FRESH ROOTS

Activity Guide

Farm Ecosystem Web

A farm isn't just plants! There's a whole complex web of relationships between plants, animals, fungus, sun, water, and more. In this activity, you'll create your own web to see how just some of the things on our farm are connected.

Things You'll Need

- A big space to draw and things to draw with, for example:
  - A driveway and sidewalk chalk
  - A white board and whiteboard markers
  - Poster or flip chart paper and markers/crayons
- Ecosystem Elements pages, printed single sided and cut out.
- Tape (to hold the Elements in place)

Suggested Grades

Grades 3-12

Time

30-45 minutes

Subjects

Science

Background: What is an Ecosystem?

An ecosystem is a community of living (or biotic) and non-living (or abiotic) things that interact with each other.

Biotic organisms include include producers, consumers, and decomposers. Producers, like plants and algae, can make their own food from sunlight. Consumers, like animals, can't make their own energy and need to eat other living things to survive. Decomposers, like fungi and bacteria, consume dead things and return the nutrients in those things back to the soil, making them available for producers to use.

Abiotic things include sunlight, water, air, and soil. Rocks, minerals, and weather are also abiotic elements that make up ecosystems.

Different ecosystems have a different mix of biotic and abiotic things, and it's that mix that makes ecosystems unique!

Want more background? Here are a couple of videos introductions to ecosystems:
For grade 3-8: What is an Ecosystem? by MonkeySee.
For grade 9-12: Ecosystem Ecology: Links in the Chain by CrashCourse

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A Note About Humans

Sometimes, when we talk about ecosystems, we don't include humans, or only include the damaging things humans do to other living and non-living things. But humans are part of ecosystems just like trees and birds and insects are. We live in relationship with every other living and non-living thing in our ecosystems. And just like trees, birds, and insects, humans can be beneficial to some things and harmful to others.

One way the humans are different from other living things is that we can be aware of how we're affecting other members of the ecosystem in specific, or even the whole ecosystem. That means we can make choices about our behaviors, and can work to have a more positive relationship with our ecosystems. As you make your web, pay attention to how humans are connected to others in the ecosystem, and think about whether those impacts are helpful or harmful. What choices can you personally, or we as a society, make to increase help and decrease harm?

Build Your Web

On your drawing surface, spread out each of the elements from the Abiotic Elements and Biotic Elements cards. Give yourself A LOT of space - more than you think you need!

Because it's a web and everything is connected, it doesn't matter how you arrange them. You can place them in a big circle at the edge of your area, scatter them randomly, or group them in a way that makes sense to you. There's no wrong way, as long as you leave plenty of space to draw and write.

Then, start looking for connections! Read the information on the Element cards to help you, and include other things you know about each element. You can start with one element and see how many connections you can find to it, or go around and find one connection for each element, then go back again. Be sure to find at least two connections for each element!

As you go, draw those connections in with a line, and write a word or phrase to indicate how they are connected. For example, you might draw a line between a ladybug and an aphid and write "Eats--->" above it with the arrow pointing to the aphid.

You may want to use different colors to show different things. Maybe a food web is one color and a water web is another, or helpful and harmful relationships are different colors.

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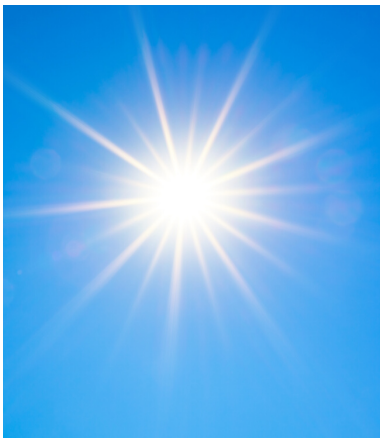
Reflection

After you make your web, think about these questions. You might want to choose a few to write about, or discuss them with someone in your household or a friend online.

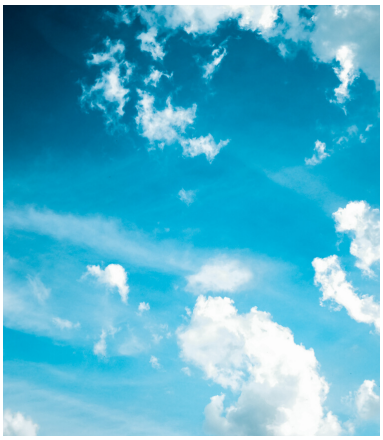
- What is something you learned by making the web? What connections did you not expect?
- What would happen if one of the biotic elements (living things) was removed? What about if one of the abiotic elements (non-living things) was removed?
- This farm ecosystem includes different kinds of living things. Do you think it's better to have more kinds of living things (higher biodiversity), or fewer kids of living things (lower biodiversity) in an ecosystem? Why?
- Modern farm ecosystems need a lot of human intervention to grow the food we like to eat, but not all our food comes from farms. Are there any foods you eat that don't come from farm? (Hint: think about seafood!) What kind of ecosystems are those foods part of?
- What might a farm look like in five years if humans suddenly disappeared? What plants and animals would you expect to see fewer of? What would you see more of?
- This is a model of a small vegetable farm that grows a wide variety of plants and doesn't use chemical pesticides or herbicides. What might a farm ecosystem look like on a different kind of farm?

