Biodiversity – Invertebrate (Critters) Tally Sheet

We are going to explore the *biodiversity* of invertebrates--critters like bugs, worms, and snails--living in a specific area!

 Field Based Investigations	Use this tool if you are interested in asking investigation questions like: 1. **How do the kinds and numbers of invertebrates change if I check in an area that is covered with leaf litter and not covered with leaf litter?** 2. **How do the kinds and numbers of invertebrates change when it's rainy vs. when it's sunny?** 3. **How many of the same kinds of invertebrates are there near my house vs. in the community garden?**

Why is biodiversity important to socio-ecological systems?

Biodiversity*, or the variety of plants and animals in an ecosystem*, is important in complex systems because all parts of the system are connected in some way. Making decisions that can affect the biodiversity in systems that we are part of is important for humans to think about whenever we make changes to our ecosystems.

Connect to your "Should We question": Why does biodiversity matter to my neighborhood?

"Should We" questions like "Should we plant a garden?" or "Should we rake the leaves or keep them on the ground?" all have to do with biodiversity in some way. For example, if you wonder if you should rake the leaves, you might want to know who lives in, around, and underneath leaf litter in order to answer that question. In this way, you could use this critter count tool to investigate the *biodiversity* in areas with leaf cover and without leaf cover.

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The investigation question we are asking is:

_____

The "Should We" question we are exploring is:

_____

Materials needed:	**Directions:**
❑ hula hoop, string (at least 2 feet long), or some other way to mark a spot to observe ❑ pencil ❑ blank paper or the next two pages	**Part 1:** 1. Place your hula hoop down in Location 1. 2. If there is leaf litter on your spot, you can *gently* move it aside. 3. In the circle draw what you see in your hula hoop, including plants, animals, rocks, etc. **Part 2:** 4. In the table, write or draw the invertebrates – critters – that you find and tally how many of them you find. 5. Gently place your leaf litter back where it was. **Part 3:** 6. Repeat steps 1-5. Depending on the question you're asking, you might repeat your observation in **another place** or **in the same place at another time**. ○ All scientists repeat their observations so that they can say whether what they're seeing is unique to one place or time.

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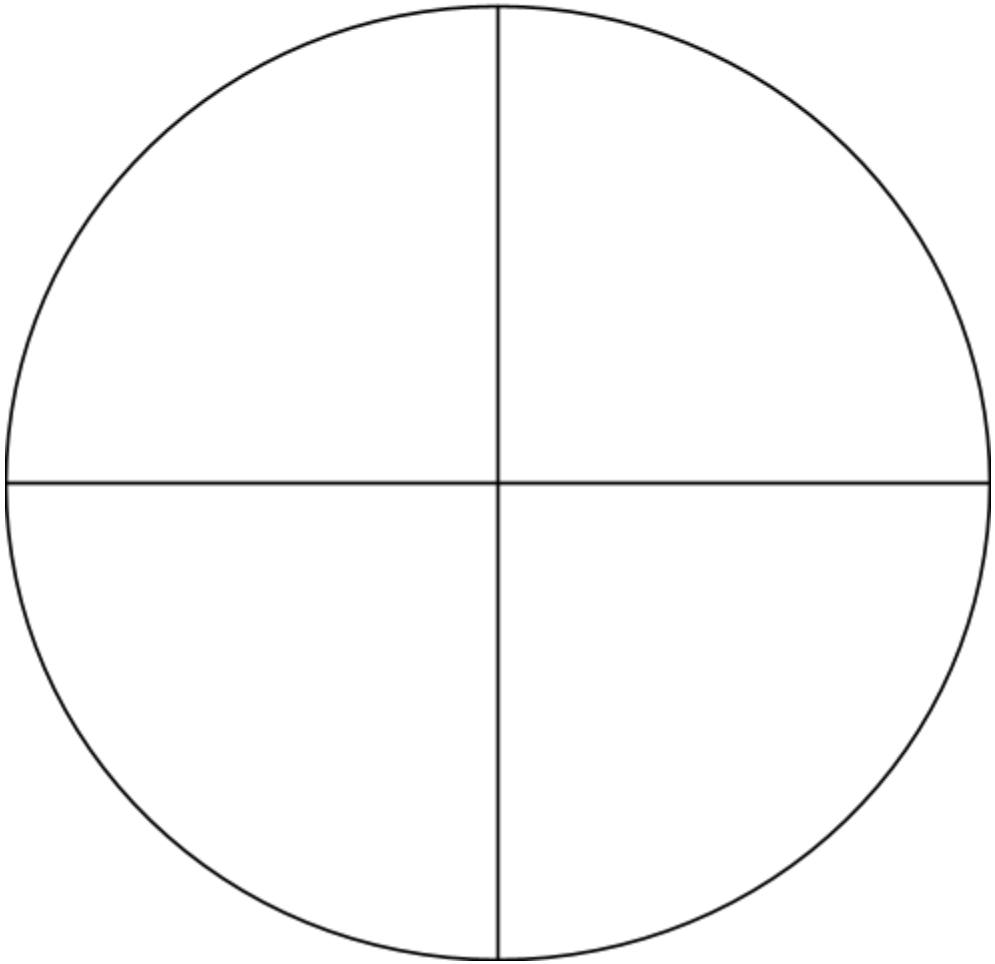
Part 1

