

FAMILIES IN NATURE™



ECOLOGIST
SCHOOL™

Pocket Guide

**waterloo
greenway**

WELCOME!

The Ecologist School Pocket Guide: Waterloo Greenway Edition is a collaborative project between Families in Nature and Waterloo Greenway Conservancy to help our community learn more about the ecosystem and history of Waterloo Greenway, while getting outside into nature together! This booklet has 64 lessons across 16 different branches of science to help you play, learn and volunteer in the park as a family!

Each branch of science corresponds with a matching badge featured in the top right corner of every activity. Complete all 4 activities in a science slice and you are eligible to earn that badge. Scan below to order your own Ecologist School badges!



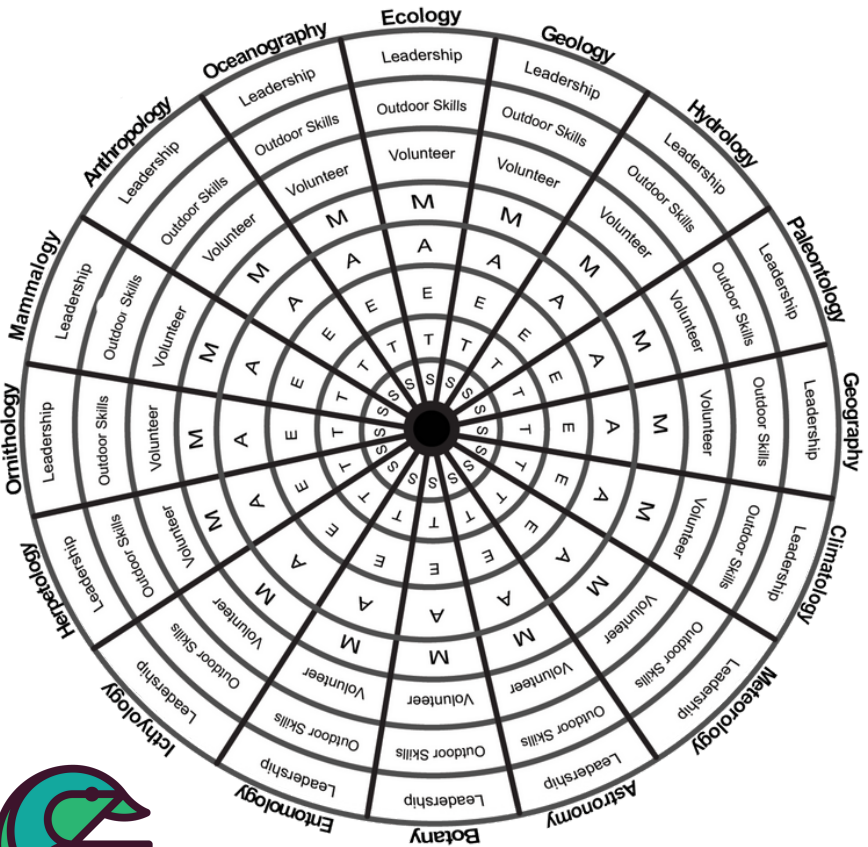
FAMILIES IN NATURE..

**For more information visit
familiesinnature.org**

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CIRCLE OF SCIENCES

Our hands on activities span across 16 different branches of science!
 Each Science Slice is broken into 8 learning categories: S.T.E.A.M.,
 Volunteerism, Outdoor Skills and Leadership Development.



WHO ARE WE?

Families in Nature works to create opportunities for nature connection with the purpose of sparking a deep love and desire to protect, conserve and restore the environment.

Our mission is to connect children and their families to nature and to each other through time spent learning, playing, and volunteering outdoors. It is our vision to inspire ALL families to fall in love with nature and foster the next generation of conservationists.



Waterloo Greenway Conservancy creates and maintains an extraordinary urban park system and a restored Waller Creek, in partnership with the City of Austin, for the benefit of all. The Conservancy renews the natural environment, promotes play, health and wellness, economic vitality and mobility, and engages the community through outreach, education, cultural events, and the arts.



FAMILIES IN NATURE™

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greenway**

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NATURE FOR ALL

Families in Nature and Waterloo Greenway actively strive to be diverse, equitable, and inclusive in all aspects of our work. FIN's vision is to inspire all families to fall in love with nature while fostering the next generation of conservationists. All individuals and families are invited to participate in our programs regardless of ethnicity, economic status, religion, gender, gender identity, sexual orientation, ability, or language. We raise funds to create equitable access to nature and strive to recruit staff, guides, volunteers, board members, and participants that represent the diversity of our entire community.

All are welcome here!



SUPPORT OUR WORK

Families in Nature believes that all families should have access to nature. Through our programming we provide opportunities that connect diverse communities of children and their families to nature and to each other through time spent learning, playing, and volunteering outdoors. Give the gift of nature by donating today!



To learn more about how we empower and inspire a love of nature for all visit www.FamiliesinNature.org



ABOUT WATERLOO GREENWAY

Think you know what a park is? Think again! Waterloo Greenway is a 1.5-mile urban ecosystem with the power to bring the entire Austin community together. Winding along Waller Creek in downtown Austin, Waterloo Greenway is on its way to becoming a wondrous public park that celebrates the spirit of our community. This extraordinary shared experience is being launched in phases, and amazing free events and programs are already taking place. So, come explore the many ways we're working to connect all of the people in our vibrant city to nature, art, culture — and to each other.



To learn more about Waterloo Greenway and view full details on upcoming programming visit www.WaterlooGreenway.org.



EXPLORING THE PARK

Use this map to help you guide your way through Waterloo Park as you complete the activities in this booklet!



- | | | |
|-------------------------|--|---|
| 1 Farmer Bridge | 8 Meredith Heritage Tree Deck | 15 Rosemary and Russell Douglass Family Gate |
| 2 Amphitheater Terrace | 9 Family Commons | 16 Waller Creek Tunnel Inlet Facility |
| 3 Amphitheater Lounge | 10 Kitty King Powell Lawn | 17 Wall painting for Austin by Arturo Herrera |
| 4 Amphitheater Pavilion | 11 Suzanne Deal Booth Skywalk | 18 Garden Bridge |
| 5 Amphitheater Stage | 12 Lebermann Plaza | 19 Winkler Family Wetland Terrace |
| 6 Mattsson-McHale Plaza | 13 Luci and Ian's Family Hill Country Garden | 20 Trailhead Garden |
| 7 Great Lawn | 14 Southwest Porch | |

WHAT'S INSIDE?

