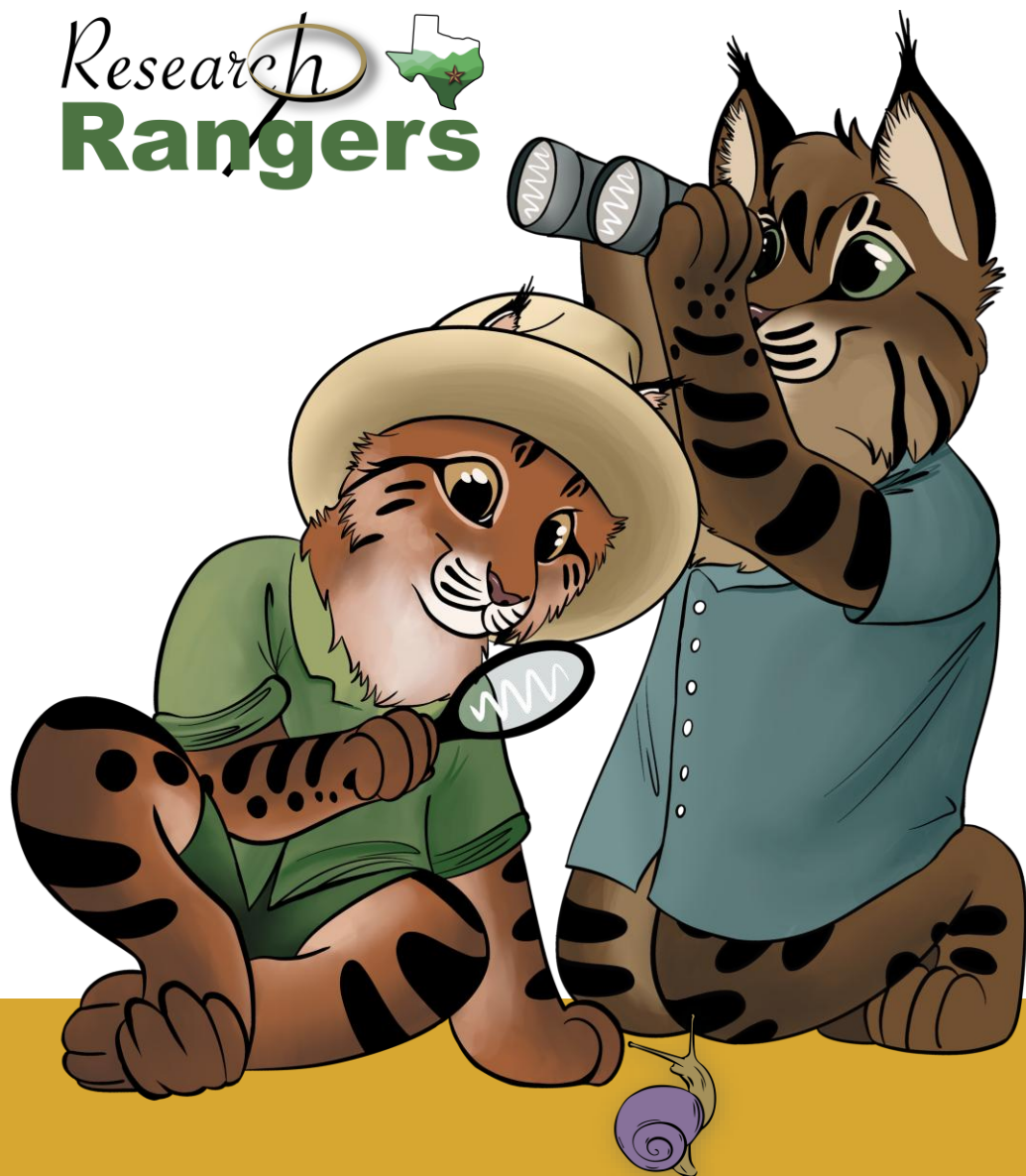


Prickly Potential



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 prickly pear growth
- Observe and count parts of prickly pears
- Explore how people have used prickly pears in different ways

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



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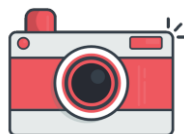


Template Designed by
Sandy Fleming [HCMN] & Kristy L. Daniel

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

Climate – typical weather patterns (like temperature and rainfall) that an area experiences over a long period of time

