

## Soil Safari

### Class Length

1 hour 15 minutes

### Class Size:

Up to 25 people per class

### Class Location:

Farber Farm

### NGSS Objectives:

MS-LS2-1: Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

MS-LS2-4: Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

MS-LS2-5: Evaluate competing design solutions for maintaining biodiversity and ecosystem services.

MS-ESS3-3: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

### Learning Goals:

#### Students will understand:

- What soil is and how it helps plants to grow.
- The impact of erosion on topsoil and strategies to reduce it.
- How use of chemicals and nutrient supplements affect biotic and abiotic soil factors.
- What monoculture and polyculture mean for biodiversity and ecosystem services.
- The care and consideration needed when tending to plants.

#### Students will learn how to:

- Be aware of their surroundings.
- Differentiate different soil types.
- Engage in hands-on tasks like weeding and clearing land, applying mulch and compost, seeding ground cover, and preparing beds for dormancy and replanting.

### Materials:

- Clipboards and Pencils
- Safari Guidebooks
- Soil Identification Keys
- 2-Liter Erosion Demo Bottles
- Buckets of Soil Types
- Laminated Venn Diagrams and Dry-Erase Markers
- Gravel
- Sugar Cubes
- Dropper Bottles with Red-Dyed Vinegar
- Water
- Buckets, Mulch, and Compost (seasonal activity)
- Shovels, Digging Forks, and Rakes (seasonal activity)
- Eager Hands! (And gardening gloves for those hands)

### **Class Set-up:**

- Make sure that you have enough materials (worksheets, pencils, buckets, etc.) for all the participating students, enough space and materials to engage with the soil types activity and the erosion demos. Make sure the soil flowcharts and the Venn diagram sheets are ready, clean, and available. If seasonally activities will be taking place, make sure there are enough shovels, rakes, hand trowels, and gloves available.

### **Safety Precautions:**

- Students shouldn't be allowed to wander around the farm during activities, as this could endanger the plants that live there.
- Tell students that they should be told from the beginning that they need to stay on the trails between the crops, and that they can't leave a designated area (pavilion, hoophouse) unless they're told that it's okay.
- Further ground rules include reading the posted signs around the farm, refraining from entering the hoophouse until asked to, and wear gardening gloves while handling certain materials.

### **Introduction** (5 minutes)

Students are toured around the farm, shown the different varieties of plants that are being grown there as well as various locations of significance, like the hoophouse. Soil safari guidebooks will be handed out.

### **Soil Field Tests** ( 15 minutes)

Broken into teams, students will be given three minutes at each soil type station. The facilitator will show kids the proper way to perform the soil "feel test", which involves taking soil with a little bit of water and feeling it between your fingers. There will be 4 buckets: sand, clay, sand + clay, and sandy loam. Each group will have 3 minutes in front of each bucket and using laminated flow charts (which will help them test out and identify the soil types), teams will take time to identify the soil in their bucket and rotate. They will take soil medium from one of the soil buckets, and "test" it in the smaller buckets in front so we can put them back together at the end. There will be a space on the Soil Safari Guidebook for them to note what they identified each bucket as. At the end of the activity, groups share what they identified and compare their results. After this, the facilitator will reveal the actual soil types for each bucket.

### **Feeding Our Soil Right:** ( 10 minutes)

This fertility exercise is a guess & match answer game. Groups will be given a laminated Venn diagram, and a list of bullet point facts. Together, students decide which facts go in which part of the diagram--do they apply to organic fertilizer, inorganic fertilizer, or both? Afterwards, we will go over the answers as a group with the facilitator revealing where each fact belongs on the diagram. As we go, students will fill in the correct answers on the Venn diagram in their Soil Safari guides.

### **Erosion:** (20 minutes)

Students are asked what they know about erosion. After they answer, affirm or clarify that erosion is when the nutrient-rich topsoil is depleted by wind, water, or artificial means (i.e. cars). Tell everyone that they're no longer the students that arrived at the farm mere minutes ago; they're elite soil scientists, or pedologists, hired to think of ways to prevent erosion in a new organic farm. Armed with their knowledge about erosion, they have three minutes to get in their groups and brainstorm a list of ways to prevent erosion. Afterward, they'll share their thoughts with the other teams of pedologists in attendance. Each group will be given a blank piece of paper and will use their pencils and clipboards to draft a list of ideas.