64 lessons to play, learn and volunteer
at Waterloo Park and at home

Science Slice	#
Geology.....	1
Hydrology.....	5
Paleontology.....	9
Geography.....	13
Botany.....	17
Climatology.....	22
Meteorology.....	26
Astronomy.....	30
Entomology.....	35
Ichthyology.....	40
Herpetology.....	44
Ornithology.....	48
Mammalogy.....	52
Oceanography/Marine Biology....	56
Anthropology.....	60
Ecology.....	64

**For more information visit
familiesinnature.org**



FAMILIES IN NATURE™

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GEOLOGY



ACTIVITY #1

Draw up plans for a house or shelter made from natural materials. What kind of rocks, plants or other materials would you use? Build it outside - either human or fairy-sized!

Science Seed: Rocks have been known historically for their architectural strength. People all over the world use rocks and natural materials to build their homes. Architecture requires engineering skills! Practice your planning and problem solving skills by transferring ideas from your imagination to 2D drawings and then to a 3D shelter! And if your structure falls, remember that redesigning to solve problems is the most important part of engineering.





GEOLOGY

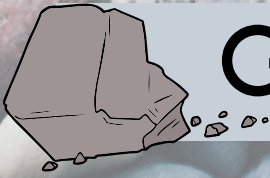


ACTIVITY #2

Go hunting for rocks with unique shapes. Use your imagination to create a story using the shapes and colors of the rocks. A circular rock could be the sun, a triangular rock could be a tree, a square rock could be a house, or a jagged rock could be an alligator!

Science Seed: Rock art is one of the oldest material forms of human expression and is found throughout the world. Ancient people created many different kinds of images, some simple and some complex. What these images were meant to depict and why they were made are interesting questions that anthropologists and archeologists try to answer by studying how they were made and where they are located.





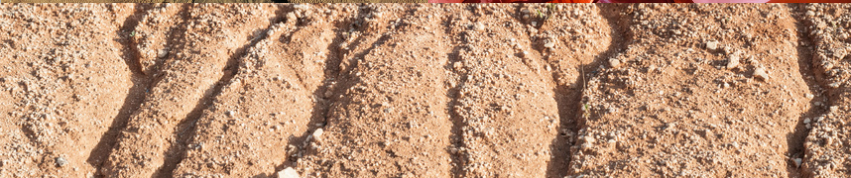
GEOLOGY



ACTIVITY #3

Go on a walk to observe places where rock or soil has gone through changes. What is causing it to move, stay, change colors? Find an example of erosion and talk about what you can do to slow this process. For example: Always staying on the trail when hiking or planting plants with deep roots that keep soil from washing away.

Science Seed: Erosion is a geological process where rocks and soil are moved from one location and transported to another location by natural forces like wind, water, gravity and ice.





GEOLOGY



ACTIVITY #4

Start your own rock collection! Try and identify them using the Geology Toolkit or Rock Identifier: Stone ID apps.

Science Seed: There are three kinds of rock: (1) igneous, (2) sedimentary, and (3) metamorphic. Each type of rock is formed through different physical changes. Igneous rock forms when magma or lava cools and solidifies, sedimentary rock forms from layers of compressed sand, silt and organic material like plants and animal bones. Metamorphic rock is formed from old igneous or sedimentary rock through forces like heat and pressure.

1



2



3





HYDROLOGY



ACTIVITY #1

Explore the Winkler Family Wetland Terrace! Notice how this area of the park is different from the rest! Wetlands are home to high biodiversity (a variety of life in one area). Try and count how many different types of plants and animals you see! Draw your favorite!

Science Seed: Wetlands are important for many reasons! They are known as the "kidneys of the landscape" helping clean and improve our water quality and prevent flooding. They are also an important habitat for many unique species of plants and animals that can adapt to changing salinity (salt levels) and seasonal flooding. Some of these animals that we have in Texas include: Egrets, dragonflies, whooping cranes, turtles, cricket frogs, alligators, ocelots, and more! Did you know that up to 90% of Texas' salt and freshwater fish species depend on wetlands for food, spawning and nursery grounds?





HYDROLOGY



ACTIVITY #2

Measure how fast the water in your local stream, river or creek is moving by floating a leaf or stick on the water and determining how long it takes to move from point A to point B. Have a race to see which leaf/stick moves the fastest!

Science Seed: Measure out the distance between the points, and use the formula:
$$\text{speed} = \text{distance}/\text{time}.$$





HYDROLOGY



ACTIVITY #3

Go outside and do a creek or lake clean up with your family. Don't forget gloves and trash bags!

Science Seed: Our creeks, rivers and lakes are important to a healthy, functioning ecosystem and community! Protected and healthy rivers provide clean water, quality of life and stronger local economies. They are also home to countless species of fish, birds and other animals that rely on water for shelter and food. Even seasonally dry inland waterways can wash trash into the ocean during heavy rains. Clean creeks help us have clean oceans.





HYDROLOGY



ACTIVITY #4

Two popular visitors at creeks and wetlands are damselflies and dragonflies. Did you know that they are actually two different types of insects! Visit the creek and wetland terrace and practice telling the difference with our tips below to impress your friends and family!

Science Seed: Damselflies and dragonflies are both in the order Odonata. Here's how you can spot the difference! Damselflies are smaller, usually under 2 inches and when they are at rest their wings close. They also have a long slender body and a noticeable gap between their eyes. Dragonflies are longer, thicker, more agile and rest with their wings wide open. These beneficial insects feed on pests like mosquitos and help tell us about the health of the ecosystem because they require clean water and stable oxygen levels to survive.





PALEONTOLOGY



ACTIVITY #1

Do you know what makes a dinosaur different from other reptiles? It's the way they walk! Read below about these adaptations and practice your lizard stance and dinosaur stance! Race a friend or family member in your stance. How are they different? Was one faster than the other?

Science Seed: Crocodiles and lizards have legs that stick out to the side, sometimes almost level with the ground. Dinosaurs have a hole in their hip sockets that make their legs sit directly under their bodies. This adaptation helped give them more speed and endurance than other reptiles with legs lower and out to the side.





PALEONTOLOGY



ACTIVITY #2

Observe a common modern dinosaur at Waterloo Greenway -- Birds! Did you know that all of the species of birds that we have today can be linked back to one specific type of dinosaur? While watching a bird, record some observations like: How does the bird move? What does the bird eat? Is the bird alone or in a group? How does the bird behave around others? What do these observations make you wonder about dinosaur behavior?