Date_____ Weather_____

Draw what you see in your hula hoop!



What questions do you have about what you found?

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Critter Count

Part 2 ❑ Location 1 or ❑ Time 1: _____		**Part 3** ❑ Location 2 or ❑ Time 2: _____	
What did I find? *(draw or write)*	How many? (tally marks)	What did I find? *(draw or write)*	How many? (tally marks)

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Biodiversity: Species Type and Abundance

 Field Based Investigations	Use this tool if you are interested in asking investigation questions like: 1. **What types of plants, animals and fungi live in the garden?** 2. **How do the types and density of these species differ by location?** 3. **How do physical environmental factors affect species types and densities?**	**We will gather data about:** 1. types and abundance of species in three different locations. 2. The relationships between species and their abundance, as well as the relationship between species type and abundance and the physical environment.

Why are the types and abundance of species important to socioecological systems?: All species live in a web of interdependent relationships that shift across time and space. By observing three different areas, we are able to observe which species interact with each other and which species prefer different types of habitats. For example, some insects and birds next and feed in snags (dead trees), while other species my thrive in grassy fields. The way humans use and alter these space can change the types and abundance of species found. For example planting flowers can attract and support pollinators, and mowing grass very short and creating more grassy areas can reduce species diversity.

Why does types and abundance of species matter to my neighborhood--connecting to our "Should We" questions:

Observing species across different sites and over time can help us understand how to create environments that attract and support more species. "Should we" questions like "should we allow some grass to grow longer or "Should we plant wildflowers around our garden" or "Should we weed the alley way" all relate to species diversity and abundance! For example, even very developed neighborhoods support a wide range of plant and animal life. We can support that diversity and abundance by creating box gardens, leaving weeds as they bloom, and allowing birds to next on windowsills and rooftops. At your three sites, explore how environmental and human factors influence the type and abundance of species you see, and then identify variables that seem to support more biodiversity in your neighborhood!

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Our Investigation question is:

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Our "Should We" question is:

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Materials needed:	**Directions:**
❏ pencil ❏ this sheet or blank paper ❏ optional: binoculars ❏ optional: field guide for plant and animals in your area	**Find three places where to observe and count species.** **Notice how many different species you can find and list them** ❖ If you're not sure of a species name, you can write "5 different types of trees" or "3 different birds" **Count the number of each species you can find.** ❖ When you are not sure of species name, you can list them as "confer tree #1" or "brown bird with red belly" plus the counts for each.

