III		
 Gouty gall	I		

(Optional) iNaturalist Resource

The iNaturalist app is an optional resource that can help you identify plants, insects, and animals for your Research Rangers projects. 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 the Apple Store onto your mobile device.
2. Sign up for an account. Then, click on the Projects button at the bottom of the app, search for the Research Rangers Project, and join!
   https://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. This can be done by clicking Projects and selecting the Research Rangers project before clicking Save or Submit.

For more information go to **https://www.inaturalist.org/**

Ranger Reflections

1. Draw a gall you found, including the part of the plant on which it is growing.

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2. Ask an adult to help you cut open a gall you found and see what is inside. My data shows that my prediction (from page for flower 8) was (circle one) correct / incorrect because _____

_____

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3. Describe the color(s) and texture(s) at least one of the galls you found.

Gall Color:

Gall Texture:

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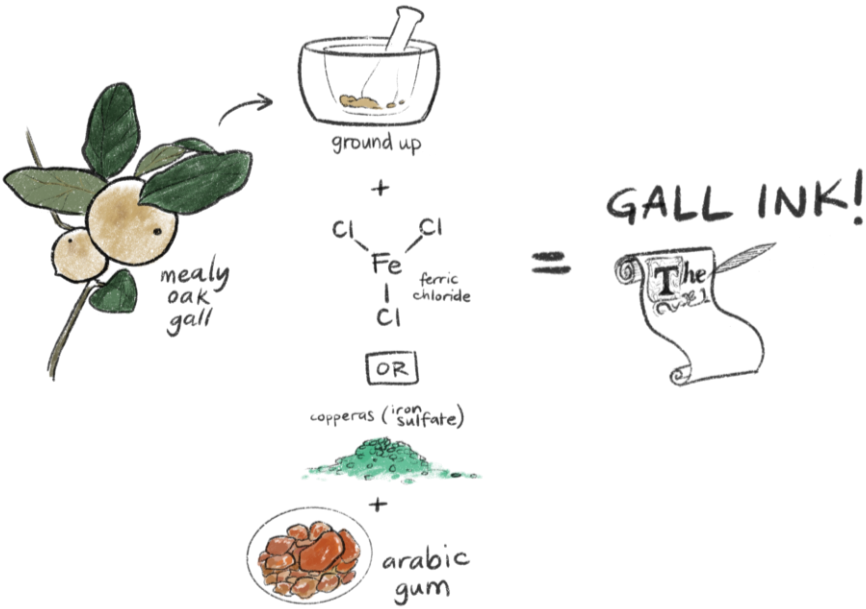
4. Explain how you think plant galls fit into the ecosystem near you? Think about what might eat the gall or the insect inside it and what might use the gall for shelter.

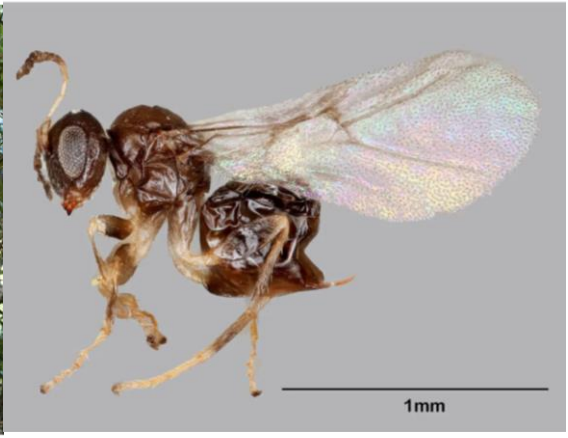
Cultural Connections

Galls have been used throughout history for a wide variety of medicines, inks, dyes, and jewelry. This is because galls contain a high amount of **tannic acid**. In all of the United States, the mealy oak gall of Texas has the highest tannic acid content.



When dried, powdered galls were mixed with ferric chloride or copperas and arabic gum. The tannic acid from the galls reacts and forms a high-quality permanent ink. Ink made in this manner was used for centuries, even by the US Treasury.

Scientist Spotlight



Left: Jeff Fitlow/Rice University; Right: Miles Zhang, Smithsonian NMNH

Pedro FP Brandão Dias is a Brazilian scientist who studies gall wasps at Rice University in Houston, Texas.

He and his labmates discovered a gall wasp called *Neuroterus valhalla.* It was found in galls on the flowers of a live oak tree on their university campus.

They are now working to answer questions such as:

- How many species of gall wasps are still undiscovered?
- How does climate change affect gall wasps' ability to reproduce?

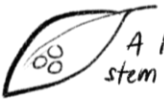
Pedro's favorite parts of being a scientist are:

- Contributing to humanity's knowledge
- Being able to describe what he sees
- Getting to learn more about what he loves every day

He believes that it is important to spend time in nature, learn about your local flora and fauna, and be aware of your surroundings. Pay close attention, because beauty and complexity is all around us even on a microscopic scale – just like with galls and gall wasps.

how to hatch your own gall

YOU WILL NEED:



DIRECTIONS:

1. Pack and moisten a layer of soil.
2. Place your leaf (or stem, or flowerbud) with galls on top.
3. Cover with breathable fabric and secure with a rubber band or elastic.

Note: If you notice a hole in any of your galls, the insect may have already hatched! Try to find galls that are unopened.

Extra Activities & Information

Need help getting started? Watch the Research Guide Video for more information about this activity!

https://researchrangers.wp.txstate.edu/ranger-guides/

Learn more about TX Galls

https://tpwd.texas.gov/publications/nonpwdpubs/young_naturalist/plants/plant_galls/

Learn how to make Gall Ink

https://www.instructables.com/Making-Iron-Gall-Ink/

Learn about the Goldenrod Ball Gall and Fly

https://www.youtube.com/watch?v=IoWbxtdwQuI

Learn more about the Hays County Master Naturalist Nature Superstars!

https://www.beautifulhayscounty.org/coloring-book

Learn more about other Research Rangers Activities!

https://researchrangers.wp.txstate.edu/