Science Seed: Like mentioned above, all birds today can be traced back to the Theropod dinosaurs, meaning "beast-footed." These dinosaurs were bipedal (stood on two feet), ate mostly meat and first appeared around 231 million years ago. The Theropod Acrocanthosaurus roamed Texas!



PALEONTOLOGY



ACTIVITY #3

Have everyone design their own fossil and draw it. Share your drawing with a sibling or with a friend, and have someone else create the creature they think made the fossil! Give it a scientific name and a common name and briefly describe its characteristics. Where did it live? What did it eat? How long did it live?

If you have a bigger group you can make a game out of it and try to guess which fossil belongs to which creature

Science Seed: Because fossils don't preserve skin or organs, it can be difficult for scientists to determine what dinosaurs really looked like and how heavy they were. They can only guess weight based on how much modern land animals weigh for their size and scale up for dinosaurs.





PALEONTOLOGY



ACTIVITY #4

Collect natural materials such as leaves, shells, flowers, grass, and more from the ground in the park. Press these materials into mud, dough or clay to make your own fossils of local native wildlife. Bake or dry your fossils. Be sure to return your materials to the place you found them!

Science Seed: A compression fossil is a type of fossil preserved in sedimentary rock that has undergone physical compression. It is one of the most common ways to find plant materials preserved!





GEOGRAPHY



ACTIVITY #1

Find the longitude/latitude of your favorite place in the park and draw a map of it, then do the same thing for your house! Draw a map of where you live. Include at least two of the following: physical features, rainfall, soil/vegetation, water basins, and natural vs. developed areas. Can you use a map to find your way from your house to the park?

Science Seed: How do you find where you live on a map? You start with longitude and latitude! These are imaginary lines that help you find the location of anything on a map or globe. The sections running from top to bottom on a map or globe are called longitude (think LONG) and the sections running from side to side are called latitude.

A T L A N T I C





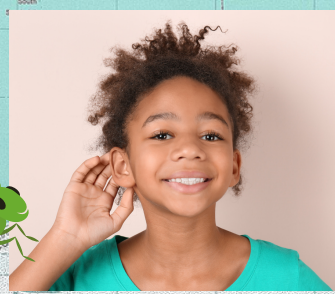
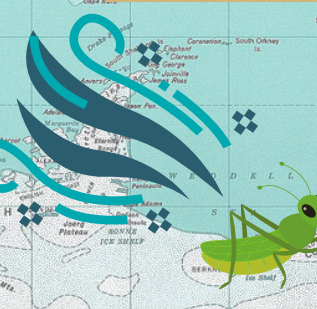
GEOGRAPHY



ACTIVITY #2

Map the sounds of a location. If you are with a group find a spot where you can spread out with at least ten feet between everyone. Draw an X on your page for where you are sitting. Close your eyes or use a blindfold and sit still and listen. Then without looking around, draw the area based on what you hear. Is there a bird high up (there's probably a tree)? Is there traffic nearby (there is probably a road)? Do you hear the babbling of water? Open your eyes and compare your maps with what you see.

Science Seed: Modern humans are primarily driven by their sense of sight. Sound mapping helps us slow and tune in to our other senses to notice the world around us. People record the sounds they hear differently, you can also use words for the noises that you hear.





GEOGRAPHY



ACTIVITY #3

Find a map of Waterloo Greenway in the park and visit at least two different ecoregions that can be found. What were the main differences? How were the plants different? What do you think influenced the types of organisms that live there?

Science Seed: An ecoregion is a geographical unit of land or water with distinct species, natural communities, and environmental conditions.





GEOGRAPHY



ACTIVITY #4

Create an outdoor scavenger hunt! Learn how to use a compass to plot hiding spots for clues. Have your parents or siblings try out your scavenger hunt!

Most smartphones have a preloaded compass app you can use

Science Seed: A compass is a device that helps you navigate based on the four cardinal directions: north, east, south, west. They have been used for over 2,000 years! A compass determines direction based on the Earth's magnetic field, and the magnetic needle always points towards north. When using your compass, hold it (or your iPhone compass app) flat in your hands and point the "direction of travel" arrow towards where you want to go. To find north, line up the north end of the needle (usually red) with the "orienting arrow."

A T L A N T I C

Sea Sea

6 ft. session

McDonald Is. (F1)

McDonald Is. (Aust.)

ANTARCTIC CIRCLE

LAND

AMERICAN HIGHLAND





CLIMATOLOGY



ACTIVITY #1

**Scan below to calculate your carbon footprint and write your own climate action pledge!
How do you pledge to try and reduce your carbon footprint?**

Science Seed: You can make a difference by turning off your lights when you leave the room, unplugging devices not in use, carpooling, replacing single use plastics with reusable options, walking or riding your bike more, eating and shopping locally, planting a garden and more!





CLIMATOLOGY



ACTIVITY #2

Go on a Sustainability Tour of Waterloo Greenway. Check out the signage along the way to learn more about the history of Waller Creek and the new additions to the park.

Science Seed: Some features to find are: Luci and Ian's Family Hill Country Garden filled with native plants that reduce water use and attract pollinators, 8 transplanted heritage live oak trees throughout the park who filter our water and air, and the Waller Creek Tunnel Inlet Facility which removes more than 28 acres of downtown from the floodplain by diverting water, keeping people safe from flash flooding. The tunnel is over 5,600 feet long, which is slightly larger than 15 football fields, 18 Texas Capitol buildings or 5 cruise ships!





CLIMATOLOGY



ACTIVITY #3

Tree Scavenger Hunt - There are 524 trees across 38 different species at Waterloo Greenway. See if you can find some of them! Extra points for finding all 8 of the transplanted Live Oaks!

Science Seed: Trees are essential for adapting to climate change because they filter the air we breathe, clean the water we drink, provide habitat, shade, food, jobs and more! 8 of the trees in Waterloo Park were carefully transplanted from the University of Texas at Austin, the Texas State Capitol Complex, Symphony Square, and from within Waterloo Park. They range in size from small heritage oaks to a 42" heritage Live Oak! Some are even 200 years old. It is important to the survival of large trees to that the original angle and direction to the sun is maintained after being moved, so this effort was no easy feat!



