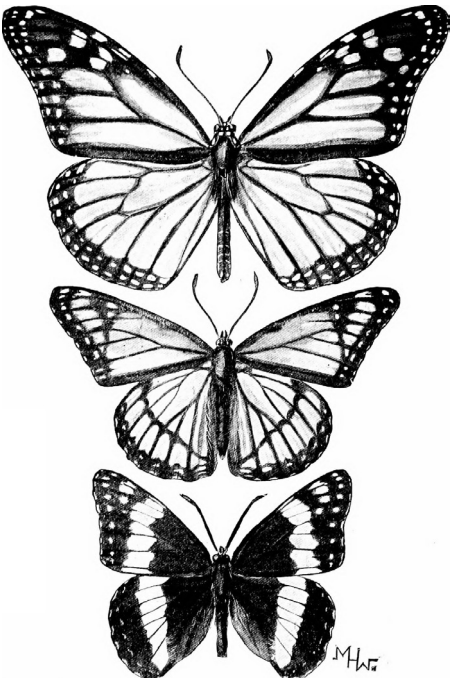
My Field Journal

Name:_____



What Scientists Do

Core to Field Science
Explore
Observe
Ask questions
Make connections
Discover science mysteries
Make evidence-based explanation

Applying and Communicating
Share findings with others
Argue and critique ideas
Develop explanations
Solve practical problems
Make and use models & Diagrams

Investigating
Plan investigation
Collect data & make measurements
Analyze and interpret data
Use feild guides and other resources

Cultivating Curiosity. The Practice of the Open Mind.

Scientists often ask themselves, and others, questions that arise while in the field or lab. Sometimes seemingly dis-connected ideas and thoughts come to mind. This is the State of Wonder that helps teams of scientists solve mysteries.
Scientists might respond to questions that arise with "I don't know, that's an interesting idea, let's think about this", "that could be", or "I am guessing that it is somehow related to…", "It could and might be…".

This is called a thought experiment and is often the beginning of the way scientists and others create, discover science mysteries, and begin to form hypotheses.

These wonderings can spark great discussions, theories, and even future advances in science.

While you explore, jot down any questions or wonderings you have in your journal. Consider discussing them with a friend. Sharing an inquiring mindset is fun and can often lead to discoveries, connections, experiment and answers. Practice makes perfect.

Nature Bingo

Put a check mark next to each activity you have completed

Find an insect with wings and note what other features you notice	Observe an insect for 3 minutes. List your observations	Draw a damaged tree and explain your theory on how it happened	Find and draw 3 patterns you find in nature	Find a rock you like and describe it
Write a story about how animals pick an area to make a shelter	Find an invertebrate that uses camouflage and describe how it was blending in	Do a sound map for 5 minutes	Record your observations about the weather	Why are some animals and plants considered invasive?
Draw a picture of your surroundings! Do not let the pencil leave the paper.	Why is nature important to you?	Find a decomposer and note what you think it decomposes	Find a flower that you like and list the reasons why	Free spot (Dance Party for 3 minutes)
Write a story about a drop of water	How do these exercises make you feel like a scientist?	Estimate the age of a pine tree by counting the whorls	Find an invertebrate without a exoskeleton and draw or describe it	Draw a picture of your surroundings without looking at the paper
What are 3 things that are important to you and why?	What is your favorite activity to do outside and why?	Find a tree you like and list all the reasons why	If you live in any ecosystem found on earth. Where would you live and why?	

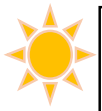
Form and Function Activity:

In the invertebrate world, there are many ways in which insects move around, inhabit the environment that they live in, and utilize a habitat. Similar to humans, invertebrates have routines and patterns they follow, preferences for places, and activities they are involved in.

1. Search for and notice the invertebrates found within the soil, on the ground or grasses, and above the ground in shrubs, trees or the air.
2. Notice the time of day that you are seeing them, the weather conditions, and what they seem to be doing.
3. Notice if they appear to be active as a solitary organism or are actively collaborating with other organisms.
4. When you find insect activity, use the template below to make a sketch of what you see in the corresponding habitat zone below. Feel free to make notes next to your drawing to indicate any other information that may help describe what you are seeing or may be wondering about.

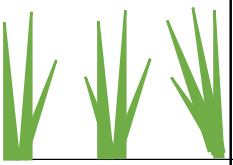
Compare and Contrast:

- What did you notice about the animals residing within the different areas?
- Did they have similar traits?
- How do they differ?
- Did you find one kind of organism in more than one of these habitats?
- Can you notice and guess at what adaptations these inverte brates use to thrive in their habitats?
- What could the niches of these invertebrates be?