Extension: To calculate the species density in addition to abundance, use the equation below. Calculating species density will help you compare the three sites, but is not necessary for for finding out more information to answer your should we question!

$$\frac{\text{\# of species A (or B or C)}}{\text{Total \# individuals for all species counted}} = \text{Species Density}$$

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Place 1 _____ Time_____ Temperature_____	Place 2 _____ Time_____ Temperature_____	Place 3 _____ Time_____ Temperature_____
Step 1: How many species? Write or draw all of the different types of living things you find in your observation location.	**Step 1: How many species:** Write or draw all of the different types of living things you find in your observation location.	**Step 1: How many species:** Write or draw all of the different types of living things you find in your observation location.
Step 2: How many of each? Next to your list or drawing, count the number of each living thing you found in your observation location.	**Step 2: How many of each?** Count the number of each living thing you found in your observation location.	**Step 2: How many of each?** Count the number of each living thing you found in your observation location.

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Soil Data Collection

 Field Based Investigations	Use this tool if you are interested in asking investigation questions like: 1. **What is the soil like in and around our neighborhoods and gardens?** 2. **What kinds of relationships can we observe in the soil?** 3. **How have humans shaped what kinds of soil and relationships we can observe?**	**We will gather data about:** 1. what is above, around, and below our soil: **relationships to other animals, plants, rocks, and elements** 2. how much water our soil holds: **moisture content** 3. **temperature of the soil** at different depths

Why is soil important to socio-ecological systems?: One important role that soil plays is to store water and nutrients for plants. Sometimes other organisms such as fungi (like mushrooms), and animals (like worms) who live in soil help to make nutrients by breaking down dead things (decomposition). Different plants and animals need different amounts of water and nutrients stored in the soil. Soil temperature also helps plants know when to transition into different parts of their seasonal cycle, like when to bud in the spring, fruit in the summer, or get ready for dormancy in the fall - this is called phenophase.

Why does soil matter to my neighborhood--connecting to our "Should We" questions:

"Should we" questions like "Should we plant a garden" or "Should we rake the leaves or keep them on the ground" or "Should we grow grass in our parks" are all related to soil and soil health. For example, growing and mowing grass does not usually contribute to decomposition and give nutrients back to the soil. It may lead to other "should we" questions about using fertilizer to help continue the health of soil and growth of grass. You may want to study what you find in the soil of a grassy lawn and compare it to the soil of a garden, under a tree, or a forest. Are there differences in temperature, moisture, or in the diversity of root systems and critters?

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The investigation question we are asking is:

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The "Should We" question we are exploring is:

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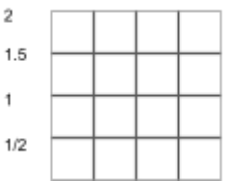
Materials needed:	Directions:
❑ Something to dig with: a small shovel, trowel, cup, etc. ❑ ruler ❑ paper towel ❑ pencil ❑ colored pencils or markers ❑ this sheet or blank paper ❑ *Optional:* thermometer	**Cut out a 2x2" square of paper towel and draw lines every ½" to make a grid on it**  Find a place where you can dig deep into the ground (at least 6 inches). **Above** ❖ Observe what is above the soil using all your senses. Draw or write this in "above soil" section ❖ If you have a thermometer: Record the air temperature **Surface** ❖ Observe the top layer (or surface) of the soil. You may need to gently move leaf litter. Draw or write this in the "surface soil" section. ❖ If you have a thermometer: stick the thermometer about 1 inch into the soil and record the temperature **6 inches below** ❖ Dig a hole about 6 inches deep with your shovel or trowel. Draw or write what you find in the "6" below" section. ❖ Using the 2"x2" paper towel, gently but firmly press the paper towel into the hole you've dug so that all of it is evenly pressed on the soil. Be careful not to press so hard you rip the paper towel. Count to "5 Mississippi" slowly, trying to be as even as you can. Lift out the paper towel to see how much water it soaked up – this is called absorption. How many squares are wet? Using your pencil/colored pencil color in the corresponding squares on your data collection sheet.