Climatology Activity #3

Tree Scavenger Hunt

Live Oak



Pecan Tree



Yaupon Holly



Texas Mountain Laurel



Red Buckeye



Anacacho Orchid



Desert Willow



Texas Persimmon



Eve's Necklace



Huisache



Wax Myrtle



Chinkapin Oak





CLIMATOLOGY



ACTIVITY #4

Learn about the difference between impervious and pervious cover by exploring the walkways and grounds of the park. How many different types of ground cover can you find?

Science Seed: Impervious cover is a human-made surface that does not absorb rainfall and water, like concrete. During a rainfall, water naturally soaks into the Earth and fills our streams, but when most of the ground is impervious cover (like concrete), the water instead rushes across the landscape, which can lead to flooding, pollution and overheating. Pervious cover on the other hand, allows the water to absorb, draining down and through the landscape into our aquifer. Some types of pervious cover are grass, gardens and permeable pavement, which can be seen through the park with a different texture than normal concrete.





METEOROLOGY



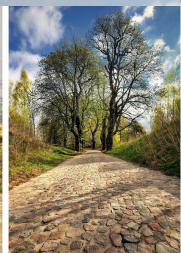
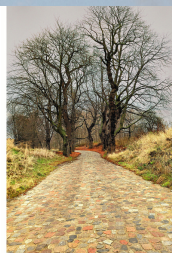
ACTIVITY #1

Visit the same location once in each season.

Draw what you see using pencils, crayons, pens, etc. Then compare your drawings of the same place in different times of the year.

Notice water, vegetation, animals, light, weather, etc.

Science Seed: The Earth's tilted axis causes different seasons. As the Earth orbits the Sun, the amount of sunlight each location on the planet gets slowly changes every day.





METEOROLOGY



ACTIVITY #2

Use natural materials to create a sculpture outside. Visit the sculpture after weather has changed it. How did it change?

Science Seed: The elements of weather can affect rocks, soil, and structures, both manmade and natural.

Wind, rain, and sunlight can carve rock, change the shape landscapes and even move trees. As our climate changes, our weather patterns also are changing. These changes in weather patterns are affecting ecosystems, species home ranges, landscapes, and even our human built structures. In Austin, we plant trees to shade our streets from hot sun which helps keep our city cooler.

Heat rising from city pavement decreases rainfall in that area. So trees over the street could increase urban rainfall. This is an adaptation technique to help us manage our changing climate.





METEOROLOGY



ACTIVITY #3

Download the Cloudspotter app to learn about the different types of clouds. What do the forms say about the weather?

Science Seed: There are four main types of clouds: (1) Stratus - high uniform and widespread clouds, like a blanket (2) Cirrus - wispy, silky clouds that resemble a horse's tail (3) Cumulus - puffy like cotton balls and (4) Nimbus - tall, grey storm clouds. Cloud types can also combine, for example cumulonimbus clouds which look like large, tall cottony storm clouds.

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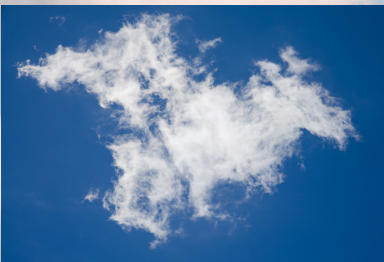
METEOROLOGY



ACTIVITY #4

Take a break and find a comfortable place to lie on your back. The Great Lawn or the hill at Kitty King Powell Lawn are great places to start! As you look up, relax and let your imagination run wild. What kind of shapes do you see in the clouds? Perhaps you see a type of animal, plant, character, or symbol.

Science Seed: The best clouds for cloud spotting are the large, fluffy, ever-changing cumulus clouds.





ASTRONOMY



ACTIVITY #1

See if you can spot the 5 visible planets:
Mercury, Venus, Mars, Jupiter, and Saturn.

Science Seed: When looking at the night sky, stars twinkle and planets don't. You can often tell the planets apart by looking at the colors! Venus is the brightest white, Saturn is usually golden-yellow and Mars is light orange-red.





ASTRONOMY



ACTIVITY #2

Go on a walk during the next full moon. Spend part or all of the hike without external light sources, using only the light from the moon.

Notice how well you can see at night by the light of the moon once your eyes adjust. Notice if the animals have any different behaviors during the full moon.

Science Seed: Most animals, including humans, have natural cycles of biology and behavior that are tied to the phase of the moon, including reproduction, congregating, vocalizing, and more. Urban light can disrupt these behaviors. How bright is the night sky during different phases of the moon where you





ASTRONOMY



ACTIVITY #3

Design, draw and name your own original constellation. Don't forget to give it its own story or legend!

Science Seed: Many of the constellations have their own stories or legends! Most of them were named after Roman, Greek and Middle Eastern cultures, and some constellations have multiple versions of stories or myths. The Greek legend of Scorpius tells the story of the scorpion that was sent to kill Orion the Hunter as punishment for his boastfulness and disrespect for the goddess Artemis, after he bragged that he would hunt and kill every wild animal on Earth. After a fierce fight, the creature accomplished the task, and was later rewarded for its service by being placed in the heavens.





ASTRONOMY



ACTIVITY #4

Locate and identify 5 constellations in the night sky. Use the SkyView Lite app to explore other stars and constellations you are less familiar with.

Science Seed: A constellation is a group of visible stars that form a pattern when viewed from Earth. The patterns are often based on animal forms, mythological creatures, humans, or inanimate objects such as Sagitta, which looks like an arrow. There are 88 officially recognized constellations covering the night sky in both the northern and southern hemispheres. However, it is impossible to see all of the constellations from any one point on Earth.





BOTANY



ACTIVITY #1

Explore the plants around Waterloo Greenway and try to identify them. If you're having difficulty, use the apps iNaturalist or FlowerChecker. There are over 91,904 plants in the park! Identify at least 5 plants that are new to you. Some plants found in this area include, horseherb, inland sea oats, Turks cap, and river sedge. As you explore the park, scan the QR codes to get more information on each plant.

Science Seed: Native plants are very important to our ecosystems because they are adapted to local environments. These adaptations help them require only the appropriate amount of water for their area's rainfall, and they provide suitable habitats for native species like birds, insects, and more.





BOTANY



ACTIVITY #2

Find two to four plants that use different seed dispersal techniques, then design a seed pod of your own using one of these adaptations. What materials will you use?