Abiotic Elements



Sunlight

- Plants use energy from sunlight for photosynthesis.
- Sunlight warms the soil, water, and air.
- Heat from the sun leads to evaporation of water.
- Heating or cooling of the air and the oceans causes wind and other kinds of weather.
- Plants and animals have a set range of temperatures they can survive in. If it's too hot or too cold, they cannot survive.



Air

- Air is a mix of gasses, including oxygen, carbon dioxide, and nitrogen.
- Plants use carbon dioxide for photosynthesis and give off oxygen as a waste product.
- Animals breathe oxygen and give off carbon dioxide as a waste product.
- Wildfires and human-created pollution can affect air quality. Smoke and other particulates in the air can reduce the amount of sunlight plants can absorb.

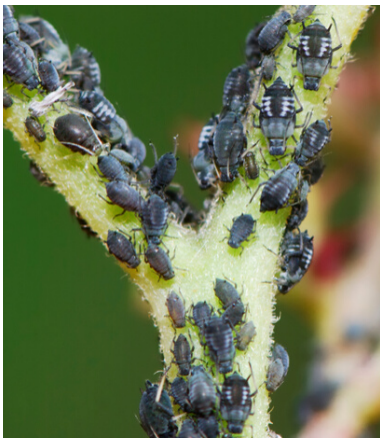
Water

- Plants absorb water, and the nutrient dissolved in it, through their roots.
- Animals need water for their bodies to work. They might drink water, get water from their food, or absorb it through their skin.
- Water drops on plant leaves can act like a magnifier and cause burning of delicate leaves if the sun is strong.
- Rain and snow adds water to the soil and fills lakes, streams, and reservoirs.
- Rain can erode soils, leading to loss of nutrients.

Soil

- Soil is partly abiotic, made of clay, sand, and silt, and partly biotic, made of decomposed plants, animals, and animal waste.
- Soils contain nutrients and beneficial bacteria and fungus that help plants grow.
- Soil is home to many invertebrates, including earthworms.
- Soil absorbs water, which lets plants "drink" it through their roots.
- Soils can absorb heat from the sun.

Biotic Elements



Aphids

- Aphids are small sap-sucking insects.
- Aphids weaken plants by feeding on sap and can transmit plant diseases.
- Aphids feed on many food crops, including kale and tomatoes.
- Aphids produce a sweet, sticky fluid called honeydew. This honeydew can make it easier plant to be injured by some fungi.
- Aphids reproduce very quickly.
- Ladybugs are one of aphids' main predators.

Basil

- Basil is a low-growing aromatic herb. It is an excellent source of Vitamin K and a good source of many other vitamins and minerals.
- Basil is often planted near tomatoes, as it is thought that the oils in basil leaves deter aphids and other pests. Some gardeners think it helps their tomatoes taste better, too.
- Basil is native to sub-tropical climates, and must be started indoors in Vancouver.

Bumblebees

- Bumblebees feed on flower nectar and pollen.
- Bumblebees' fuzzy bodies make them very good pollinators.
- Tomatoes, blueberries, salal, and some other plants rely on bumble bees to pollinate them due to the shape of their flowers.
- Bumblebees live in underground nests or brush piles.
- Bumblebees prefer to visit areas with a variety of flowers.
- There are 46 different species of bumblebee in North America.

Compost

- Compost is made from food waste, garden clippings, weeds, leaves, and other biotic materials.
- Decomposers like invertebrates, bacteria, and fungi digest the biotic materials and leave behind nutrient rich compost.
- Humans add compost to soil to increase the amount of nutrients plants can access.

Biotic Elements

Crows

- Crows are common throughout North America.
- Crows will eat just about anything - seeds, young plants, grain, worms and other invertebrates, small animals like mice and frogs, and food waste left behind by human.
- Crows nest primarily in oaks and other large trees. They live in families.
- Crows are very intelligent and can use tools to get food.
- Bird droppings are high in nitrogen, potassium, and phosphorus, chemical elements plants need to grow.