Drought - a long period of time with very little or no rainfall

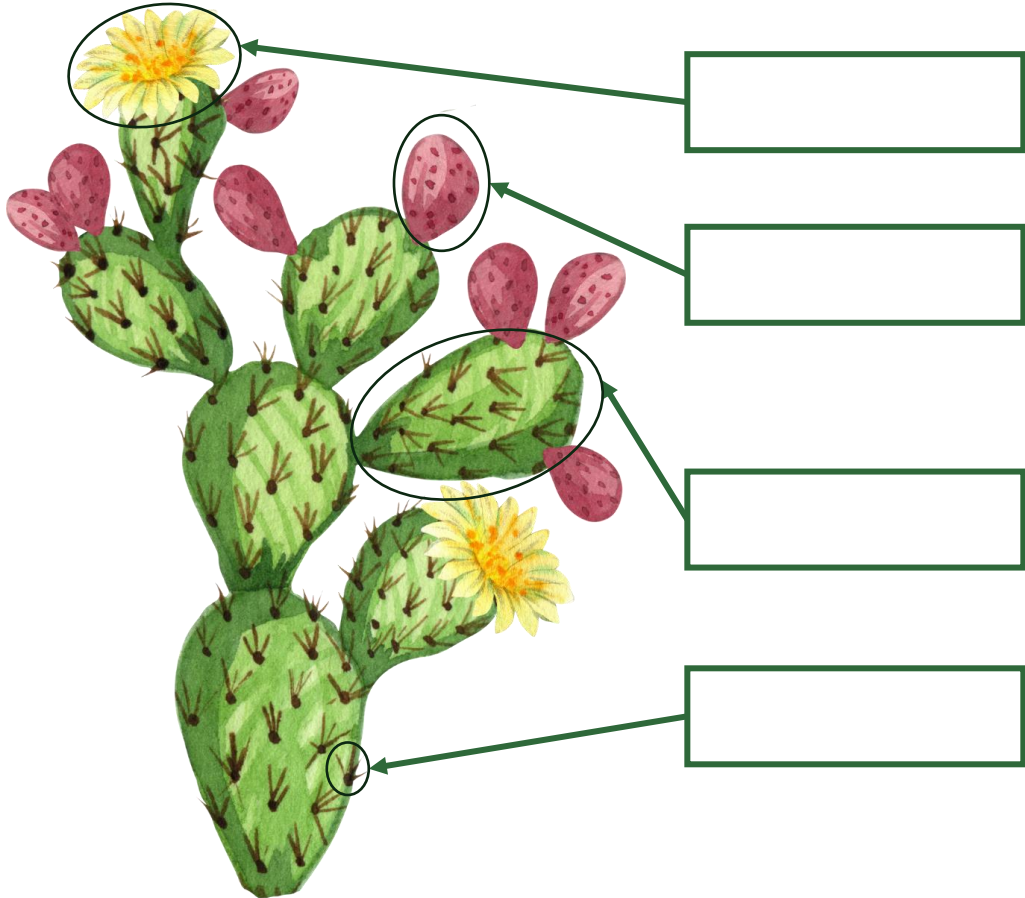
Parasite – a living thing that feeds on another living thing without killing it, but causes harm

Nopales – the flat, green stems of the prickly pear that look like pads and store water to help the cactus survive dry weather

Tuna – the colorful fruit of the prickly pear cactus, which can be red, green, or yellow

Spines – sharp, needle-like modified leaves that protect the cactus from being eaten by animals

Label the parts of the Prickly Pear diagram!



Engage With Nature

Prickly pear cacti are a very important species in dry ecosystems because they can provide wildlife with water (in the pads), food (the pads, fruit, and flowers), and safety from predators and heat (spines provide protection, dense growth helps with nesting and hiding). These plants are often used by birds, deer, javelinas, rabbits, insects, and reptiles,



A javelina resting by a prickly pear cactus

Did You Know?

- There are over 200 species of prickly pear cacti that grow across the globe! And this plant was selected as the official state plant of Texas in 1995.
- The sharp spines on prickly pears are technically leaves that become hard and needle-like.
- The nopales (pads) and tunas (fruits) of the prickly pear can be eaten by humans!

Prickly pears thrive in dry climates and are useful for humans.