Science Seed: There are 6 main ways of seed dispersal: (1) being tasty – many seeds are adapted to being consumed by animals and then are carried to a new location in the animal's droppings (2) clinging – some seeds are adapted to cling to the fur of animals to be carried to new locations to drop off and plant themselves (3) parachutes – some seeds, such as dandelions, float through the air carried by the wind, as though they have a parachute, to get to a new location to plant themselves. (4) helicopters – some seeds, such as maple, have a central seed with wing-like structures coming off the center that cause the seed to float and spin as it falls (5) floating – many seeds are carried by the ocean or rivers and some even require water to germinate ; (6) exploding - ballistic seeds pop open to release seeds into the air.





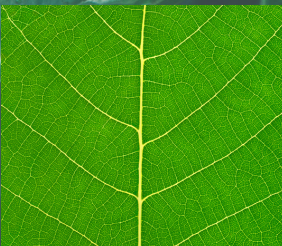
BOTANY



ACTIVITY #3

Go on a symmetry walk. Find or photograph radial, bilateral, or Fibonacci symmetry patterns in plants. Try to find an asymmetrical plant. Find a flowering plant with an odd number of petals. Is it still symmetrical? What kind of symmetry does it have?

Science Seed: An object or organism is symmetrical when it looks the same on one side as it does on the other, or when both sides mirror each other. There are multiple types of symmetry: Radial symmetry occurs around a central point or axis, like in a starfish, while bilateral symmetry is when an organism or object can be divided down the middle into two equal halves, like a butterfly. Some organisms appear in a spiral pattern and this is explained by the Fibonacci sequence, a series of numbers that starts with 0 and 1, and each number after is found by adding the two previous numbers. Some examples of the Fibonacci sequence in nature are shells, pinecones and pineapples!





BOTANY



ACTIVITY #4

Waterloo Greenway is full of beautiful native wildflowers. Go on a scavenger hunt to see how many you can find! A few commonly spotted species are: Pink evening primrose, blue mistflower, winecup and spreading aster. Use the worksheet to keep track or make your own identification guide.

Science Seed: Texas wildflowers provide important habitat and food sources for birds and insects like butterflies and bees. Wildflowers are also important because they can help improve soil health and water quality as well as prevent erosion.



Botany Activity #4

Wildflower Scavenger Hunt

Blackfoot Daisy



Blue Mistflower



**Pink Evening
Primrose**



Spreading Aster



Winecup



Turk's Cap



Frogfruit



Zexmenia



Autumn Sage



Engelmann Daisy



**Purple
Coneflower**



Heartleaf Skullcap





ENTOMOLOGY



ACTIVITY #1

Visit Waterloo Greenway's Hill Country Garden monarch waystation. Count how many pollinators you see! The best time to find monarchs in the park is from spring to fall before they leave for winter, but there are many other pollinators that stay year round. Over 95% of the plants in the park are native to Central Texas

Science Seed: A monarch waystation is a place that provides the resources required for monarchs to lay their eggs and support their migration. They need specific host plants like milkweed for larvae, and nectar plants for energy sources once they become butterflies. Austin is a very important stop during monarch migration as we are on the way between their summer home in Canada and their overwintering grounds in Mexico.





ENTOMOLOGY



ACTIVITY #2

Go on a nature walk to find insect homes. How do different insects build their homes? What materials do they use? Where do they choose to build?

Science Seed: Some insects create homes in places or ways that are incredibly destructive, such as pine bark beetles that are killing forests in many places, and termites that destroy human structures made of wood, but there are some insects that create nests that are beneficial to humans such as silk caterpillars. Insects can make homes of mud, leaves, sap (such as the spittlebug), and even their own saliva (such as paper wasps).





ENTOMOLOGY

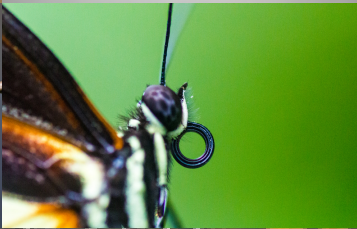


ACTIVITY #3

Create your own insect. What is its name? What are its adaptations? Draw it or build it out of natural or recycled materials.

Science Seed: Insects have many different adaptations, or different features that they have developed to better help them survive.

Some of these adaptations include: an exoskeleton, wings, camouflage, and adapted feet or mouth parts. For example, grasshoppers have long, strong hind legs that help them jump. This adaptation helps them get away from predators and jump over tall grasses.





ENTOMOLOGY



ACTIVITY #4

Go on a bug scavenger hunt in the park! How many types of bugs did you find? How many of each species? Which bugs seem more common in your area? Use the worksheet to keep track or make your own.

Science Seed: Though spiders and bees are both referred to as "bugs," they are classified very differently. Arachnids have eight legs and two body segments and include animals such as spiders, ticks and mites. Insects have six legs, wings and three body segments, and include animals such as butterflies, bees, praying mantis, and ants. There are other classes of "bugs" as well that include animals such as millipedes.



Entomology Activity #4

Bug Scavenger Hunt

Bee



Butterfly



Dragonfly



Spider



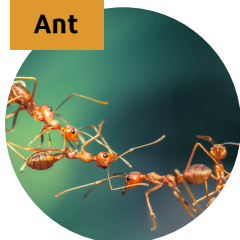
Caterpillar



Roly poly
(wood louse)



Ant



Wasp



Mosquito



Beetle



Ladybug



Cricket





ICHTHYOLOGY



ACTIVITY #1

Take a break to watch minnows in the shallow water of the wetlands. How many do you see? What's the largest school you can find? Minnows are small shoaling and schooling fish, meaning they stay together for a variety of reasons including: Defense against predators, higher foraging (food finding) success, and better odds of finding a mate.

Science Seed: The minnow family, Cyprinidae, is the largest freshwater fish family in the world, with over 3,000 species! Some minnows eat mosquito larvae, and many animals eat minnows, making them a valuable part of the food web as both predators and prey.





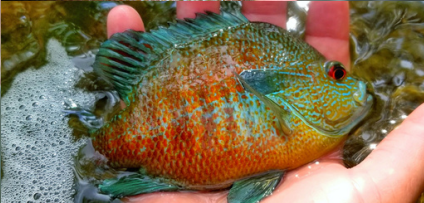
ICHTHYOLOGY



ACTIVITY #2

Search throughout the park for signs of a healthy fish habitat. What makes it a healthy habitat?