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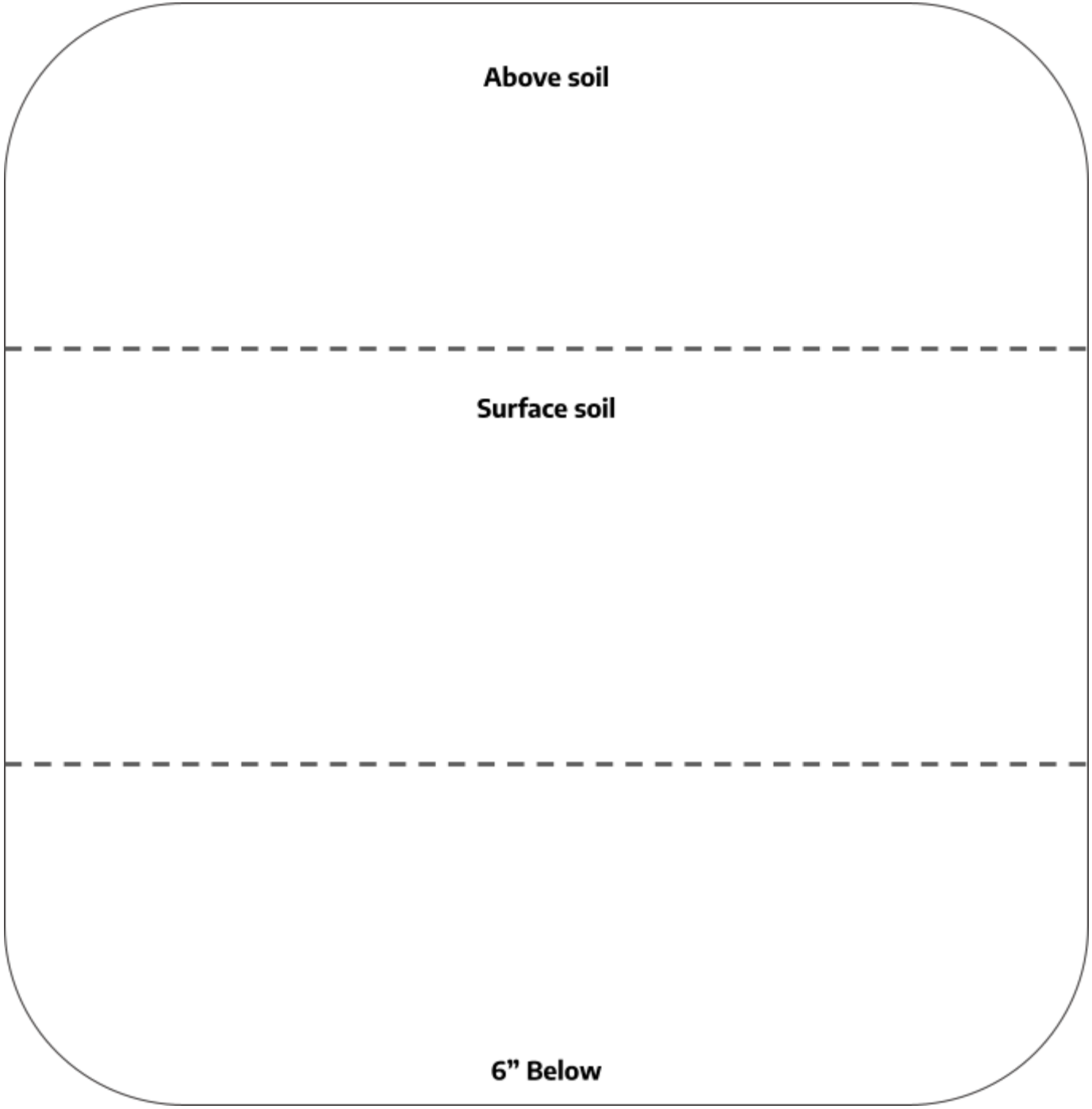
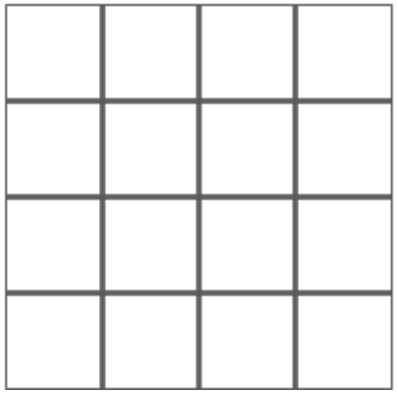


Air Temperature

Surface Soil Temperature

Soil Temperature at 6”

Soil Moisture Absorption



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Soil Moisture Observations

We are going to explore soil moisture to see how plants, animals and humans interact in ways that change our soil!