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



Field Guide

Prickly pears, scientifically named *Opuntia*, are a group of cactus with over **200 different species** found across the world. There are around 20 prickly pear cactus species **native** to Texas.

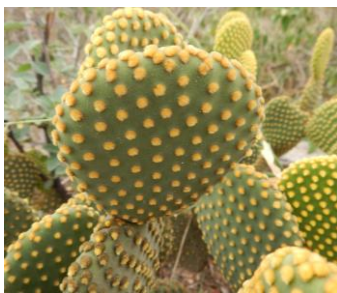
Prickly pears usually grow in dry desert regions and have flat, green stems, called **nopales**, that store water for the plant. This **adaptation** helps them survive in environment with little rainfall. The cactus produces a fruit, called **tunas**, that can be red, green, or yellow, depending upon the species. Be careful when observing prickly pears and make sure you **do NOT touch** them because they have special leaves, called **spines**, that can hurt!



Texas prickly pear (*Opuntia lindheimeri*)



Some prickly pear species may not grow spines



Some prickly pear species may grow groups of short, fuzzy-looking spines



Some prickly pear species may be a different color, like this purple variety found in Big Bend National Park

Field Guide



Nopales (pads) – flattened, modified stems that help hold extra water



Tunas – fruit of the plant, typically red when ripe (but can be green or yellow)



Blossoms – flowers that attract lots of pollinators



Spines – long, spiky modified leaves that protect the plant from herbivores



Cochineal – a small, scale insect that lives on prickly pears, is considered a parasite, and is used by humans to create a natural red dye



Damage – prickly pears get damaged by pests (like cochineal, cactus moths, or being eaten by wildlife), diseases (like stem or root rot), and environmental stress (like too much water, too little water, too much sun, or being too cold)

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)



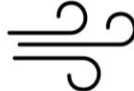
sunny



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

Search for three (3) prickly pear cacti! For each cactus you find, record the number of nopales and tuna you observe. Start at the bottom of the cactus near the ground, and work your way up, counting the plant structures. You can use tally marks to keep track of how many nopales and tunas you find. In the Then mark other details about feature you notice and then draw where you found them on the cactus!

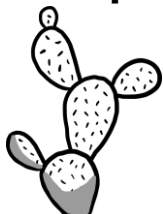
Observation Drawing

Number of Nopales

Number of Tuna

Features noticed

Example

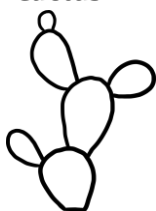


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- ☒ Spines
- ☐ Blossoms
- ☒ Damage
- ☐ Cochineal
- ☐ Cactus moth

Cactus #1



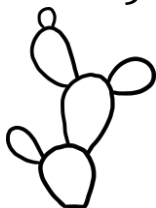
- ☐ Spines
- ☐ Blossoms
- ☐ Damage
- ☐ Cochineal
- ☐ Cactus moth

Cactus #2



- ☐ Spines
- ☐ Blossoms
- ☐ Damage
- ☐ Cochineal
- ☐ Cactus moth

Cactus #3



- ☐ Spines
- ☐ Blossoms
- ☐ Damage
- ☐ Cochineal
- ☐ Cactus moth



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. Plowes in the field, and a close-up photo of a Cactus moth larva

Dr. Robert Plowes is a research scientist at The University of Texas. He works in the Department of Integrative Biology at the Brackenridge Field Laboratory. He has a PhD in landscape ecology, which he uses to understand the effects of **invasive species**, a species that are introduced to a new area where they are not originally from. Dr. Plowes also studies how land usage affects **biodiversity**, all the different kinds of plants and animals that live in a specific area.

Since 2007, he has led a project dedicated to preventing and limiting the spread of the invasive cactus moth. The first cactus moth was found in Texas in 2017, and Dr. Plowes and his team have been studying how quickly the moths might spread across the state. They have also researched how cactus moths harm different kinds of prickly pear cactus and how releasing parasitic wasps (*Apanteles opuntiarum*), a natural enemy of the cactus moth, could help protect Texas prickly pear plants. His research is necessary to keeping Texas prickly pear populations safe from the cactus moths.

Build Your Knowledge

The prickly pear, a type of cactus, are originally from North and South America, but have been brought all over the world. Today, they are mostly found in Mexico and the Southwestern United States, such as California, Nevada, Arizona, and Texas. Each red square on the map shows a place where a prickly pear has been observed in the Americas!