Science Seed: There are 3 main parts to a healthy fish habitat: (1) Water - fish live in and get their oxygen from water (2) Food: Fish rely on microorganisms, small fish, and insects for food, and must be able to find enough to eat at various life stages (3) Shelter- Fish need a place to hide from predators, lay their eggs and safely raise their young. Proper shelter includes aquatic plants, root systems from the shoreline, rocks, soft sediment like mud, and more. Healthy fish habitats should have no smell and are free from foam or too much algae.





ICHTHYOLOGY



ACTIVITY #3

Visit a body of water and determine where the fish might be hiding if you can't see them. What elements of the ecosystem might support fish with food, flowing water, or places to hide or lay eggs? If you had to catch fish to survive, where would you look for them?

Science Seed: Many creek and stream fish use sunken trees, rocks, edges, drop offs, aquatic plants, roots, overhanging trees, and bushes for protection and shelter.





ICHTHYOLOGY



ACTIVITY #4

Create your own frankenfish! Draw an imaginary fish adapted to an aquatic or marine environment that you like. Describe how its eyes, mouth, color, and body shape make it well-suited to its environment.

Inspired by Project Wild and MarineLab

Science Seed: Many fish change colors or patterns during their lifespan, so color is not a good identifier. Use body shape, tail, fins and mouth when identifying fish or learning about their behavior or habitat. The shape of the mouth can tell you what it eats (nibblers, gulpers, biters). The color and size of the eyes can tell you if it lives in the light near the surface or in the dark of deep water or under coral ledges. The shape of its body and fins can tell you how the fish moves through the water. Short, rounded fins and tail indicates a fish that darts in and out of crevices, possibly in rocks or a coral reef, and can move or change directions quickly but does not travel long distances. A longer pointed tail is efficient for fast, long distance swimming.





HERPETOLOGY



ACTIVITY #1

While you explore the park, see if you can spot the difference between toads and frogs with these key characteristics below!

Science Seed: (1) Skin: Toads have dry, bumpy or "warty" skin compared to the smooth, almost slimy skin of frogs (2) Shape: Toads are round and squat compared to frogs who are longer and slimmer (3) Eggs: Toads lay their eggs in ribbons or strands where frogs lay their eggs in clusters (4) Legs: Toad hind legs are shorter than their bodies, whereas frog legs are long and can even be longer than their bodies!





HERPETOLOGY



ACTIVITY #2

Amphibians, such as frogs and toads, undergo 4 main stages of metamorphosis as they grow. See if you can find multiple stages of metamorphosis in the park like tadpoles and toadlets! There are multiple species in the park, from Gulf Coast toads to Strecker's Chorus frogs and Cliff chirping frogs. See how many you can find with these herping tips!

Science Seed: (1) Make sure your hands are clean! Amphibians breathe through their skin. So if you have used sunscreen or bug spray, please always make sure to wash your hands before handling frogs, toads, salamanders and others. (2) Keep tadpoles in the water! Just like fish, tadpoles have gills and need water to breathe. (3) Look for toads under rocks or branches near water on moist ground. Look for aquatic frogs in the shade along the shoreline and tree frogs in leaf litter or on branches/fronds.





HERPETOLOGY



ACTIVITY #3

Shell Study: Learn about the function of turtle/tortoise shells and how they are different from other animal shells, like hermit crabs. See if you can identify which type of turtle you find based on its shell pattern. Some frequently found residents in Waller Creek are the common slider, Texas cooter and Mississippi map turtle.

Science Seed: A turtle/tortoise's shell, or carapace, serves many purposes. It functions as a shield attached to the animal's body, protecting them from predators and weather. The shell's color and patterns provide camouflage, allowing them to hide in their habitat. To help them swim better, turtle shells are usually flatter than the high, domed shells of tortoises. Their shells contain over 50 bones on their inner surface, including the ribs and spinal column, that grow with them as they age!





HERPETOLOGY



ACTIVITY #4

Think about the wild patterns that reptiles sometimes use as camouflage. How do these contrasting patterns create camouflage? Create an imaginary animal, then draw the habitat that your imaginary animal might live in. What would its skin look like to camouflage it to its habitat?

Science Seed: Camouflage is an adaptation that allows some animals to blend in with parts of their environment.

Camouflage is not only used to disguise animals from predators, but it is also used by many predators as a tool for hunting, hiding from their prey. There are 4 basic types of camouflage 1) concealing coloration (hiding against a background of the same color, eg. polar bears), 2) disruptive coloration (spots, stripes and other patterns that disguise an animal's body shape, eg. zebras), 3) disguise (like #1, but with textures and shapes, eg. walking stick bug) and 4) mimicry (copying characteristics of unappetizing animals, eg. the viceroy butterfly looks just like its toxic cousin, the monarch).





ORNITHOLOGY



ACTIVITY #1

Walk around the park and study the beaks of birds to find out what they eat. Create a “beak” that you can use to pick up berries, seeds, nuts or other items you find in the park using items found in your backpack or around you in nature, like sticks, moss, pencils, rubber bands, etc.

Science Seed: The saying “form follows function” applies well to bird beaks. Their shape is adapted to match their food source. Charles Darwin based his theory of evolution on the different shapes of mockingbird beaks found on different Galapagos Islands. Raptors have sharp beaks for tearing meat, seed-eating birds have thick beaks that are strong enough to crack seed shells, some shore birds have pointed beaks to spear fish, and hummingbirds have beaks that match the flowers they prefer to get nectar from.





ORNITHOLOGY



ACTIVITY #2

Learn about different types of bird nests (ground nests, tiny nests, large loose nests, tight medium sized tree nests, mud nests, burrows, hanging nests, artistic nests, etc). Build a bird's nest with materials found on the ground in the park to see what the native birds might use.

Science Seed: Birds create nests as a safe place to lay eggs and raise their young. Some nests are camouflaged to prevent predators from seeing them, and many are placed in areas away from the weather, like rain and wind. Just like human houses look different in different climates, birds create different types of nests based on their needs and location. For example, Bald Eagle nests can be as big as 10 feet wide for their large chicks, and many Swiftlets make their nests out of their own spit to hold their eggs safely inside caves and even behind waterfalls!





ORNITHOLOGY

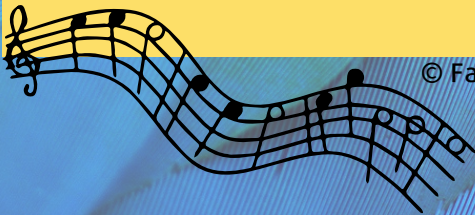


ACTIVITY #3

Listen for bird communication by hiking or sitting silently in the park. Try to figure out what they are communicating! Are they sounding an alarm call when you get close to them? Are the fledglings begging for food from their parents? Are the males advertising their location to potential mates?