Above Ground

On the Ground



In the Soil

In the water

Creative Wondering and Writing:

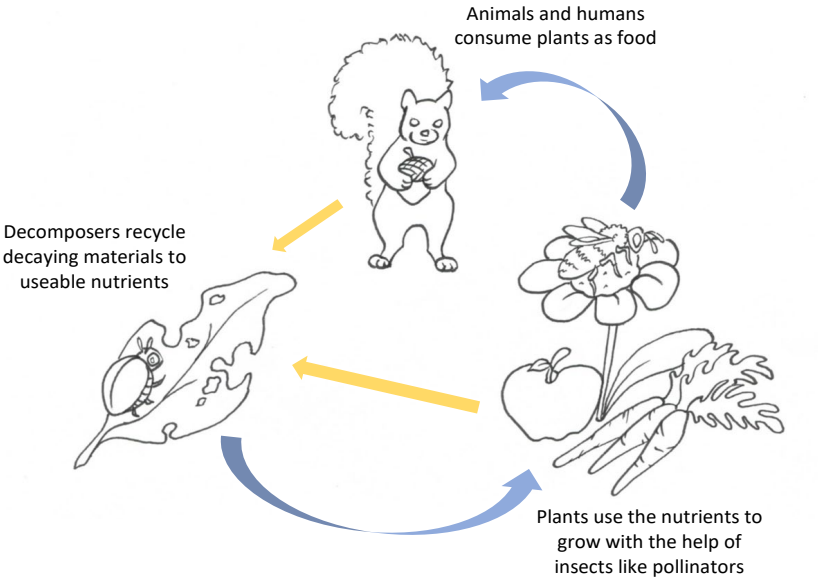
Imagine and write a story, poem, or a draw cartoon about what life might look like in the day of an insect. Do you remember Charlotte the spider in the Story 'Charlottes Web', Babbity Bumble in The Tale of Mrs Tittlemouse, Spiderman?

The novelist H. E. Bates described the rapid, agile flight of dragonflies in his 1937 nonfiction book. Down the River:
I saw, once, an endless procession, just over an area of water-lilies, of small sapphire dragonflies, a continuous play of blue gauze over the snowy flowers above the sun-glassy water. It was all confined, in true dragonfly fashion, to one small space. It was a continuous turning and returning, an endless darting, poising, striking and hovering, so swift that it was often lost in sunlight.

Think of the senses they might use to navigate their world and how they obtain the things that they need to survive. To help gain ideas from their perspective spend some time quietly watching, perhaps take a wandering walk through your local habitat, or lay on the ground and look up through grasses, leaves, and trees and across the water.

Here are some ideas to get you started:

- What's an insect you know of, or have found while exploring, that you find to be beautiful?
- What is it that you find particularly fascinating, intriguing, or peculiar about your insect?
- What other animals might they meet, or obstacles might they encounter?
- Where is their home and what does it look like?
- If you could have a discussion with this animal, what kind of questions would you ask them?
- What do you think they might say in response?


Animals and humans consume plants as food
Decomposers recycle decaying materials to useable nutrients
Plants use the nutrients to grow with the help of insects like pollinators

Mapping and Attunement Activity: Sound, Weather Conditions, Phenology

Time: 7-15 minutes
Required Materials:
A journal and writing utensil for each student

Objectives:
This activity provides students with a new way to become aware of, explore, and connect with habitats. Using their senses to map site conditions students will discover the range of inhabitants that may occupy a space and the possible relationships between the inhabitants and the conditions of the site.

Outcomes:
1. Students will practice using their senses for the exploration and discovery of a given habitat and/or ecosystem
2. Students may determine relative species abundance through the attunement to a specific site and make connections across the sciences relative to the site conditions and inhabitants
3. Students may compare and contrast observations at the site during different times of day and over time, and make habitat and phenologic connections
4. Students will learn how to create a simple pictorial representation of inhabitant data in order to convey information. Basic map components will include a map key, weather information, date and time stamp.

Activity:
Prepare students before they head out by telling them:
1. They will need to find a spot within the designated boundaries that is within sight of the teacher but away from other students.
2. Sound maps are a quiet, individual activity. They need to be as quiet as possible and not interact with other students in order to not disturb the natural environment and to successfully capture all the data at their site.