Reported observations of prickly pear cactus submitted to iNaturalist



Ripe tunas

Prickly pears can grow in hot, dry **climates** where there are 8-12 hours of sunlight a day. They do not need very much rainfall and prefer sandy or rocky soil. When the cacti are fully grown, you can see a brightly colored fruit called a **tuna**.

The **cochineal** is a **parasite** (a living thing that feeds on another living thing without killing it) that feeds on the juices of the prickly pear. The prickly pear provides shelter and protection for the cochineal. Cochineals leave behind a white, waxy coating on the prickly pear to protect themselves from **predators** and the sun.



Cochineal on a prickly pear

Build Your Knowledge

Prickly Pears Can Show When There is a Drought

Droughts are long periods of time without rainfall. Most plants are unable to live long during these conditions, but the prickly pear can. This is because of their shallow roots that collect water fast and their ability to store water in their **nopales** (green, paddle-like leaves) for later use.

Wrinkly Nopales:

The nopales are special stems that store water to use during drought conditions. When they are full of water, they look plump. But during a drought, the stored water gets used by different parts of the plant, making the nopales look wrinkly.



Wrinkly Nopales

Dull/Decaying Fruit:

During normal dry conditions, the tuna uses stored water from the nopales. But during drought, the stored water can get used up! When there is no more water available, the tuna will begin to lose its color, become wrinkly, and start to **decay** (break down),



Dull and Decaying Tunas

White Film:

Cochineal insects need water to thrive. During drought, these insects will feed on the prickly pear nopales. When this happens, they produce a waxy, white film to protect themselves from predators, the sun, water loss, and other insects.



White Film from Cochineal Scale Insects

Cultural Connections



Tierra Firme creates a tapestry of a landscape using cochineal dye

The Payaya People and the Power of Red Dye

Indigenous Americans have used the cochineal insect for at least 2,000 years for clothing dye, art, and fabrics. In Central Texas, the cochineal was heavily used by the **Coahuiltecons** (kow-uh-hee-tuh-kaans), including a people living in the San Antonio Valley named the **Payaya** (Pah-yah-yah), for dyeing material.

To create this dye, the cochineal is collected from prickly pears. Then the insects are ground into a powder, boiled, and strained to stain the water a deep red color. This dye is then used on wool, fur, fabric, and paper.

Today, the cochineal is used by Tierra Firme, a collaborative arts project, to highlight the art and culture of the groups along the Texas/Mexico border.

Above and Beyond

Help Scientists Find and Destroy the Cactus Moth

Cactus moths (*Cactoblastis cactorum*) are an **invasive species** that has been introduced to a North America (where they are not originally from). They are originally from South America and lay eggs on the spines of cacti. The larvae then burrow in the nopales of the cactus and eat it from the inside out, which kills the cactus. Cactus moths can kill lots of cacti quickly, causing a big problem for nature.



How can you help?

If you see a moth/larva, remove the infected nopales, put them in a plastic bag and place it in your freezer.

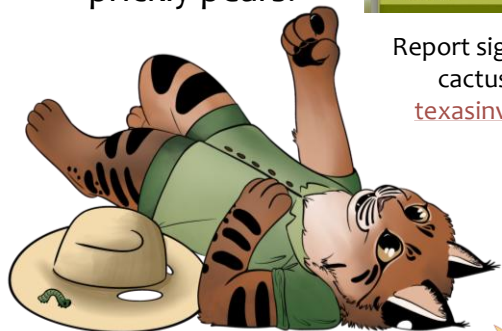
After they are fully frozen (about a week), throw them away (bag and all)!

Report where you found the insect to texasinvasives.org/

Together we can slow the spread of cactus moths to protect our native prickly pears!



Report sightings of the cactus moth at texasinvasives.org/



Extra Activities & Information



Find more Research Rangers activity topics and upcoming events!



researchrangers.wp.txstate.edu/



Learn the fascinating life cycle of desert plants!



youtube.com/watch?v=oSSUA2r-cXk



Watch how to harvest cactus tunas safely.
WARNING: Use supervision and caution when harvesting!



facebook.com/reel/851030086228231



Learn how to make your own delicious prickly pear juice!



dorastable.com/agua-de-tuna-prickly-pear-juice/



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

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