 Field Based Investigations	Use this tool if you are interested in asking investigation questions like: **1. What is the difference in soil moisture where there are lots of leaves versus if the garden soil is bare?** **2. What kinds of relationships do we observe in the soil?** **3. How does the soil moisture affect erosion in my garden?** **4. How have humans shaped the soil in our neighborhood?**	**We will gather data about:** 1. type of soil in three locations. 2. how soil type and cover relate to soil moisture. 3. how soil moisture is related to the plants and animals in places.

Why is soil moisture important to socio-ecological systems?: Soil moisture is the amount of water that is stored in soil that is available for plants, so soil moisture is very important for supporting the types, numbers and health of plants and the animals and humans that depend on them in our neighborhoods. Different neighborhoods have different types of soil that include sandy soil, silty soil (what we usually call dirt), and clay which each relate to how well our soil can hold moisture and drain excess water. The types of plants that grow in our soil also affect soil moisture- grass and leaf coverage will keep water from leaving the soil and can hold soil in place during weather events, like heavy rain and strong wind!

Why does soil matter to my neighborhood- connecting to our should-we questions:

Because soil helps with so many things--storing and filtering water, being the home for many kinds of plants and animals, providing nutrients for plants and animals, and even providing the basic foundation in which our homes and buildings are built--it is important that we understand how moist our soil actually is. If soil is too moist it won't be able to hold enough nutrients for plants, and the soil can be easily washed away (eroded) by rain. If it is too dry, it might not be a good home for the plants and animals that depend on it. If it is too hard and dry, we may not be able to dig into it to build buildings. "Should we questions" like "Should we buy garden soil for our gardens", or "Should we cover our garden beds with leaves or mulch?" "Should we water our garden bed with soaker hoses?" all relate to soil moisture!

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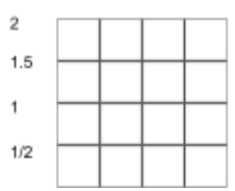
Materials needed:	Directions:
❑ paper towel ❑ pencil ❑ The next page or blank paper ❑ *Optional:* thermometer	**Cut out TWO 2x2" squares of paper towel and draw lines every ½" to make a grid on them**  Choose 3 different places or 3 times to do your observations. ❖ If you have a thermometer, record the temperature of the soil ❖ Place the paper towel on the soil hole and gently press for 30 seconds. ❖ Lift out the paper towel to see how much water it soaked up – this is called absorption. How many squares are wet? Using your pencil/colored pencil color in the corresponding squares on your data collection sheet. ❖ Use the formula below to calculate the percentage moisture. ❖ Repeat your observations. Depending on the question you're asking, you might repeat your observation in **another place** or in the **same place at another time**. Use the charts below to record what you see. ➢ All scientists repeat their observations so that they can say whether what they're seeing is unique to one place or time or not.