3. They can choose to sit however is comfortable for them and that being still will provide for the most robust and accurate data collection opportunity.
4. They begin by drawing a dot in the center of the paper to represent them. Space at the top of their paper represents space in front of them. Space at the bottom of the paper represents space behind them. The right side of the dot represents space to their right and so on.
5. When the teacher gives the signal to start, students close their eyes in order to attune their hearing to inhabitants, and the feeling of weather more acutely. Students record everything they feel and hear using a symbol or words they create. Each time they hear a repeated sound, they record it again using the same symbol.
6. Students keep listening and recording until the time is up.
7. Students will finish by creating a legend to accompany their sound map. They do not need to know what the sound they heard was.

Extension Ideas:

- Students can adopt one specific location on campus as their own unique spot for ongoing phenological study and exploration throughout the year.
- The mapping activity can be repeated from different locations or different habitats, during different times of year or different times of day. Students can compare their results and make note of any differences.
- Maps could be used to determine species abundance at different times of the year and relationship between species and climate.
- Students could create a story of events to accompany their sound map.
- Students could create graphs from their maps to determine the relative frequency and timing of sounds in their location and make comparisons to other locations chosen by their classmates.
- Students could use the map data to make predictions about habitat quality of different locations or to determine the various ways their location is affected by external factors such as human activity, wind, light, and availability of survival resources (food, water, shelter).

Cup Trap Exercise and Journaling

What insects travel across the soil near you? What might emerge at different times of the day and night?
Let's find out using a cup trap!

To make one:

1. Dig a small hole in your testing habitat large enough to fit a cup or small can.
2. Adjust the hole depth and cup position so the lip of the cup is even with the top of the soil. Your trap is now set
3. Return in 4-12 hrs. to see what crossed its path!
4. Journal entry information:

    a. Location: Date & time trap set:

    Weather: Temperature:

5. Note insects found & descriptions:
    Helpful Prompt: I notice that…I wonder about…

Please remember to release trapped critters after you journal!

Additional Journal writing ideas:

- Do you notice any differences in the type and number of insects traveling in the habitat at night vs the day?
- Rainy vs. Sunny days? Cold vs. Warm days? Spring vs. Summer?
- What are some similarities between the insects you found? Some differences?

Make Your Own Microscope

Materials:
Plastic or paper cup
Saran wrap or clear sandwich bag
Rubber band or hair tie
Scissors
Water
Journal
Pencil

1. Cut the bottom of the cup off using the scissors so you are left with the cylinder sides of the cup. Then, starting at the bottom of the cup, cut a rectangular arch out of the side out the cup, leaving about an inch of room at the top.

2. Cut a square section of plastic wrap or sandwich bag so that it fits over the wider, open end of the cup with one inch of extra material on the sides.

3. Using the rubber band, hair tie, or tape, secure the plastic sheet over the wide end of the cup so that there is a slight dip in the center like a shallow bowl.

4. Pour a small amount of water in this bowl to complete the lens of your microscope (be careful not to spill!), you can adjust the amount of water to find what works best.

5. To use, place an object or specimen under the open end of the cup, moving the item up or down using the window to focus what you see through the water lens. Note: this works best when there is adequate light on the specimen. Look at all that magnified detail!

6. Note what you observe. Notice differences in what you see and draw conclusions about how the different characteristics of the insect might be providing for its lifestyle and needs.

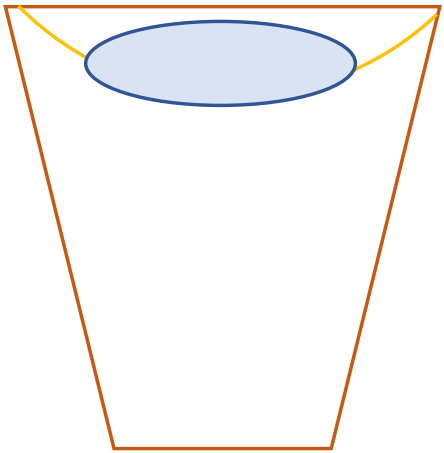


Figure 1: Image of Magnifying Cup

Create Your Own Insect and Habitat Activity

After you have wandered and wondered and had some time to discover things about different insects, their habitats and the strategies they use to get their needs met, have fun imagining what kind of insect you might like to be and why.

1. Take some time and ask yourself:
    - What characteristics might be amusing to have?
    - What could you look like and why?
    - What kind of habitat might you prefer to live in and what would it look like?
    - What adaptions will you give your insect so it can utilize and thrive in it's environment?
    - What does your insect need in its habitat to survive? It may help to think of your own basic needs, you might have some in common with your new insect friend.

