**The Garden Ecosystem…**

**The Science behind Grandmother’s Garden!!**

INSTRUCTOR COPY

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**Activity 1: *Stuff in your garden***

**Procedure**

Take a trip to a nearby garden and observe every aspect of the garden. If there is no garden nearby, search for pictures of gardens online and observe them. Once you have completed your observation, fill out the table below and classify the garden components you observed. Make sure to also provide a reason for why you think they are important to the garden.

|  |  |
| --- | --- |
| **Living components (Biotic)** | **Importance in the Garden** |
| **Fungi** | **Help in breaking down organic matter in the soil**  |
| **Garden Plants** | **Use photosynthesis to make sugars and Oxygen for other organisms. Provide nutrient to the soil when they die** |
| **Rodents** | **Scavengers responsible for destroying seeds and burrowing the soils** |
| **Insects** | **Help with pollination of plants** |
| **Worms** | **Help to aerate the soil and breakdown organic matter** |
| **Birds** | **Help with getting rid of pest insects and worms that negatively impact the plant growth** |
| **Weeds**  | **Opportunistic invaders that compete for nutrients in the soil with garden plants.** |

|  |  |
| --- | --- |
| **Non-Living components (Abiotic)** | **Importance in the Garden** |
| **Air**  | **Gas exchange between atmosphere and soil** |
| **Water**  | **Medium for nutrient exchange between soil and plant** |
| **Soil**  | **Habitat for organisms, nutrient storage for plants, surface to hold plants** |
| **Rock**  | **Source of parent material in the garden** |
| **Dead plant material** | **Source of natural organic material and nutrients in the garden** |
| **Fertilizer** | **Source of nutrients in the garden** |
| **Wind**  | **Pollination and air circulation**  |

**Questions**

1. What are some of the benefits we get from gardens?

Several: food, aesthetics, fresh air, workout, hobby

1. What does a 3-sisters garden look like?

A garden with corn, squash, and beans planted together

1. What does a medicine wheel garden look like?

A circular garden designed in the fashion of the medicine wheel

1. Which important living component of the garden is not visible to the naked eye?

Microbes

**Activity 2A: *Soil Organisms***

1. Please complete the following table below, using your computer as a resource.
2. Soil Organisms include:
	1. Microrganisms: Bacteria, Fungi, Actinomycetes, Virus, Protozoa
	2. Macrorganisms: Nematodes (round worm), Arthropods: insects, Annelids (segmented worms)
3. Activity (20-30 minutes) with discussion to follow.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Microorganisms Scientific Name** | **Common Name** | **Describe Shape** | **Function in Soil** | **Insert/Add/Draw a Picture** |
| Bacillus subtilis | Bacteria | Rod shaped | Inhabit the rhizosphere, which is the interface between plant roots and the surrounding soil. The plants roots and associated biofilm can have a significant effect on the chemistry of the soil, creating a unique environment. |  |
| Tabacco Mosaic | Virus |  | infects a wide range of plants, especially **tobacco** |  |
| Streptomyces | Actinomyces | Rod shaped bacteria | Gram-positive bacteria that grows in various environments, and its shape resembles filamentous fungicommonly found in soil. It helps to naturally decompose organic matter. |  |
| Pseudomonas | bacteria | Rod shaped | bacteria can be found in **soil**, marshes, coastal marine habitats, and plant and animal tissue; often located in soils that have a history of pollution by chemical wastes. |  |
| Mucor | Mold | Filamentous fungi | is a mold found in soil, plants, manure, decaying fruits, vegetables and as a common contaminant of stored and processed foods in the kitchen |  |
| Chlorella | Algae | Circular shaped plant | found either singly or clustered in fresh or salt water and in **soil**. **Chlorella** has been extensively used in photosynthetic studies, in mass cultivation experiments, and for purifying sewage effluents.It is important to maintain a balance in the **soil** |  |
| Euglena | Protozoa | Oval shaped free living microorganism | brackish water rich in organic matter and can also be found in moist **soils**.useful for environmental biomediation |  |
| Lumbricus | annelidEarthworm | Long & segmented | ability to break down organic materials and excrete concentrated nutrients |  |
| Pratylenchus | nematode | Long, microscopic worm-like shape | migratory endoparasites that feed and reproduce in the [root](https://en.wikipedia.org/wiki/Root) and move around, unlike the [cyst](https://en.wikipedia.org/wiki/Heterodera) or [root-knot nematodes](https://en.wikipedia.org/wiki/Root-knot_nematode), which may stay in one place. They usually only feed on the cortex of the root, affected by soil moisture, mineral components, temperature, aeration, organic matter, and pH.[[3]](https://en.wikipedia.org/wiki/Pratylenchus#cite_note-Norton.2C_D._C._1978-3) They are more common in sandy soils and land with [weed](https://en.wikipedia.org/wiki/Weed) infestations |  |

**Questions**

1. Which soil organism is the most important organism in soil and why?

Vary by student, but it should be typically Earthworm (for macrofauna) or nitrogen fixing bacteria and actinomycetes (for microflora)

1. Do all of these organisms live in all types of soil?

They live & survive in various soil types depending upon the organism and the conditions in which the organism prefers.