If you are having trouble identifying, try out one of these helpful apps: Merlin Bird ID, Audubon Bird Guide or eBird.

Science Seed: Birds make a variety of noises to communicate. Two of the most common noises are songs and calls. Songs are meant for members of the same species and are generally sung by males to attract a mate or defend their territory. Calls tend to be shorter and less melodic. Some examples include alarm calls (to warn of predators), mobbing calls (to scare off predators in a group) and flocking calls (to keep groups of birds together in flight). Some birds can also imitate sound! Our own state bird, the mockingbird, can imitate other birds' calls, cats, and even human noises such as fire trucks! Can you hear a mockingbird in the park?



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ORNITHOLOGY



ACTIVITY #4

Go birding around the park and start your own life list! This is also great time to practice using binoculars if you have any (if you don't have any binoculars, make your own pretend ones!)

Scan below for an easy guide to binoculars for beginners

Science Seed: A life list is a record of the species of birds you've seen over your lifetime. You can organize it in whatever way fits you best! Some birders like to categorize by year, location or taxonomic group. You can check off species in a bird ID book, write it in a nature journal, or create your own iNaturalist account to keep your list.





MAMMALOGY



ACTIVITY #1

Visit an area of a park at 3 different times during the same season. This is better when fewer visitors are present if possible. Document all of the animals you observe during the 3 different time periods of your selected days. Create a graph using the information you find.

Science Seed: Animal behavior is greatly impacted by many factors, including humans, temperature, season, time of day and more. See if you can find any patterns in what kind of animals you see active and when! Many animals, like opossums and foxes, are crepuscular, meaning they are most active at dawn and dusk. Other mammals, like squirrels are diurnal (active during the day), but more heavily in the mornings when it is cooler out.





MAMMALOGY



ACTIVITY #2

Go on a hike, but do it the raccoon way: Walk on all fours (or hands and knees), and be very, very quiet. What do you see at this level that you never noticed before? What do you hear? You probably won't see a raccoon on your hike, since they sleep in trees during the day and are most active at night. What do you smell? Look for things that might make a great snack for a hungry raccoon!

Science Seed: Raccoons are highly adaptable critters and are considered opportunistic feeders. An opportunistic feeder eats a wide variety of prey and is able to adapt to whatever food becomes available. Raccoons are omnivorous animals (they eat plants and animals). They eat anything from fruits to nuts, including wild grapes, berries, and acorns as well as crayfish, insects, frogs, fish, and bird eggs. Raccoons have also adapted to eat trash and other food available in urban areas!





MAMMALOGY



ACTIVITY #3

Squirrel search! Waterloo Park is home to many squirrels. The most popular species in the park is the Eastern fox squirrel, however you can also find Texas rock squirrels if you look closely and quietly! See how many squirrels you can find while adventuring in the park. When you find a squirrel that peaks your interest, stop and observe it for a while. What is it doing? Using your Animal Behavior skills, create a time budget for your squirrel. Record how much time your squirrel spends traveling, foraging (looking for food/eating), resting, socializing and any other behaviors you see! Using a watch or phone timer do this for 5 minutes or longer.

Science seed: Ethology is the study of animal behavior. One way to quantify behavior is by watching an animal over an extended period and making an activity budget. Basically, an activity budget shows how an animal spends their time and how much time is spent doing various activities such as eating, resting, sleeping, and moving.





MAMMALOGY

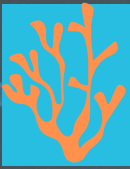


ACTIVITY #4

Waterloo Greenway is home to many native mammals. Go on a quest to see how many you can find! If you're having trouble, look for animal traces like foot prints, burrows and scat. In the park you might find: Eastern fox squirrel, Texas rock squirrel, common raccoon, eastern cottontail, gray fox and more!

Science Seed: Many biological research studies require scatology. The types of animals that live in an area can be discovered by identifying the different types of scat that are found. The population size of specific species can be estimated by identifying and counting scat in an area. The contents of scat can also indicate what an animal ate, which is useful in biological research. What can you figure out about an animal's behavior, diet, size, or age from its tracks?





OCEANOGRAPHY/ MARINE BIOLOGY

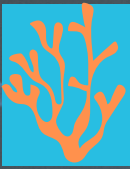


ACTIVITY #1

Search the park for marine fossils! How many can you find? Even though you can't get close to the creek, you can find marine fossils embedded in the limestone rocks throughout the park!

Science Seed: Not very long ago in geologic time, Austin was part of a huge inland sea which stretched from Texas to parts of Illinois, Idaho, and the Dakotas. At times Waterloo Park was as much as 300 feet or more below the surface of the water! Austin is now what used to be the bottom of the ocean so it has rocky outcroppings of fossil-filled limestone.





OCEANOGRAPHY/ MARINE BIOLOGY

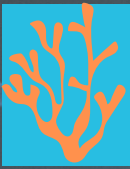


ACTIVITY #2

Imagine a marine species that is specifically adapted to an environment you choose or create. Draw the animal and the ecosystem it lives in and explain the adaptations it has that help it survive where it lives. Research different adaptations real marine species use for inspiration.

Science Seed: Specific fins and tail shapes, patterns, size, and other specifications of species make them uniquely fitted for the places they live. One example is clownfishes' mucus coat that protects them from being stung by the anemones that they live in.





OCEANOGRAPHY/ MARINE BIOLOGY

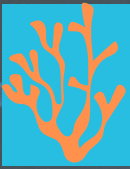


ACTIVITY #3

Find out about the Mammalian Diving Reflex and how long different species, including humans, can hold their breath. How long can you hold your breath on land?