2. Jot down some of your ideas and thoughts in your journal

3. Using materials you have on hand (paper, coloring utensils, recycled materials, cardboard, string, leaves, bits of wood, anything!), brainstorm and create your own insect and a habitat for them to live in!

4. When scientists explore and find a new species, they get to name and describe it so it can be officially recognized, write up information about the habitat along with specific characteristics of the insects. So it can be identified easily by others. Try naming and describing your new insect too!

Vocabulary List

Adaptation: Inheritable modification of an organism's parts or behavior that better suits it to survive in its environment

Camouflage: The use of texture and/ or color to blend in with the surrounding habitat

Decomposer: An organism that feeds on dead material breaking it down into soil

Ecology: The science of studying relationships between living things and the environment
Ecoservices:

Ecosystem: All the living and non-living elements within a defined area and the interactions between them

Emergent Properties: Properties, of a group of items, that emerge through the functioning of a system of individual parts working together and where typically complex interconnections among the parts give rise to qualities that belong only to the whole. Examples of emergent properties include cities, the brain, ant colonies and complex chemical systems.

Habitat: The environment in which an organism (plant or animal) lives that contains all the things that the organism needs including water, food, and shelter.

Insect: Small invertebrate animals. Adults have three clearly defined body regions and three pairs of legs

Invertebrate: Animals lacking a backbone or spinal column. They include creatures like arthropods (insects, arachnids, and crustaceans), mollusks (snails, squids, and octopuses), annelids (earthworms and leeches), and cnidarians (jellyfish, sea anemones, and corals). With well over one million species, insects and other invertebrates vastly outnumber all other animal species, and form the foundation of many ecosystems.

Mutualism: Symbiotic relationship in which both organisms benefit

Niche: An organisms role or 'job' in a community

Phenology: The study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life.

Pollinator: An animal who moves pollen from flower to flower such as birds, bees, bats, butterflies, moths, beetles, flies, wasps.

Producer: Green plants that have the ability to convert the sun's energy into food through the process of photosynthesis

Fun facts:

Ants:

- On average a single ant can carry 50x their own body weight
- The western harvester ant queen can live up to 30 years old- and it's found in the western USA!
- Ants use vibration sense in their legs instead of ears to hear
- Ants, like some other insects, don't have lungs- instead gas ex change happens in tiny pores on their exoskeleton
- Ants use their antennae to smell and follow pheromone trails of other ants for directions.
- Some birds have been known to roll in ants for the formic acid inside them which is antiparasitic.

Bees:

- The tiny hairs on bees are branched- an adaptation that helps them collect pollen!
- Not all bees live in hives- most native bees in America are solitary and nest in cavities made by beetles!
- Some bees have long leg hair that curl to create little pollen bas kets
- Bumblebees- the big fuzzy ones- have wings that beat 130-240 beats per second
- The special pattern of veins on their wings often help scientist identify them.
- Not all bees are black and yellow- some are metallic, and green, blue, red, orange and even purple!

Beetles:

- Firefly is actually a beetle, and each species has their own special flashing pattern. The light comes from a chemical reaction within them called bioluminescence.
- The hard parts on their back covering their wings are called elytra, and they move to the side when they want to fly.
- Beetles often have specially modified antennae – like the com mon ten-lined June beetle whose antennae have finger or comb like projections.

- Although commonly called ladybugs, their real name is ladybirds or lady beetles.
- Not all ladybird beetles are red with black spots- some are orange with spots while others are black with colored spots.

Snails:

- Snails have tiny fingerlike cells on their foot that move them along.
- Inside the mouth of the snail there is a rough toothed structure called a radula that helps them scrape at food.
- Snails don't have eyes like you and I, they have a cup like structure and a water filled cavity that acts like a lens, but they can only see light and dark shadows.
- Snails don't breathe through their mouth, instead they breathe through special reparatory cavity near their mantle (where the body and shell connect
- Snail slime is mostly just a mixture of water and proteins.

Dragonflies:

- Dragonflies are holometabolous which means they must go through a full metamorphosis to get to their adult form- like butterflies!
- When a dragonfly molts from its larval stage into an adult, the wings are initially folded, and then dry and expand out, and they will never fold again for the rest of its life.
- Dragonflies have specialized eyes that enable them to lock on to and track flying prey when hunting; this is called hawking.
- Many dragonflies prey on mosquitoes and help manage populations.
- Many dragonflies have a stripe of black along the front edge of their wing, this is called a stigma and makes the wing stronger.

Pondering Pages

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