After three minutes, the facilitator will call everyone back to a central area and ask each group to share out their ideas. Following a group sharing, at least one person from each group (somebody different every time) will say something that they appreciated about the group's ideas. During this time, students will be encouraged to jot down interesting ideas in their guidebooks that they hear voiced by all groups.

#### *Physical erosion:*

- Once all groups have shared, the facilitator will show them the five erosion demo bottles. These are two-liter bottles cut in half and filled with different soil media. They represent the following five types of erosion prevention (or lack thereof): cover crop, mulch, tilled soil, untilled soil, and matting.
- Students will be given a minute in their groups to predict which of the setups will have the highest amount of soil erosion, and which will have the lowest amount. Then, the facilitator will run all five demos and have students voice their observations following each one.
- Following the demos, a final question will be asked: in what ways are these real-life erosion prevention techniques similar to those that your groups thought of earlier?

#### *Chemical erosion:*

- Similar to the two-liter bottle erosion example, the facilitator will give each group a small clear container, which has gravel inside. On top the gravel are sugar cubes. Each group will be given a dropper filled with red dyed vinegar.
- The facilitator will give instructions to each group in order to demonstrate chemical erosion. Each student in the group will take a turn dropping 10 drops of vinegar onto the cubes.
- As the sugar cubes disintegrate, the groups will discuss what they see happening. As the vinegar seeps through the gravel and starts to run off, the facilitator will discuss with the students how this activity is symbolic of chemical erosion, and the damage that herbicides cause to the soil.

- The facilitator will discuss how chemical burn occurs to roots, and the runoff of the chemical application enters into rivers and streams, and deeper into the soil which eventually enter into our drinking water.

**Monoculture/Polyculture Drawing:** (10 minutes)

There is a space on the soil safari guidebook with two boxes, and three bullet points corresponding to each box. The first box asks students to sketch out what they think a farm looks like. The second asks students to sketch out what they think a farm *should* look like, to benefit soil health. For each, they need to bullet point what that style of farming does to the soil. The initial sketch will happen before anything is revealed, and most students will probably sketch out a monoculture. Then, students share out and compare/contrast their drawings. Six laminated copies of the monoculture vs. polyculture table are passed out and the facilitator talks the class through the differences between monoculture and polyculture. Then, students sketch out what a farm should look like and bullet out three things for each type of farming from the table.

**Conclusion:** (5 minutes)

- What are some of the things we need to keep in mind when caring for our soil?
- What are some things soil needs in order to be healthy and support plant growth?
- How does treating soil well help us in the long run?
- What information did you learn during our soil safari that would help you to grow plants at home?
- What is one new thing you know about keeping soil healthy that you didn't know before
- Did you have fun?

**Class Tear-Down:** (5 minutes)

- Have participants bring all laminated sheets and dry erase markers to the facilitator.
- All soil buckets should be organized and placed in their original spaces.
- Pans and erosion activity materials should be brought to the facilitator.
- If the seasonal activity applies, all tools should be put back in their resting place.

## Soil Safari Seasonal Activity

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### Class Size:

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- Water
- Buckets, Mulch, and Compost (seasonal activity)
- Shovels, Digging Forks, and Rakes (seasonal activity)
- Eager Hands! (And gardening gloves for those hands)

### **Class Set-up:**

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### **Safety Precautions:**

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- The facilitator will discuss how chemical burn occurs to roots, and the runoff of the chemical application enters rivers and streams, and deeper into the soil which eventually enter our drinking water.

**Every season whatever the reason (dependent upon timing/season):**

Every season whatever the reason is a seasonally appropriate additional activity to fit in depending on the state of the farm... In the fall, a plot of land will be weeded and cleared, and mulch or compost will be applied for the winter time. In the spring, compost or mulch will be applied to a plot of land, or ground cover will be seeded. Additionally, students will have the opportunity to prepare beds for planting in the springtime. This involves digging and raking of beds, and/or planting of spring crops. This hands-on activity will only be available if the farm in the right space seasonally and programmatically, and if the right age group is present. The facilitator will discuss with the farmer in advance whether any of these activities are possible.

\* If this activity is available, the monoculture/polyculture activity and/or erosion activity will be taken out and substituted for the seasonal activity. This will also take 20-30 minutes, and points of learning can be applied to the Soil Safari Guide.

**Conclusion:** (5 minutes)

- What are some of the things we need to keep in mind when caring for our soil?
- What are some things soil needs in order to be healthy and support plant growth?
- How does treating soil well help us in the long run?
- What information did you learn during our soil safari that would help you to grow plants at home?
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- Did you have fun?

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