Earthworms

- Earthworms are soil-dwelling invertebrates. They absorb water and oxygen through their skin, and their skin needs to be wet for them to breathe.
- They eat decaying plant matter. They don't have teeth, so need other decomposers, like fungi, to start breaking it down.
- Their waste, called "castings", is an amazing source of nutrients for plants.
- As they tunnel through the soil, they loosen and aerate it, making it easy for plants' roots to grow.
- Worms are a favorite food of some birds, including robins and crows.

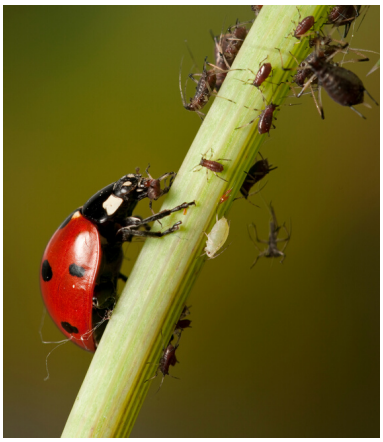
Fungus

- Fungi are consumers. Like animals, they consume energy from other living things, and can cause diseases in their hosts.
- Fungi are also decomposers. Fungi consume dead or decaying plants and animals, leaving nutrients behind that available to plants.
- Humans use a variety of fungi for food including mushrooms, yeasts (to make bread and fermented foods), and molds (in some cheeses).

Humans

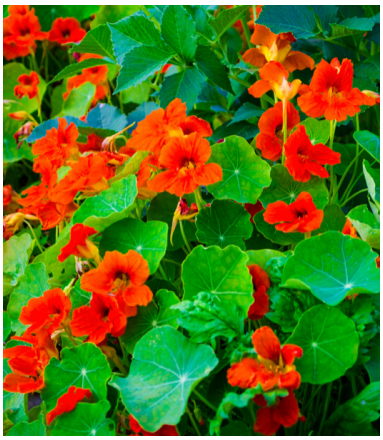
- Humans grow farms as a source of food, and as cash crops to sell to others.
- Humans have bred many varieties of plants for taste, size, or ease of growing. Most vegetables don't look much like their wild ancestors.
- Humans often plant crops in rows, and tend them by weeding, watering, or providing additional shelter. This allows plants to thrive that would not be able to on their own.
- Humans choose which plants to grow based on local tastes and marketability.

Biotic Elements



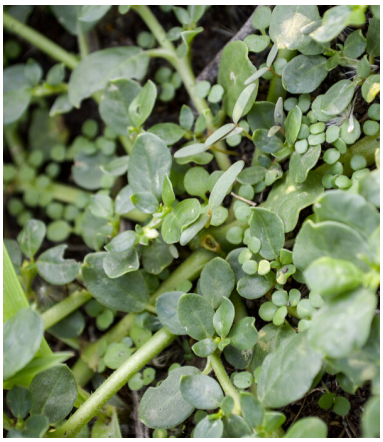
Ladybugs

- Ladybugs (or ladybirds) are small beetles, often red with black spots.
- Ladybugs are predators. They feed largely on aphids, but will also eat other plant-eating insects.
- Ladybugs lay their eggs on the underside of leaves of plants that their prey prefers, so the new larvae have an easy source of food.
- Ladybugs hibernate over the winter, often in cracks in buildings.
- Ladybugs' bright coloring lets predators know they don't taste good.



Nasturtiums

- Nasturtiums are low-growing herbaceous plants, often grown for their edible flowers and leaves, and for their bright colors.
- Nasturtiums are nitrogen-fixers. They host beneficial bacteria in their roots which can take nitrogen from the air and convert it to a form plants can use, improving the soil around them.
- Nasturtiums are a favorite target of aphids, and can draw aphids away from other crops.



Purslane

- Purslane is an edible plant that grows like a weed on the farm.
- Weeds are any plants that are growing where a farmer doesn't want them. They can absorb nutrients and water from the soil, and can crowd out intentionally planted crops
- Purslane is an excellent source of vitamins A and C, and a good source of Calcium and some B vitamins.

Tomatoes

- Tomatoes originated in western South America and are now eaten throughout the world in sauces, stews, salads, and more.
- Tomatoes are heat-loving plants that generally need to be started indoors in Vancouver.
- Tomatoes can be pollinated by bumblebees or the wind.
- Basil is often planted near tomatoes as a companion plant.
- Tomatoes are a favorite target of aphids.