1. If you went outside and dug up a teaspoon of soil, what soil organisms do you think that it would contain?

Vary by student: they should list various types of bacteria, actinomycetes, and fungi.

**Activity 2B: Soil *Microscopy***

**Questions:**

1. What organisms did you find the most interesting?

Vary by student: students should write down the name of the organism

1. What shapes of microorganisms were you able to see under the microscope?

Rod, circular, spiral, round, oval, filamentous, variable shapes

1. Can you classify some of the organisms that were seen today?

*Bacteria, Actinomycetes, Fungi, Algae, Protozoa: Flagellates (F), Amoebae (A), Ciliates(C)*

**Soil Microorganisms through a Microscope: Classifications**

*Bacteria, Actinomycetes, Fungi, Algae, Protozoa: Flagellates (F), Amoebae (A), Ciliates(C)*

|  |  |  |
| --- | --- | --- |
| **Microorganism Name** | **Classify: Bacteria, Fungus, Algae,****Protozoa: F,A, C, Actinomycetes** | **Draw a Picture** |
| 1 They will fill this in depending on the slide given | You can give two slides of each type of organismfungus | This will vary per student group |
| 2 | fungus |  |
| 3 | bacteria |  |
| 4 | bacteria |  |
| 5 | algae |  |
| 6 | algae |  |
| 7 | actinomycetes |  |
| 8 | actinomycetes |  |
| 9 | Protozoa: euglena |  |
| 10 | Protozoa: amoebae |  |

**Activity 3: *How to Start Seeds***

**Six Steps, from Seed to Garden (Straightforward steps to follow)**

<https://www.gardeners.com/how-to/how-to-start-seeds/5062.html>

1. Find the right containers
2. Prepare the "potting soil"
3. Start planting
4. Water, feed, repeat
5. Light, light, light!
6. Move seedlings outdoors gradually

**Questions**:

1. What is it called when a seed sprouts or opens up?

 Germination

1. What will your seed produce and will it grow and produce in the area that you live?

 Vary by the seed chosen: if seeds grow in the area it will be yes they will grow and produce the respective plants.

1. What does a seed need in order to sprout?

 Right conditions, water, soil, nutrients, light

**Activity 4: *Garden Planner***

**Procedure**

* Download the garden planner almanac on to your computer
* Follow the quick easy video tutorial
* Open the planner on your computer screen and explore all its components
* Design an ideal garden for your home, adding all your preferred plants!
* Once you have completed your design, print the design

**Questions**

1. **Describe the design of your garden?**

Description will vary by student: should include the list of plants selected, type of garden, types of rows, and general choice of where the plants are located in the garden.

1. **What were some of the major considerations you wanted included in your garden?**

Consideration will vary by student: size, purpose, location, significance, ease of care.

1. **Does the row size influence the number of crops you can plant in a row?**

Yes

1. **What are the cultural significance of some of the crops you included in your designed garden?**

Could vary: food, medicine for people, medicine for animals, spiritual/sacred ceremony

1. **Lookup the planting time range for the following crops in the garden**

|  |  |  |
| --- | --- | --- |
| Garden Produce | When to plant in soil (Month) | How long before harvest |
| Carrots: | Early spring | 90 days |
| Radishes: | Early Spring, Late Summer | 3 – 10 weeks |
| Lettuce: | Early April | 70 – 90 days |
| Tomatoes: | May | 4 – 5 months |
| Green beans: | May | 60 days |
| Okra: | 2 weeks after last frost | 50 – 75 days |
| Eggplants:  | 2 weeks after last frost | 4 – 5+ months |
| Cucumbers: | May - June | 2 – 3 months |
| Onions:  | Plant sets in April | Sets: 50 – 60 days, seeds: 3 - 4 month |
| Peppers: | May | 4 – 5 months |
| Raspberries: | Late fall, early spring | Early summer |
| Broccoli: | Late April, May | 4 – 5 months |
| Squash: | May - June | 40 – 100 days |
| Potatoes: | April - May | 90 – 150 days |
| Peanuts:  | Early April | Fall |

**Activity 5: *Edible Garden Soil Mosaic***

See attached document



**Discussion:**

1. What are the layers of soil?

Residue

Topsoil

Subsoil

Parent material

1. What types of organisms live in soil and aid in soil production?

Earthworms,

Bacteria

Fungi