Science Seed: The mammalian diving reflex is inherent to all humans as an adaptation left over from the time when life developed in the oceans. It occurs when a mammal's face is submerged in cool water. Breathing automatically stops, heart rate is reduced to conserve oxygen, blood vessels to the extremities narrow, blood is shunted to vital organs, and the spleen contracts to push extra stored blood into the body. Freedivers learn to utilize the mammalian diving reflex to extend their time under water. *Always have supervision when you practice holding your breath.*





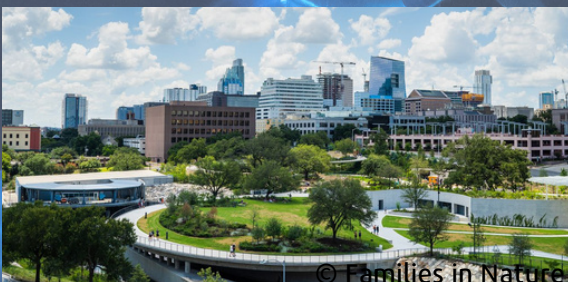
OCEANOGRAPHY/ MARINE BIOLOGY



ACTIVITY #4

Following the flow of water in the park, take a walk along lower Waller Creek. This six-mile creek carries rainwater south to the Colorado River, emptying into Lady Bird Lake and continuing on to the Gulf of Mexico. Scan this code to learn more about our North Urban watersheds. Scan to trace the Waller Creek Watershed and find out where the Colorado River ends.

Science Seed: A watershed is an area of land that drains rainfall and other water, like streams, into a single body of water be it a creek, a river, a wetland, a lake, or an ocean. Over 800 miles long, the Colorado River starts in northwest Texas and eventually empties into the Gulf of Mexico at Matagorda Bay.



SCAN ME



ANTHROPOLOGY



ACTIVITY #1

Research the technology used to create ancient tools. Create your own tool. Build a bow and arrow, atlatl (also known as a spear-thrower) or another ancient tool that you find in your research!

Science Seed: Archaeologists all over the world have found Stone Age tools ranging from 25,000 to 50,000 years old! Many of these tools were spearheads and daggers (for hunting), hand axes (for cutting meat) and scrapers (for skinning animal hides). Some popular tool materials were obsidian, flint, quartzite, jasper and bone because they could easily be shaped and sharpened. Many of these kinds of tools have been found in Central Texas.





ANTHROPOLOGY



ACTIVITY #2

Head over to the Moody Amphitheater and perform a skit, dance or other creative expression on the stage! Bonus points if it's related to the history or ecology of the park!

Please note the stage is free for day use as long as there are no scheduled or reserved events

Science Seed: Music and the arts are an incredibly important part of culture! In the 1950s and 1960s, Red River Street, right along the park, took its place as the heart of Austin's music scene. Even with development and changes in the city, it continues to be a place of musical innovation and cultural expression!



Ernie Mae Miller, 1950

16 Deluxe, 1990s



ANTHROPOLOGY



ACTIVITY #3

Create a cave painting (on paper or any other material you brought) to describe your life story, your family's history, or an adventure you experienced. Use real symbols or make up your own!

Science Seed: The oldest known cave painting is a red hand stencil painting in Spain that dates over 64,000 years old! Drawings of humans were actually rare in cave paintings, and instead, the most common themes were animals, such as bison, horses, and deer, stencils of hands and geometric lines. Many cave paintings dating back to about 4500 years ago can be found in SW Texas along the Pecos River.





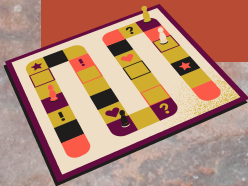
ANTHROPOLOGY



ACTIVITY #4

Many indigenous people played different games to pass the time, practice skills, and develop coordination, balance, and strength. One game popular with the Apache tribe is called Toe Toss Stick! To play this game find a stick and make or find a mark on the ground. This can be a line drawn in the dirt or a crack in the sidewalk, be creative! Stand behind the mark and balance your stick on your toe. Toss the stick as high as you can with your foot and try to have it land on the mark. Create your own scoring system for height and accuracy. Then with natural materials you find around the park, try to create your own game!

Science Seed: We acknowledge that the land on which Waterloo Park sits was once home to the Lipan Apache, Tonkawa, Coahuiltecan and Comanche Nations. It is our intention to share this history with park-goers and to make Waterloo Greenway a place that honors the lives, successes and struggles of the Native people who once lived here and still do. We ask that you take a moment to honor these ancestral grounds and celebrate the resilience and strength that all indigenous people have shown worldwide.



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ECOLOGY



ACTIVITY #1

Tell the story of your favorite outdoor/nature experience or place to visit. Create a photo, story, song, or poem. If you'd like to share your story, you're invited to submit your work to be featured on FIN's website or our newsletter. Send your work to info@familiesinnature.org.

A love for nature is the foundation of all conservation.

Share your nature love story with us on social media! Tag @FamiliesInNature and @WaterlooGreenway and use the hashtag #FallinLovewithNature





ECOLOGY



ACTIVITY #2

Paint or draw what you see in your mind's eye when you think about "ecology." Go on a nature walk for inspiration.

Science Seed: Ecology is the study of the relationships between living organisms, abiotic factors (nonliving elements such as water, sunlight and wind), and the environment. Ecologists study how living things interact with each other and natural resources for survival. Ecology is important because it shows how changes in the environment affect the survival of living things. Humans are a part of ecology! For example, in South Texas new efforts to help ocelot populations include building bridges and corridors for ocelots to pass through barriers like roads, fences and walls. It's critical to their survival to have safe ways to navigate their territories, find each other, food and shelter. These corridors keep them from crossing highways and now their population, though still incredibly small, is starting to recover and grow again.





ECOLOGY



ACTIVITY #3

Create a square outdoors (quadrat) using sticks, tubing, string, etc. Estimate how many different types of plants you observe in that square. Extrapolate (expand your estimate based on what you measure) how many types of plants live in your yard or community space based on the number of species within that square.

Science Seed: It is impossible to count every species in a habitat, so scientists use quadrats for sampling purposes. These squares of a set size are placed in areas of an ecosystem to help determine the diversity of plant and animal species in the area. Information (data) from these quadrats can then be used to help monitor an area and local species over time. Quadrats are even used to measure the health of coral reefs!





ECOLOGY



ACTIVITY #4

Play the "I see, I think, I wonder" game for an object you find in nature on a walk or in your backyard. Pick up a natural object and spend 2 minutes observing your object. After the 2 minutes is up, write or tell someone these 3 things: 1) I see... 2) I think... and 3) I wonder...If there are multiple people you can answer "I See" and then pass your object to the next person. Then the next round you will all say what you think, then what the object makes you wonder on the 3rd time around.

Science Seed: This game helps stimulate curiosity and inquiry through close observation! Try to think more deeply and take notice of an object fully and creatively before trying to interpret it! Try not to name the object.