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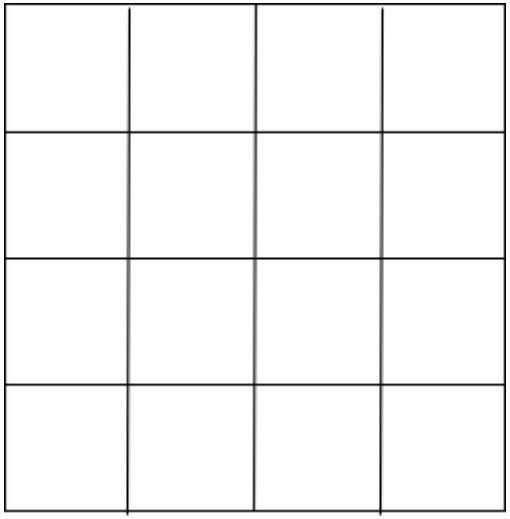
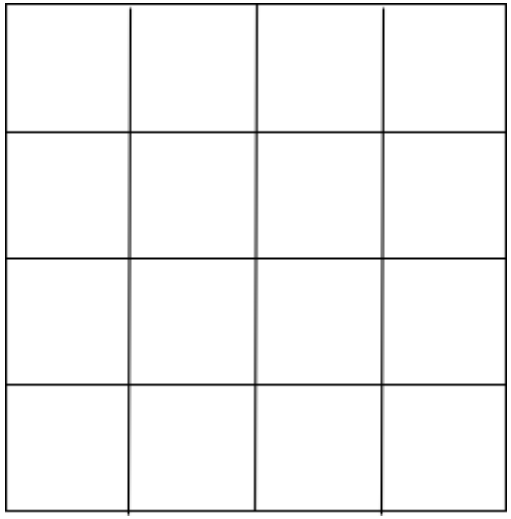
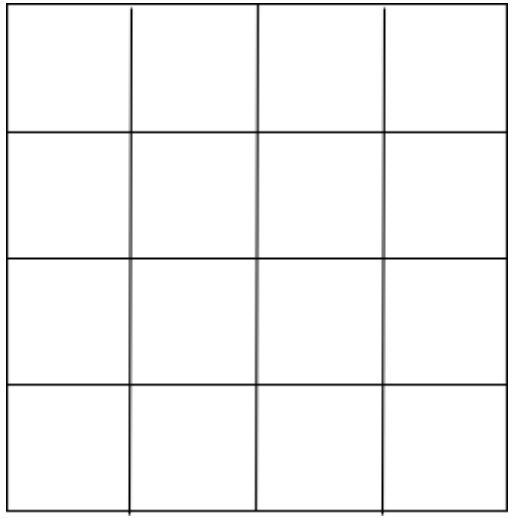
❑ Location 1 or ❑ time 1: _____ Soil Temperature _____	❑ Location 2 or ❑ time 2: _____ Soil Temperature _____	❑ Location 3 or ❑ time 3: _____ Soil Temperature _____
Soil Moisture: Shade in the squares where you found moisture absorbed into the paper towel.  Turn your **moisture into a percentage**. (Number of squares covered / Total number of squares) x 100 __ = ____ x 100 = _____ % 16	**Soil Moisture:** Shade in the squares where you found moisture absorbed into the paper towel.  Turn your **moisture into a percentage**. (Number of squares covered / Total number of squares) x 100 __ = ____ x 100 = _____ % 16	**Soil Moisture:** Shade in the squares where you found moisture absorbed into the paper towel.  Turn your **moisture into a percentage**. (Number of squares covered / Total number of squares) x 100 __ = ____ x 100 = _____ % 16

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Type of Soil. Feel the soil in your hands. Based on its feel and the moisture percentage you calculated, circle the type of soil you explored in this place. Sand Silt Clay Peat Chalk Loam	**Type of Soil.** Feel the soil in your hands. Based on its feel and the moisture percentage you calculated, circle the type of soil you explored in this place. Sand Silt Clay Peat Chalk Loam	**Type of Soil.** Feel the soil in your hands. Based on its feel and the moisture percentage you calculated, circle the type of soil you explored in this place. Sand Silt Clay Peat Chalk Loam

Types of Soil

Sand	Silt	Clay	Peat	Chalk	Loam
Large soil particles that dry out easily. The large particle size allows water to drain easily down to plant roots.	Silt has a floury feel when dry and slippery feel when wet. It is one of the most fertile soils and is found on floodplains and near rivers.	Clay is a very fine-grained type of soil that develops a semi-solid, flexible texture when wet which makes it hard for water and air to move through.	Peat soils are nutrient rich and filled with decomposed plant material.	Chalk is a soft rock that breaks down easily. Water drains easily and chalky soils can lose nutrients easily.	Loam is considered the perfect soil for growing plants and is a mixture of 40% sand, 40% silt and 20% clay. It holds nutrients and water, but also allows for drainage.

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